STUDENT CHOICE AMONG LARGE GROUP, SMALL GROUP, AND INDIVIDUAL LEARNING ENVIRONMENTS IN A COMMUNITY COLLEGE MATHEMATICS MINI-COURSE

by
Eldon C. Baldwin

Maryland
LD
3931
.M70d
Baldwin
E.C.
Vol. 1
Folio

Dissertation submitted to the Faculty of the Graduate School
of the University of Maryland in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy
1986

Copy 1

c Copyright Eldon C. Baldwin

APPROVAL SHEET

Title of Thesis: Student Choice Among Large Group, Small Group, and Individual Learning Environments in a Community College Mathematics Mini-Course

Name of Candidate: Eldon C. Baldwin
Doctor of Philosophy, 1986

Thesis and Abstract Approved: Neil Davidson
Neil Davidson
Associate Professor
Mathematics Education

Date Approved: December 19, 1985

ABSTRACT

Title of Dissertation: Student Choice Among Large Group, Small Group, and Individual Learning Environments in a Community College Mathematics Mini-Course

Eldon Cole Baldwin, Doctor of Philosophy, 1986

Dissertation directed by: Neil Davidson
Associate Professor
Mathematics Education

This study describes the development and implementation of a model for accommodation of preferences for alternative instructional environments. The study was stimulated by the existence of alternative instructional modes, and the absence of a procedure for accommodation of individual student differences which utilized these alternative modes.

The Choice Model evolved during a series of pilot studies employing three instructional modes; individual (IM), small group (SGM), and large group (LGM). Three instructors were each given autonomy in designing one learning environment, each utilizing her/his preferred instructional mode. One section of a mathematics course was scheduled for one hundred students. On the first day the class was divided alphabetically into three orientation groups, each assigned to a separate classroom. During the first week, the instructors described their respective environments to each group, using video taped illustrations

from a previous semester. Environmental preferences were then assessed using take-home student questionnaires. In the final pilot, fifty-five students were oriented to all three environments. Each student was then assigned to his/her preferred learning environment. The distribution of environmental preferences was 24% for IM, 44% for SGM, and 33% for LGM.

The following student characteristics were also investigated: 1)sex, 2)age, 3)academic background, 4)mathematics achievement, 5)mathematics attitude, 6)mathematics interest, 7)self-concept, 8)communication apprehension, and 9)interpersonal relations orientation. This investigation revealed several suggestive preference patterns: 1)Females and students with weak academic backgrounds tended to prefer the SGM environment. 2)Students with higher levels of communication apprehension tended to avoid the SGM environment. 3)New college students and students with negative mathematics attitudes tended to avoid the IM environment. 4)Students with higher grades in high school tended to prefer the LGM environment.

Student preferences were successfully accommodated, and student evaluations of the Choice Model were generally positive. The literature suggests that opportunities to experience choice in education tend to enhance student growth and development; adaptation and institutionalization of the Model were addressed from this perspective. Additional studies with larger samples were recommended to

further investigate environmental preferences with respect to student and instructor characteristics of gender, age, race, socioeconomic background, academic background, and learning style.

FOREWORD

This dissertation signifies not only the completion of the author's doctoral program, but also the completion of fifteen years of community college teaching. It is clear to the author that if he had completed his graduate studies before entering the teaching profession on a full-time basis, he would have completed his degree work at least a decade sooner. It is equally clear, however, that this study would have never occurred had he not also been teaching at Prince George's Community College.

The original notion of offering students a choice among instructional modes occurred to the author in August 1971, during his first faculty orientation program. He began his graduate program in mathematics education during that same month. The evolution of the choice idea corresponds in many respects to the author's own developmental experiences as a mathematics teacher. Those experiences, however, were profoundly effected by the author's graduate studies.

So, would it have been wiser to remain a full-time graduate student before starting a career? In retrospect, this author is sure that his graduate studies would have been much easier to complete had he done so. He is equally sure, however, that as a full time graduate student his doctoral program would not have been nearly as rewarding.

DEDICATION

When I recently told my son, who is now twelve, that I had just completed my Ph.D., I could not understand at first why he wasn't very impressed by the significance of the occasion. It was only then I realized that I have been working on this dissertation for his entire life. He does not know what it means to have a father who is not writing and studying. In fact, none of my family have ever known me when I was not a graduate student.

My family has long suffered when I have disappeared for hours in the study, let the grass grow too long, and stayed inside the house when everyone else went outside. Most of their suffering has been in silence, even though I know they can not feel the same sense of fulfillment and accomplishment which I do. It is for this reason that I am dedicating this dissertation to my wife Barbara, and to my children Amy and Eldon. Thank you all for your patience, for your support, and for just being there when I needed you.

ACKNOWLEDGEMENTS

In fifteen years you become indebted to so many people that it is impossible to acknowledge all of their contributions. First and foremost, however, I must thank my readers for their patience, their support, and their endurance. Dr. Neil Davidson, my advisor, introduced me both to small group instruction and to educational research. I have always been able to rely on him for encouragement and constructive suggestions. Dr. James Fey long ago impressed upon me the need for careful and believable documentation to substantiate research in mathematics education.

My other three readers are not mathematicians, and their respective influences both on me and on this study are undeniable. I first met Dr. Raymond Falcione when he addressed the faculty at Prince George's Community College concerning organizational communication. I subsequently enrolled in his small group seminar, where he provided me with an introduction to communications concepts and research. Dr. Jean Grambs first introduced me to educational sociology, and provided many helpful suggestions during the proposal, writing, and editing stages of this dissertation. Most recently, Dr. L. Lee Knefelkamp provided me with an overview of various student development theories, models, and research.

I must also thank the students, faculty, and staff of Prince George's Community College. This study would not have been possible without the many and varied forms of both direct and indirect cooperation and support which I have received over the years. I especially want to thank the students who participated in the study, and the faculty who designed and taught in the learning environments: Mr. Harry Phillips, Mr. David Russell, and Ms. Jennie Thompson.

TABLE OF CONTENTS

FOREWARD ii

DEDICATION iii

ACKNOWLEDGEMENTS iv

CONTENTS vi

Chapter page

I. INTRODUCTION 1

Overview 1
A Brief Historical Perspective 4
Individual Differences 9
Differences in Cognitive Style 10
Cognitive Style Mapping 11
Genotypic Differences 13
Heredity vs. Environment 15
Aptitude Differences 17
Adaptation and the Predetermined Program 18
Adaptation and Optional Goals . . 19
Adaptation and Remedial Instruction 21
Adaptation and Alternate Instructional Methods 22
Student Choice of Instructional Mode 25
Study Outline and Research Questions 28

II. REVIEW OF RELEVANT RESEARCH - PART I. 31

Overview 31
Choice in Education. 35
Choice and Personal Development 35
Choices in Secondary School . . . 37
Choices in College 39
Choice and Learning Environment 41
Choice Between Alternative School Environments 42
Choice Among Alternative College Classroom Environments . . . 46
Summary 49
Some Components Common to All Learning Environments 51

Chapter page

Physical Environment 52
Historical Overview 53
Territoriality, Personal Space, and Spatial Arrangement 56
Implications of Physical Environment Research Which Relate to Environmental Preference . . 62
Communication Environment 63
Functions of Classroom Communication 64
Communication Malfunctions in the Classroom 66
Communication Networks 69
Implications of Communication Environment Research Which Relate to Environmental Preference 74
Social Environment 77
Class Size 78
Homogeneity Versus Heterogeneity . 80
The Reward System 83
Sociometric Structure 90
Implications of Social Environment Research Which Relate to Environmental Preference . . 92

III. REVIEW OF RELEVANT RESEARCH - PART II 95

Overview 95
The Community College Environment 98
A Brief History 100
The Instructor 104
Identity and Professionalism . . . 104
Creativity, Flexibility, and Authoritarianism 110
Communication Behavior 116
The Student 120
Identity 121
Comments Concerning College Experiences 125
Self-Concept 131
Communication Apprehension 141
Interpersonal Relations Orientation 151
Mathematics Attitude 156
Implications of Community College Environment Research Which Relate to Environmental Preference 161
Instructional Modes and Goals 168
Methods and Models of Teaching 169
Modes of Instruction 178
The Large Group Mode (LGM) 180
The Small Group Mode (SGM) 189

Chapter page

The Individual Mode (IM) 198
Implications of Instructional Mode Research Which Relate to Environmental Preference . . 207
Summary 210

IV. STUDY DESIGN 212

Overview 212
Early Designs 213
First Pilot 213
Second Pilot 219
Design Changes 225
Mini-Courses 225
Descriptive Study 227
Final Pilot 229
Post-Orientation Preference . . . 231
Post-Instruction Evaluation . . . 235
Conclusions 239
Final Adjustments 241
The Final Design 243
Course Structure and Content 245
Instructional Environments:
Mode and Style 248
Large Group Mode (LGM) 251
Small Group Mode (SGM) 252
Individual Mode (IM) 257
Pre-Instruction Phase 260
Orientation 260
Assessment of Preferences 262
Instruction Phase 264
Post-Instruction Phase 265
Additional Questionnaires 266
Academic Records 270
Original and Additional Research Questions . 272

V. ORIENTATION AND PRE-INSTRUCTION PREFERENCE DATA . 276

Overview 276
Sex and Age 279
Table Format 280
Sexes of Students and Instructors . . . 289
Ages of Students and Instructors . . . 293
Summary 299
Student Orientation and Data Collection . . 301
Data Collection and Analysis 302
Degree and Sequence of Orientation . . 306
Degree of Orientation Exposure . . 308

Chapter page

Sequence of Orientation Exposure . 320
Summary 324
Determination of Preferences 326
Assignments to Preferred Environments . 328
Environmental Preference Scores 332
Questionnaire Format 332
Scoring Procedure 334
Distributions of Preference Scores 335
Summary Statistics for Preference Scores 345
Orientation Comments 347
Quantification of Environmental Comments 347
Comparisons of Response Score and Preference Score Distributions 350
Quantification of General Student Comments 359
Distribution of General and Total Response Scores 360
Summary 365

VI. PRE-INSTRUCTION STUDENT DATA 369

Overview 369
Post-Orientation Student Characteristics . . 370
Post-Orientation Mathematics Attitude. 372
Post-Orientation Self-Concept 378
Self-Concept 379
Self-Ideal-Concept 382
Comparison of Self-Concept and Self-Ideal-Concept Reports . 385
Interpersonal Relations 389
Expressed Affection 395
Withheld Affection 400
Summary of Expressed and Withheld Affection Findings 404
Expressed Control 406
Withheld Control 409
Summary of Expressed and Withheld Control Findings 415
Expressed Inclusion 416
Withheld Inclusion 420
Summary of Expressed and Withheld Inclusion Findings 425
Communication Apprehension 426
Summary of Student Characteristics . . 433
Pre-Instruction Academic Archive Data . . . 439
High School Data 440
Placement Test Data 445
Elementary Algebra Achievement . . 446
Mathematics Interest 451

Chapter page

Summary of Placement Data 455
College Data 455
Developmental Mathematics 456
Previous Course Enrollment 459
Previous College Enrollment . . . 462
Previous Quality Point Average . . 465
Summary of College Data 470
Summary of Archive Data 472

VII. POST-INSTRUCTION DATA 476

Overview 476
Academic Outcomes 478
Experimental Group Grade Distribution . 478
"Pseudo-Control Group" Grade Distribution 481
Comparison of Environmental Preference Groups Within the Experimental Group 484
Comparison of Course Grades with Selected Pre-Instruction Characteristics 487
Summary 493
Post-Instruction Measured Preferences . . . 495
Post-Orientation Versus Post-Instruction IM Preference Scores . 497
Degree of Response to Post-Instruction Instruments . . . 506
Statistical Differences Between the Original Sample and the Reduced Sample 508
IM Preference Score Changes Within the Reduced Sample 512
Post-Orientation Versus Post-Instruction SGM Preference Scores 513
Statistical Differences Between the Original Sample and the Reduced Sample 520
SGM Preference Score Changes Within the Reduced Sample . . 523
Post-Orientation Versus Post-Instruction LGM Preference Scores 524
Statistical Differences Between the Original Sample and the Reduced Sample 530
LGM Preference Score Changes Within the Reduced Sample . . 532
Summary 532
Post-Instruction Measured Student Characteristics 536
Mathematics Attitude 537

Chapter page

Statistical Differences Between the Original Sample and the Reduced Sample 542
Mathematics Attitude Score Changes Within the Reduced Sample . . 544
Communication Apprehension 546
Statistical Differences Between the Original Sample and the Reduced Sample 551
Communication Apprehension Score Changes Within the Reduced Sample 553
Summary 554
Post-Instruction Student Evaluation of the Choice Study 555
Student Evaluation of the Choice Model 556
Student Evaluation of the Environments 558
Teacher Receptivity 560
Summary 567
Post-Instruction College Archive Data . . . 568
Associates Degrees Earned 570
Total College Enrollments 574
Total Quality Point Averages 579
Summary 585

VIII. FINDINGS, OBSERVATIONS, AND CONCLUSIONS 588

Overview 588
Pre-Instruction Environmental Preference Findings 593
Pre-Instruction Student Characteristics Findings 602
Post-Instruction Findings 612
Observations, Implications, and Recommendations for Further Study . . . 624
Accommodation of Individual Differences Among Students 626
Matching Different Learning Styles With Different Teaching Styles 638
Conclusion 645

APPENDICES

Appendix		page
A.	Student Voices	657
B.	Guidelines for Group Facilitators	667
C.	Spring 1973 Choice Questionnaire	671
D.	Fall 1973 Choice Questionnaire	672
E.	Fall 1976 Post-Orientation Packet Environment Preference Questionnaire Environment Evaluation Form	673
F.	Fall 1976 Post-Instruction Packet Environment Preference Questionnaire Environment Evaluation Form	675
G.	Spring 1977 Post-Orientation Packet Instructions Orientation Comment Form Learning Environment Preference Scale Mathematics Attitude Scale Self-Concept Scale Communication Apprehension Report Interpersonal Relations Orientation	677
H.	Spring 1977 Post-Instruction Packet Instructions Learning Environment Evaluation and Comment Form Learning Environment Preference Scale Mathematics Attitude Scale Communication Apprehension Report Instructor Receptivity Scale	691
I.	Sample Objectives and Mastery Test	696
J.	SGM Sample Worksheet	697
K.	Environment Descriptions	698
L.	Post-Orientation Measured Preference Data	705
M.	Post-Orientation Measured Student Characteristics	707
N.	Pre-Instruction Archive Data	709
O.	Post-Instruction Grades	715
P.	Post-Instruction Measured Data	717
Q.	Comparison of Preference Scores	719
R.	Comparison of Measured Characteristics	721
S.	Post-Instruction Evaluation	723
T.	Post-Study Archive Data	725

BIBLIOGRAPHY 727

LIST OF TABLES

Table		page
1.	Communication Patterns	70
2.	Spring 1973 Choice Questionnaire	216
3.	Fall 1973 Choice Questionnaire	222
4.	Fall 1976 Post-Orientation Questionnaire	234
5.	Fall 1976 Post-Instruction Questionnaire	237
6.	Distribution of Sex by Preferred Environment	281
7.	Distribution of Age by Preferred Environment	294
8.	Summary Statistics for Age and Sex by Preferred Environment	297
9.	Distribution of Individual Mode Orientation Exposure by Preferred Environment	310
10.	Distribution of Small Group Mode Orientation Exposure by Preferred Environment	314
11.	Distribution of Large Group Mode Orientation Exposure by Preferred Environment	318
12.	Distribution of Measured Individual Mode Preferences by Preferred Environment	336
13.	Distribution of Measured Small Group Mode Preferences by Preferred Environment	340
14.	Distribution of Measured Large Group Mode Preferences by Preferred Environment	343
15.	Summary Statistics for Preference Scores by Preferred Environment	346
16.	Distribution of IM Mean Written Response Scores by Preferred Environment	352
17.	Distribution of SGM Mean Written Response Scores by Preferred Environment	354
18.	Distribution of LGM Mean Written Response Scores by Preferred Environment	357
19.	Distribution of General Written Response Scores by Preferred Environment	361
20.	Distribution of Mean Total Written Response Scores by Preferred Environment	320
21.	Distribution of Measured Mathematics Attitude by Preferred Environment	374
22.	Summary Statistics for Mathematics Attitude by Sex and Preferred Environment	375
23.	Distribution of Measured Self-Concept by Preferred Environment	380
24.	Summary Statistics for Self-Concept by Sex and Preferred Environment	381
25.	Distribution of Self-Ideal-Concept by Preferred Environment	383

Table page

26. Summary Statistics for Self-Ideal-Concept by Sex and Preferred Environment 384
27. Distribution of Self-Ideal-Concept by Preferred Environment and Self-Concept 385
28. Key to FIRO-B Statements and Responses 390
29. Distribution of FIRO-B Expressed Affection by Preferred Environment 396
30. Summary Statistics for Expressed Affection by Sex and Preferred Environment 397
31. Distribution of FIRO-B Withheld Affection by Preferred Environment 401
32. Summary Statistics for Withheld Affection by Sex and Preferred Environment 402
33. Distribution of FIRO-B Expressed Control by Preferred Environment 407
34. Summary Statistics for Expressed Control by Sex and Preferred Environment 408
35. Distribution of FIRO-B Withheld Control by Preferred Environment 411
36. Summary Statistics for Withheld Control by Sex and Preferred Environment 412
37. Distribution of FIRO-B Expressed Inclusion by Preferred Environment 418
38. Summary Statistics for Expressed Inclusion by Sex and Preferred Environment 419
39. Distribution of FIRO-B Withheld Inclusion by Preferred Environment 421
40. Summary Statistics for Withheld Inclusion by Sex and Preferred Environment 422
41. Distribution of Communication Apprehension by Preferred Environment 430
42. Summary Statistics for Communication Apprehension by Sex and Preferred Environment 431
43. Distribution of High School Average Grade by Preferred Environment 442
44. Distribution of High School Average Math Grade by Preferred Environment 443
45. Distribution of CGP Algebra Score by Preferred Environment 448
46. Summary Statistics for CGP Algebra Score by Sex and Preferred Environment 450
47. Distribution of CGP Mathematics Interest Score by Preferred Environment 452
48. Summary Statistics for CGP Mathematics Interest Score by Sex and Preferred Environment . . 453
49. Distribution of Developmental Mathematics Grade by Preferred Environment 459
50. Distribution of Repeated Course Enrollment by Preferred Environment 452
51. Distribution of Previous College Session Enrollments by Preferred Environment . . . 463

Table page

52. Distribution of Pre-Instruction Quality Point Average by Preferred Environment 467
53. Summary Statistics for Pre-Instruction Quality Point Average by Sex and Preferred Environment 469
54. Distribution of Course Grades by Preferred Environment 479
55. Distribution of Course Success by Preferred Environment 485
56. Summary Statistics for Average High School Mathematics Grade, Mathematics Attitude, and Communication Apprehension by Course Grade 489
57. Distribution of Post-Instruction Measured Individual Mode Preferences by Preferred Environment 498
58. Summary Statistics for IM Preference Score Changes by Preferred Environment 510
59. Distribution of Post-Instruction Measured Small Group Mode Preferences by Preferred Environment 514
60. Summary Statistics for SGM Preference Score Changes by Preferred Environment 521
61. Distribution of Post-Instruction Measured Large Group Mode Preferences by Preferred Environment 525
62. Summary Statistics for LGM Preference Score Changes by Preferred Environment 531
63. Distribution of Post-Instruction Mathematics Attitude by Preferred Environment 538
64. Summary Statistics for Mathematics Attitude Score Changes by Preferred Environment . . 543
65. Distribution of Post-Instruction Communication Apprehension by Preferred Environment . . . 547
66. Summary Statistics for Communication Apprehension Score Changes by Preferred Environment 552
67. Summary Statistics for Model Evaluation by Sex and Preferred Environment 557
68. Summary Statistics for Environment Evaluation by Sex and Preferred Environment 559
69. Teacher Receptivity Scale Weighting Factors . . 563
70. Distribution of Measured Teacher Receptivity by Preferred Environment 565
71. Summary Statistics for Teacher Receptivity by Sex and Preferred Environment 566
72. Distribution of PGCC Degrees Earned by Preferred Environment 571
73. Degree Attainment for Sample Students by Academic Year 572
74. Degree Attainment for Transfer Students by Academic Year 573

Table page

75. Distribution of Total College Sessions After Four Years by Preferred Environment 576
76. Distribution of Total Quality Point Average After Four Years by Preferred Environment . 581
77. Summary Statistics for Total Quality Point Average by Sex and Preferred Environment . 584

Chapter I

INTRODUCTION

1.1 OVERVIEW

The general purpose of this study was to address two questions concerning instruction in secondary and post-secondary educational institutions.

1. To what extent do different existing teaching styles accommodate individual differences among students?
2. How can educational institutions attempt to match different student learning styles with the different existing teaching styles?

The author's investigation of these questions started during the early 1970's, at Prince George's Community College (PGCC) in Largo, Maryland. Beginning in 1973, the author conducted a series of pilot studies in mathematics classes, in which students were offered alternative learning environments from which to choose. These pilots led to the development of a model for offering students an informed choice among three alternative learning environments.

The first environment, which the author called the Large Group Mode (LGM), can best be described as a traditional lecture-discussion class in which all students (up to 35) were free to participate. In the second environment, named the Small Group Mode (SGM), the class of up to 35 students was subdivided into small discussion groups of 4 to

6 members each. These small groups then conducted their own independent discussions of the course material with instructor guidance and supervision. In the third environment, called the Individual Mode (IM), students were permitted to work both individually and in small informal groups to master the course objectives.

Due to the length of this study, it is subdivided into two volumes, the contents of which are described briefly below. Volume I consists of the first four chapters. In chapter 1, the author establishes an historical perspective for the study by briefly reviewing the "new math" era of the previous decade, an era which led to increased concern for the individual in the classroom. Next, the author surveys the field of individual differences, and examined three different nomothetic approaches to modeling individual differences. The author concludes that while most individual difference psychologists seem to agree that accommodation of individual differences in instruction is potentially beneficial, there is little agreement as to how that goal should be accomplished.

The author notes that at the time of this study, the SGM and IM modes of instruction were already being used as alternatives to LGM instruction at PGCC. The existence of these alternative modes of classroom instruction, coupled with the absence of a persuasive theoretical model for matching individual students with these alternative modes, led the author to propose the Choice Model, in which

students are given the opportunity to choose between the three learning environments. The author concludes chapter 1 with the presentation of his initial set of research questions which were formulated during an early stage of the study.

The literature review is divided into two chapters. In chapter 2 the author reviews literature which specifically addresses the issue of choice in education, and literature which deals with the physical, communication, and social aspects of learning environments. In chapter 3, the author reviews literature which addresses the community college and the three alternative instructional modes (LGM, SGM, and IM.)[1]

In chapter 4, which concludes volume I, the author presents a narrative description of the various pilot studies, accompanied by preliminary sets of environmental preference and evaluation data. Following this, he provides a more detailed description of the resulting Choice Model. An expanded set of research questions is included at the end of chapter 4.

Volume II contains the remaining chapters 5 through 8, the appendices, and the bibliography. A variety of student data were collected in conjunction with the latest classroom test of the Choice Model. The author presents and discusses

---

[1] The complete bibliography for this study can be found at the end of volume II.

pre-instruction data in chapters 5 and 6, and post-instruction data in chapter 7. In chapter 8, the author summarizes his observations, answers to the research questions, recommendations for further study, and overall conclusions. Sample questionnaires and the complete database pertaining to the research presented in Volume II is included in the appendices.

1.2 A BRIEF HISTORICAL PERSPECTIVE

As the United States moved into the space age during the late 1950's, increased demands were placed upon the various educational institutions to train more mathematicians, scientists, and engineers. Carl B. Allendoerfer [1965] described the response of the mathematics community in terms of "revolution." A variety of mathematics curricula and study materials were introduced in an effort to modernize mathematics instruction. Allendoerfer reported that these materials were initially given great publicity within the educational community, but that they were adopted in a rather piecemeal and erratic manner. Subsequently, the Cambridge Report [1963] called for a complete restructuring of mathematics curricula from elementary school through college. The resulting mathematics programs came to be known popularly as "new math."

Allendoerfer was highly critical of the Cambridge Report, and other "new math" proposals of that era, in three respects:

1. The proposed curricula were developed for and tested on "superelite" college-bound students; they were neither developed for nor tested on a cross section of the general student population.
2. Too little attention was devoted to the true nature of learning and teaching styles and problems in the elementary schools.
3. No provisions were made for preparation of the lower third of the public school population, for whom "new math" was not principally designed, to survive (let alone thrive) in the rapidly changing and increasingly technological society of the space age.

One of the major curriculum projects to which Allendoerfer referred was the School Mathematics Study Group (SMSG.) E. G. Begle [1973], in a longitudinal review of research related to the SMSG project, addressed some of Allendoerfer's criticisms. While he did not directly dispute the issue of whether or not curriculum materials were designed and tested on the general student population, Begle did report the following findings relating to various ability levels:

1. The data revealed no cutoff point in IQ, below which modern mathematics instruction was inappropriate.
2. Below-average junior high students, given sufficient extra time to study new curriculum

materials, were able to outperform above-average junior high students who studied traditional curriculum materials, on mathematics achievement tests.

3. Students using texts which concentrated on the structure of mathematics scored better on problem-solving tests than did comparable students using texts concentrating on skills development.

4. Previous mathematics achievement was a far better predictor of future mathematics achievement than was IQ or any of the other non-mathematical predictors considered, and more specifically:

   a) The best predictors of computational skills at the end of the year were computational skills at the beginning of the year.

   b) The best predictors of higher cognitive levels of understanding, application, and analysis seldom included computational skills.

Concerning attention to learning and teaching styles, Begle indicated that a great deal of information was collected concerning teacher traits and attitudes, but conceded that SMSG did little to influence pedagogical procedures.

In retrospect, Allendoerfer's criticisms seem to have struck a responsive chord with the American public. "New math" failed to gain popular acceptance, and the 1970's brought retrenchment with the strong call of

"back-to-basics." Vernon Smith, Robert Barr, and Daniel Burke [1976] shed further light on the negative reaction when they addressed the problems which are created when new educational programs, like the "new math" curricula proposed by the Cambridge Report, are imposed upon the public rather than being adopted by choice.

> The reform efforts of the past two decades were typically designed for everyone. The new math was for all students and all teachers. When a new curriculum is imposed on everyone, it is threatening to some, particularly to those who are convinced of the value of the former curriculum. This automatically creates resistance to the new curriculum from some teachers and parents.
>
> Because the alternative is not for everyone, but only for the clients and staff who choose it, choice creates a commitment and a subsequent involvement by families and teachers. [Smith, et al., 1976: 147]

Begle expressed concern that the gains of SMSG may be lost due to increased calls for teacher accountability.

> The importance of the objectives of mathematics education has increased greatly in recent years. This is a result of a movement to hold teachers and schools accountable for the educational progress of their students. This requires stating educational objectives and comparing actual student achievement with the desired achievement expressed in the objectives.
>
> Accountability inadvertently poses a threat to the reforms in mathematics education carried out during the sixties. The reason is that it is much easier to write statements of objectives for computational skills than for understanding of mathematical concepts or for the ability to analyze mathematical problems. Many of the lists of objectives that have been published lately put a heavy emphasis on computational skills, and there is a danger that the mathematics curriculum will, as a result, revert to an emphasis on rote learning of skills that SMSG, among others, worked to replace with an emphasis on understanding. [Begle, 1973: 208]

The primary focus in mathematics education has now shifted from modernizing curricula to improving

instructional effectiveness. Jerome S. Bruner both startled and tantalized the educational community with his frequently quoted belief:

> Any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in a recognizable form. [Bruner, 1968: 44][2]

In the most general sense, one might view this study as an attempt to address the issue of how and to what extent Bruner's lofty tenet can be applied in the classroom today. What are the individual differences between students which are of educational significance, and what can instructors do to accommodate these differences? How effectively can students assess alternative learning environments and choose those which best accommodate their individual needs? These and similar questions pertinent to this study prompted the author to conduct a preliminary survey of some of the fields of psychology which deal with individual differences. In addition to the examination of pedagogical concerns relating to individual differences, this preliminary investigation also revealed some related philosophical issues which are of special importance to community college educators.

---

[2] This author earlier cited Begle's report of higher achievement by below-average junior high students. The increased achievement occurred when the below-average students were given additional time for learning, using "new math" materials. This type of finding is consistent with Bruner's philosophy of learning as stated here.

1.3 INDIVIDUAL DIFFERENCES

Allan R. Buss and Wayne Poley [1976] introduced the study of individual differences by describing two major perspectives in the field of trait psychology; the nomothetic and idiographic approaches. The nomothetic approach, which the authors stated is more widely endorsed within the psychological community, deals with the attempt to identify certain measurable traits which are possessed by all persons to some degree. The individuality of each person is thus described in terms of her/his profile with respect to the traits in question. Although all subjects share the same traits, their individual combinations of strengths and weaknesses make each person unique.

A psychologist who approaches the study of individual differences from the idiographic perspective searches for different qualities in each subject. Uniqueness is determined not by how strongly a person exhibits a trait, but rather by the manner in which (s)he expresses his/her traits. Buss and Poley [1976: 2] effectively dismissed the idiographic approach as "limited", due to the difficulty involved in studying traits which cannot be generalized among large groups of subjects. In the remainder of this chapter, attention has been directed toward several alternative nomothetic approaches to the study of individual differences.

1.3.1 Differences in Cognitive Style

One class of individual differences which seems, at least on an intuitive level, to hold much promise for education is that of cognitive style. In the field of psychology, the concept of cognitive style has evolved over the past forty years as investigators have sought to discover how the human brain-mind mediates between stimuli and responses, and how this mediation function differs between individuals. Kenneth Goldstein and Sheldon Blackman [1978] traced the historical evolution of cognitive style research in psychology, and identified the following principal areas of investigation:

1. authoritarianism, rigidity, and intolerance of ambiguity
2. dogmatism
3. personal constructs and cognitive complexity
4. integrative complexity
5. field dependence

One or more "tests" have been developed to measure traits in each of these areas of cognitive style, and analysts have in most cases identified several different dimensions of the respective styles under investigation. Goldstein and Sheldon concluded that:

> Cognitive Style is best construed as a generic construct, much like personality. There are various approaches to the measurement of personality, and investigators differ in the number of aspects, or dimensions, they use in the study of personality. [1978: 213]

They continued by recommending future studies using several of the existing cognitive style instruments, in order to better account for observed variance in behavior.

1.3.1.1 Cognitive Style Mapping

While psychologists generally accept the importance of cognitive style in the learning process, little work has been attempted in the field of psychology to study the various cognitive style constructs in the context of education. One notable exception is the Educational Science of Cognitive Style for which Joseph E. Hill [1971(A-C)] is both principal researcher and advocate. The Educational Science of Cognitive Style is a nomothetic construct concerned with the application of cognitive style to the education process. Joseph F. DeLoach [1969, 1970] described the differences and relationships between this educational construct and other psychological constructs of cognitive style.

The educational science of cognitive style is based upon a mathematical model; the Cartesian product of four sets. Each set consists of a carefully defined collection of possible human orientations with respect to one of the four following areas:

1. Set "S" - how meaning is derived from information.
2. Set "E" - how cultural background influences this meaning.
3. Set "H" - how modes of inference influence this meaning.

4. Set "X" - how this meaning is remembered (this area has not yet been formalized.)

The model for the educational science of cognitive style is represented by the universal set "G", given by the Cartesian product of "S", "E ", "H", and "X". The cognitive style mapping of a particular individual is a subset of "G". The individual is first diagnosed in each of the four areas, and her/his subsets of orientations in each area, named "s", "e", "h", and "x" respectively, are determined. The individual's cognitive style map "g" consists of the Cartesian product of these four subsets. Thus the cognitive style map of an individual represents in the form of a Cartesian product, those factors unique to that individual which have been identified for this construct as important to the learning process.

Oakland Community College, in Oakland, Michigan, has undertaken an extensive testing, computer analysis, and evaluation program in an attempt to "personalize" educational programs through cognitive style mapping. Both students and faculty are mapped. Since it has been found that cognitive style alone does not explain differences in teaching, counseling, and administrative styles, further work has been done to describe and diagnose different classifications of style in these areas [Hill, 1971(A): 15-18]. Faculty are encouraged to develop alternative instructional styles, and their teaching styles are diagnosed accordingly. Counselors assist students in

interpretation of individual cognitive style mappings, and in selection of compatible learning environments.

1.3.2 Genotypic Differences

Arthur R. Jensen is another member of the nomothetic school of individual differences in learning. Jensen [1967: 117-134] classified individual differences (IDs)[3] into two general groups.

1. Extrinsic IDs are not directly related to the learning process, but can influence an individual's learning performance. Included in this group are: age, IQ, sex, and personality.
2. Intrinsic IDs are directly involved in learning processes. Jensen presented a multi-dimensional model as a rough representation of this class of IDs:
   a) Types of learning (conditioning, rote learning, motor learning, discrimination, etc.)
   b) Procedure (pacing, distribution of practice, amount of material, stage of learning, intra-task similarity, etc.)
   c) Content (verbal, numerical, spatial, perceptual-motor, etc.)

---

[3] Jensen consistently used the abbreviation "ID" to represent "individual difference" in his writings. This abbreviation has been used in this study as well.

d) Sensory modality (visual, auditory, haptic, etc.)

Jensen's model of intrinsic individual differences in learning, similar to Hill's model of cognitive style, can be expressed as the Cartesian product of these four dimensions: Type of learning, procedure, content, and sensory modality. Jensen did not insist that there are only four variables possible, nor that the above lists exhaust the domains of the respective variables. He also pointed out that some elements of the Cartesian product cannot occur in real learning situations, and that more than one value of any variable may be relevant to any particular learning task.

In his writings, Jensen referred to the elements of his intrinsic model of IDs as "phenotypic" sources of individual differences. He explained:

> As the term is used here, a phenotype is a significant interaction between Ss and any of the kinds of independent variables[4] that have been listed above. Viewed in this way, one gets the impression that the number of phenotypes is apt to be practically overwhelming. Unfortunately, this is probably the correct impression.
>
> If there were no significant correlations between learning scores under all these variations in the multitude of independent variables, the situation would indeed be hopeless. There would then seem to be no basis for developing a science of IDs in learning. We would never be able to progress beyond merely describing phenotypes. From a scientific standpoint this would seem to be a most unexciting and unrewarding exercise. Therefore, we must begin with what seems to this investigator to be a wholly warranted article of

---

[4] By the term "independent variables", Jensen was referring to the elements of the Cartesian product; not just the dimensions of the model.

faith, vis., that a limited number of basic genotypes underlie the welter of phenotypic IDs in learning. [1964: 45]

1.3.2.1 Heredity vs. Environment

In the 1964 research report from which the previous quotation was taken, Jensen dealt with his experimental research efforts to isolate and identify some specific genotypes. The terms "phenotype" and "genotype" however, come from the field of genetics. Buss and Poley [1976: 198-224] described the field of behavior-genetics psychology, which had its origins in the early 1960's. They described phenotypic differences as variance in overt behavior, and proposed that this variance can be expressed as the sum of:

1. Variance due to genetic differences (genotypes)
2. Variance due to environmental differences
3. Variance due to interaction between genetic and environmental sources of difference

Implicit then in Jensen's use of the term "genotype" is the belief that there is some basic genetic explanation behind much of the observed variance in overt learning behavior. The question is, how much of the variance is due to heredity? Prior to 1960, the field of behavioral psychology was dominated by "environmentalists". Since that time the relative merits of heredity versus environment have been argued in great detail by psychologists, sociologists, educators, and even politicians. In his book dealing with inequality and education, Christopher Jencks [1972] drew the

following conclusions from his extensive data analysis, concerning what he called "cognitive inequality":

1. If we could equalize everyone's genes, inequality in test scores would probably fall by 33 to 50 percent.
2. If we could equalize everyone's total environment, test score inequality would fall by 25 to 40 percent. [Jencks, 1972: 109]

These findings raise serious questions concerning Jensen's model of intrinsic individual differences. If heredity and environment both play major roles in the determination of individual differences, then where are these differences to be accounted for. Buss and Poley claimed that the nomothetic approach shows the most promise in the investigation of IDs. Jensen claimed that extrinsic differences do little to explain variances in learning behavior. Assuming that Jensen's "article of faith" is appropriate, then are these fundamental factors which interact with different learning environments to produce individual differences truly "genotypes"?

Jencks balanced the observed learning variance equation by attributing 45% to genetic factors, 35% to environmental factors, and the remaining 20% to "the tendency for environmentally advantaged families to have genetically advantaged children...[1972: 66]."[5] If these conclusions are accepted, then there is a clear need to modify Jensen's

---

[5] This tendency can be thought of as an interaction between environmental and genetic factors.

model of individual differences. It would appear that a theory based solely upon genotypes can at best explain about half of the observed differences in learning behavior.

1.3.3 Aptitude Differences

At this point it should be clear that very little has been settled concerning the true nature of individual differences in learning. Most authorities seem to agree that IDs are very significant in the learning process, but as Jensen indicated, the size of the task of studying IDs tends to be overwhelming. Jensen's "article of faith" that there are a limited number of fundamental ID factors, whether genotypes or not, is not universally shared by the psychological community. Others suspect that there is no general pattern of IDs in learning, but rather that the nature of IDs themselves change from one learning situation to another.

Since the existence and importance of individual differences does not seem to be in question, it is the task of educators to deal with this reality. Lee J. Cronbach [1967: 23-37] addressed various ways in which instruction can be adapted to IDs. He first defined the aptitude of an individual for learning as:

> ...a complex of personal characteristics that accounts for an individual's end state after a particular educational treatment, i.e., that determines what he learns, how much he learns, or how rapidly he learns. [1967: 23]

Cronbach also included under the heading of aptitude:

> ...whatever promotes the pupil's survival in a particular educational environment, and it may have as much to do with styles of thought and personality variables as with the abilities covered in conventional tests. [1967: 24]

1.3.3.1 Adaptation and the Predetermined Program

How one adapts the educational process to individual differences in aptitude depends in large part upon the degree to which flexibility exists in the structure of the educational program, and upon the type(s) of flexibility which are available or permissible. Cronbach proposed two alternative forms of adaptation when the goal of the program and the instructional treatment are both predetermined.

1. Alteration of sequence. Students are divided into homogeneous groups based upon aptitude. The same instructional style is used for all students, but alternate learning sequences are employed for different groups. The tasks selected for each sequence are selected on the basis of the "group aptitude", but all sequences lead to the same ultimate objective.
2. Alteration of duration. Students are grouped or work individually, consistent with the predetermined instructional technique. The same instructional style and the same learning sequence are used for all students. The amount of time required for mastery of objectives in the sequence is dependent upon the aptitude of the student(s.)

In essence, Cronbach believed that when the educational goals and treatments are predetermined, adaptation to "rate of learning" is appropriate. Cronbach added, however:

> My hypothesis implies that the person's learning rate will vary, depending on the nature of the instruction; I therefore expect that adapting instructional technique will in the long run be more important than merely altering the duration of exposure. [1967: 26]

1.3.3.2 Adaptation and Optional Goals

A second educational setting is one in which the program has more than one possible goal, but the instructional technique is still fixed within each goal option. In this situation, Cronbach suggested that aptitude be considered in the process of selecting the goal. This is the procedure followed in most traditional secondary and post-secondary educational programs. Curricula are selected on the basis of students' prospective adult roles. Instructional treatments may vary between curricula, but are fixed within curricula. Of course the "rate of learning" forms of adaptation are still available within each curriculum.

Cronbach used the field of mathematics, by way of illustration, to inject a note of caution however:

> We haven't the faintest evidence, for example, what constitutes mathematical aptitude, save for the obvious fact that a person who has mastered one mathematical fact or process has an advantage in learning the next process in a sequence. [1967: 27]

Christopher Jencks [1972] and Daniel Zwerling [1976] would probably point to the potential for educational systems which feature optional goals to function as vehicles

for socioeconomic discrimination.[6] In his work concerning inequality in schools, Jencks concluded:

> ...that educational opportunities are far from equal. This inequality takes several forms. First, resources are unequally distributed. Second, some people have more chance than others to attend school with the kind of schoolmates they prefer. Third, some people are denied access to the curriculums of their choice. None of these inequalities appears to us either necessary or just. [1972: 37]

In his book concerning community college education, Zwerling [1976: 3-39] strongly attacked alternate curriculum goals which lead students away from the senior colleges and universities. Zwerling charged that vocational programs in high schools and colleges are used to divert poor and educationally disadvantaged students away from the programs which lead to the elite status of earning bachelors and higher level degrees. He believed that open-admissions policies in community colleges are designed to relieve the pressure for more open admissions to senior institutions, and that once non-traditional students enter community colleges they are subjected to systematic attempts to channel them into vocational-technical programs. Many students resist these attempts, and drop out of college

---

[6] Since the instructional phase of this study was conducted at a community college, the comments of both Jencks and Zwerling concerning community colleges are particularly relevant. Jencks wrote from the outside perspective of a university researcher, and Zwerling wrote from the inside perspective of a community college instructor. Additional community college research can be found in chapter 3.

instead of lowering their goals. Zwerling contended that socioeconomic data analyzed by Jencks and the Carnegie Commission on Higher Education support the position:

> ...that the major hidden function of community colleges is to support the social status quo, and that one should also be not at all surprised that their dropout rate, particularly among their economically poorest students, is dramatically higher than at other colleges. Attrition then turns out not to be a problem, as just about everyone claims, but to be one of the two-year colleges' primary social functions. [1976: 34-35]

1.3.3.3 Adaptation and Remedial Instruction

Cronbach was particularly skeptical of attempts to use remedial or developmental skills instructional programs to erase individual differences in achievement. These programs are often based on the assumption that traditional instructional programs are fixed, and that those students who are not successful in the traditional programs need some kind of extra help. Much of the work involving programmed instruction has been adapted for these remedial programs. Cronbach concluded that this "type of hole-patching is not very interesting psychologically, and its value may be quite limited [1967: 27]."

At the community college level, Daniel Zwerling [1976: 75-103] described the role of remedial skills programs in the "cooling-out" process for non-traditional students. These high-risk students are first attracted to the community college by open-admissions, low cost, and a variety of educational options. After diagnosis of basic

skills deficiencies, these students are channeled into developmental skills programs which are supposed to remediate those deficiencies.

Frequently, however, these students encounter traditional teaching faculty who have very low success in remediating basic skills deficiencies, and not coincidentally these same faculty usually have very low expectations of success for high-risk students. This "remedial" system frequently leads to failure, as a result of which many non-traditional students are counseled out of transfer programs which would lead them to the senior institutions. Many of these high-risk students would rather quit than switch. When the remedial program "works" in this way, it tends to leave students with the impression that the system is fair because it offers them opportunity for advancement, and that their individual differences are really personal deficiencies which are to blame for their failures.

1.3.3.4 Adaptation and Alternate Instructional Methods

Cronbach [1967: 28-37] saw the greatest hope for accommodation of individual differences through alternative instructional methods. Wallen and Travers [1963], Nuthall and Snook [1973], and Cohen and Brawer [1982] reported, however, that educational research involving alternative teaching methods has thus far done little to influence the traditional manner in which most teachers teach. Nuthall

and Snook maintained that much of the research into different models of teaching is prejudiced in favor of one or another particular model, and contributes little to the long term development of alternative teaching methods.

Traditional research design encourages randomization in the assignment of subjects to treatments. Cronbach, on the other hand, suggested that subjects be assigned to treatments on the basis of aptitude-predictors which have been found to interact with the treatment variable.

> If two treatments are about equally good on the average, the decision about the subject requires a predictor that correlates with payoff under one treatment and does not correlate under the other treatment; (or, what is less likely, that correlates negatively with payoff under the second treatment.) This implies that general ability is likely to be a poor basis for differentiating instruction, because it correlates with success in most instruction. [1967: 30]

The question is of course how to find appropriate variables for differentiating between appropriate methods of instruction. Cronbach suggested that rather than examining different variables with respect to existing instructional alternatives, specific alternative treatments should be designed to interact with a promising differential variable. Cronbach stated:

> Until the present time, the differential psychologist has let the institution tell him the treatments for which he is predicting success, and he has designed tests or batteries to make that prediction. I suggest that we now let the institution specify only the criterion - not the treatment - and that the psychologist select an aptitude variable and design treatments expected to interact with it. [1967: 32-33]

Jerome S. Bruner echoed the sentiment of Cronbach in reference to psychological research in conjunction with the

many curriculum projects of the 1960's. In his book Toward a Theory of Instruction, Bruner stated with specific reference to the field of mathematics:

> For the fact of the matter is that the evidence available on factors affecting the learning of mathematics is still very sparse. Research on the instructional process - in mathematics as in all disciplines - has not been carried out in connection with the building of curricula. As noted, psychologists have come upon the scene, armed with evaluative devices, only after a curriculum has already been put into operation. Surely it would be more efficient and more useful if embryonic instructional materials could be tried out under experimental conditions so that revision and correction could be based upon immediate knowledge. [1968: 54][7]

Bruner then went on to describe a research project in which he and Z. P. Dienes, with the help of four tutor-observers, taught the algebra of quadratic functions to four eight-year old children. The point of the project was not to advocate a six-to-four teacher-student ratio, but rather to describe how a psychologist and a mathematician could work together in the classroom to develop and simultaneously test instructional materials and procedures. The observers kept minute-by-minute records of each child's activities, and photographs were taken of the children's constructions. With this kind of immediate feedback, the instructor could modify, adjust, and test instructional approaches on a day-to-day basis.

---

[7] These comments by Cronbach and Bruner tend to underscore the objections voiced by Allendoerfer [1965] with respect to the Cambridge Report on School Mathematics, which were discussed earlier in this chapter.

This author concludes his survey of selected individual difference literature with a remark by Cronbach, which tends to temper undo optimism concerning the rapidity with which research into individual differences is likely to progress:

> While in principle a unique instructional diet could be matched to the student's idiosyncratic intellectual metabolism, nothing is to be gained by introducing unvalidated modifications. And it will be a long time before we have adequately validated rules of adaptation that take into account even a half-dozen differential variables. As I see it, our greatest hope for fitting the school to the individual lies in the development of theory that finally marries the differential and experimental approaches to learning.
> [Cronbach, 1967: 37]

1.4 STUDENT CHOICE OF INSTRUCTIONAL MODE

At this point one might be inclined to surrender totally to the position that alternative instructional modes offer few significant advantages over traditional instruction. The lack of applicable research findings pertaining to individual differences and instruction should not be construed, however, as a ringing endorsement of large group instructional modes like those commonly employed in college classrooms. Sarane S. Boocock wrote:

> ...that the conventional classroom represents a decidedly unnatural arrangement for the young and is not the most effective environment for effective learning. One could argue that in a situation involving a choice between teaching materials or methods that retained the conventional classroom structure and dynamics and methods that changed the classroom in some basic way, the burden of proof should be upon the former.
> [1972: 170]

This author began teaching mathematics at Prince George's Community College in 1971. During his early years

at PGCC, there were two principal instructional modes being used by the mathematics faculty as alternatives to the traditional lecture-discussion or large group mode; the individual mode, and the small group mode. After teaching courses by the traditional and by both alternative modes, and after exposure to generally accepted research conclusions that no single method of instruction has been demonstrated as significantly superior, the author began to explore alternative procedures for identification of individual differences among students.

Cognitive style mapping was the first alternative considered. It requires, however, a broad and significant fiscal as well as psychological commitment. While the author was and still is intrigued by the theory of cognitive style mapping, the literature pertaining to this model is still quite limited. In addition, Hill's cognitive style mapping approach is apparently unknown to, or at least unrecognized in, the field of trait psychology. It can be persuasively argued that those systems of greater complexity must clearly offer significantly greater chances for success than are offered by simpler systems, in order to justify their employment.

Given the general lack of consensus in the literature concerning individual differences, beyond the acceptance of IDs as important factors in the learning process, the author began to search for a simpler method of matching students with appropriate instructional modes. This search ended

with the selection of student choice as a promising and yet relatively simple method to accomplish the desired pairing of individual students with alternative instructional modes. Perhaps the features of student choice which are most attractive to the author are that it allows the instructor to teach by his or her preferred method; it does not subject the student to the preference of a single instructor; and it makes no presumptions concerning which matching is best for which student.

Vernon Smith, et al. [1976: 119-120] described several advantages to be gained by offering a choice of learning environments.

1. What a student thinks of the learning environment may be as important, if not more so, than what is cognitively gained from a given learning experience.
2. The responsibility for a given choice is shifted from the institution to the teacher or student or both.
3. A new relationship between teacher and student forms a partnership in teaching and learning.
4. The concept of choice is commensurate not only with democratic expectations but also with the real world that students are preparing to enter.

This and other literature pertaining to choices in education are examined more thoroughly in chapter 2.

1.5 STUDY OUTLINE AND RESEARCH QUESTIONS

The remainder of the author's work focused on the use of student choice as a mechanism to "match" learner with learning environment. The author developed a model through which students could be offered an informed and controlled choice among the options of studying mathematics in one of three learning environments. The three alternative environments were based, respectively, on three modes of instruction: Large Group Mode (LGM), Small Group Mode (SGM), and Individual Mode (IM.)

The remaining chapters in volume I describe the research relating to the final design of the Choice Model. The author reviewed the literature pertaining to learning environments from several perspectives. The first section of chapter 2 addresses several aspects of choice in education, and the second section deals with several major considerations common to all learning environments. The first section of chapter 3 addresses the nature of community college faculty and students, and the second section deals with instructional goals and the three specific instructional modes selected for the study.

In chapter 4 the author describes the evolutionary process by which the Choice Model was developed. The remainder of the chapter is devoted to a more detailed description of the final design of the Model. The various types of data which were collected when the model was employed in the classroom are also discussed in chapter 4.

The original set of research questions which guided the early design and subsequent modifications to the study are presented below.

1. To what extent did students value the opportunity to choose a learning environment?
2. When did students form their preferences for learning environments offered in the study, and what aspects of those environments were most significant to the students?
3. How were the students' preferences for the learning environments distributed?
4. How were the students' mathematics attitudes affected by the study?
5. How and to what extent were the students' preferences for the learning environments associated with individual traits, as measured by selected normed instruments?
6. How did the grade distributions for the total study group compare with the normal College grade distributions for the same course?
7. How and to what extent were the students' grades earned during the study associated with mathematics attitude, and with previously earned high school grades?

As is explained in more detail in chapter 4, the evolution of this study led to significant changes in the design of both the Choice Model itself and the research

methods which were employed study the Model. Many of the tight controls associated with a comparative study were abandoned, so that the instructors could be given greater freedom in designing their respective learning environments. In conjunction with this, the nature of the study itself changed from comparative to descriptive research. Hypotheses were neither formulated nor tested. Rather, the Choice Model was implemented, data was collected and analyzed, and observations were recorded. Upon completion of data collection and analysis, it became clear that additional research questions were appropriate. Chapter 4, and volume I, concludes with the presentation of the resulting expanded set of research questions.

Volume II is devoted to the presentation and analysis of experimental data relating to these research questions. These data pertain to environment orientation and subsequent measurement of pre-instruction environmental preferences, pre-instruction student characteristics, and post-instruction environmental preferences and student characteristics. The final chapter of volume II addresses the specific research questions posed in chapter 4. This chapter concludes with a philosophical discussion of some of the potential ways in which the provision of student choice among alternative learning environments might broadly and significantly impact the processes of professional staff development, instructional development, and student personal development colleges and universities.

Chapter II

REVIEW OF RELEVANT RESEARCH - PART I

2.1 OVERVIEW

While the literature pertaining to student choice is relatively limited, the literature pertaining to learning environments is both vast and diverse. As a result, the author has introduced appropriate restrictions to both the scope and depth of this review. Since the final classroom model was tested during the Spring 1977 semester, most of the literature review was restricted to pre-1977 publications. Some selected more recent publications, however, have also been reviewed or recommended for review.

In this study, the term learning environment encompasses all characteristics of a particular educational setting. While of unquestionable importance, instructional mode is only one aspect of the classroom learning environment. The classroom represents its own physical environment for learning, within which some particular mode or modes are used to present the information to be learned. The teacher exhibits his or her own style of instruction through the manner in which that information is presented. Different forms of communication and interaction are employed by both teachers and students. Other major issues relevant to this study concern the interrelationships among characteristics of learning environments, characteristics of students, and student preferences for learning environments, within the

context of student choice among alternative learning environments. The author has reviewed both literature pertaining to different aspects of learning environments, and literature pertaining to other issues related to choice of learning environment.

The author's general criterion for selection of literature to be reviewed was to include studies which helped to answer the following questions.

1. What is known about the issue of choice with respect to education?
2. What are the variables with which instructors work when fashioning alternative learning environments?
3. What are the general attributes of learning environments which stimulate student awareness upon first exposure?
4. What are the general traits, characteristics, and orientations of community college instructors and students, which interact with each other and with other characteristics of learning environments in the formation of initial preferences?
5. What are the general characteristics and educational goals of the alternative modes of instruction employed in this study; those being the large group (LGM), small group (SGM), and individual (IM) modes of instruction?

The review of literature addressing these questions is subdivided into two parts, with two major sections in each

part. Part I of the review, which is presented in this chapter, includes major sections entitled:

1. Choices in Education.
2. Some Components Common to All Learning Environments.

Part II of the review, which is presented in chapter 3, includes major sections entitled:

1. The Community College Environment.
2. Instructional Modes and Goals.

In this chapter, the author begins his review of the literature by addressing choices in education, with a brief discussion of the importance of choice in human maturation and identity formation. This leads to more general consideration of the educational choices students make in high school and college which can contribute to that process. The review continues with a discussion of choice between alternative schools, and some of the related benefits derived from the opportunity for choice. The section concludes with a review of research dealing with choice of and preference for alternative learning schemes in the college environment.

The literature clearly identifies certain general components of all learning environments, which have important implications for any mode of instruction. These components, which are listed below, are addressed in the concluding section of this chapter.

1. Physical environment.

2. Communications environment.

3. Social environment.

Chapter 3 begins with consideration of the community college environment, the setting within which this study was conducted. A brief review of pertinent community college history leads to consideration of community college instructor identity and professionalism. Additional instructor traits are discussed, to include:

1. Creativity.

2. Flexibility.

3. Authoritarianism.

4. Communication Behavior.

Student characteristics which may interact with characteristics of instructors and learning environments are also addressed in chapter 3. The author identifies and discusses the potentially relevant characteristics listed below.

1. Self-concept.

2. Communication Apprehension.

3. Interpersonal Relations Orientation.

4. Mathematics Attitude.

Chapter 3 concludes with a discussion of alternative instructional modes and goals. In addition to an overview of the general differences between various instructional models, the following specific modes are addressed.

1. Large group instruction.
2. Small group instruction.
3. Individual instruction.

2.2 CHOICES IN EDUCATION

One of the specific goals of this study was to describe the process of making choices among alternative learning environments. A more general goal for this section of the literature review, however, was to provide answers to the first question posed in the chapter overview.

1. What is known about the issue of choice with respect to education?

First the author examined the theoretical importance of "choice" from a holistic student development point-of-view. From this perspective, the author focused primarily on student choices in secondary and post-secondary education. The author reviewed the relatively limited research concerning choice of learning environment at both the public school and college levels.

2.2.1 Choice and Personal Development

The works of Eric Erikson [1959, 1963, 1964, 1968] are acknowledged to be of fundamental importance to the growth and development of various theories of holistic human and student development. Erikson described the process of human growth and maturation in terms of sequential development

through eight stages which encompass the entire life span.

1. The Sense of Trust
2. The Sense of Autonomy
3. The Sense of Initiative
4. The Sense of Accomplishment (or Industry)
5. The Sense of Identity
6. The Sense of Intimacy
7. The Parental Sense
8. The Sense of Integrity

Erikson's first four stages are generally associated with the childhood period, during which time the senses of trust, autonomy, initiative and accomplishment initially develop. Erikson's fifth stage, when the individual begins to develop a sense of identity, is generally associated with the period of adolescence and young adulthood. According to Erikson, identity resolution is the central personal growth process which is underway during the high school and early college years.

Erikson maintained that progression through the life stages, and the resulting resolution of individual "identity", is governed jointly by biological growth, social experience, and internal interpretation of that experience. In general, progress from one stage to the next is marked by a time of "crisis" or decision when the individual chooses "psychosocial" attitudes concerning his/her role in society. Erikson thought that the nature of the attitudes one adopts, and hence the "identity" which evolves, is strongly

influenced by the environmental setting and the experiences which that setting provides. Of particular relevance to this study are the individual's educational environments, experiences, and choices as they contribute to the process of identity resolution.

2.2.1.1 Choices in Secondary School

Research by Hudson [1968], Pask [1976], Entwistle and Wilson [1977], Entwistle [1981], and others revealed a variety of relationships between choice of subject in secondary school, differing personality characteristics, and styles of learning and teaching. Hudson showed that students starting secondary school perceive differences between subjects. Hudson saw subject choices made in secondary school as important to the Eriksonian identity resolution process of adolescence.

> I now envisage the choice between arts and sciences as one of the first major steps that the able adolescent takes towards his adult identity. This is often the individual's first opportunity to select and reject from among the ways of life his culture offers; his first attempt to fit a chosen style of thinking into some semblance of harmony with his more private needs. [Hudson, 1968: 86-87]

Noel Entwistle wrote about a link between choice of subject in school, learning styles of students, and teaching styles of instructors. He first suggested that:

> ...teachers will often adopt methods of teaching which reflect their own preferences in learning. Different subject areas are also likely to differ in the relative incidence of highly structured teaching methods, partly because of the nature of the subject and partly because of the cognitive styles of the teachers who are attracted to that subject. [1981: 241-242]

Entwistle next described evidence of a basic dichotomy between "arts" and "science" instruction. Pask [1976] reported that science teachers tend to rely on previous knowledge and use mathematical analogies to build and illustrate new ideas, whereas humanities and social science teachers tend to depend on analogies based upon personal experiences. Entwistle and Wilson [1977] indicated that college student surveys have revealed significant personality differences between arts and science students. Leith [1974] reported similar findings with respect to differences in personality traits of both faculty and students in various academic areas.

Based upon work by Witkin [1976], Witkin et al. [1977], and others, Entwistle suggested that:

> The more logical, unemotional, sequential nature of science is likely to attract the field-independent student who prefers a serialist learning strategy. The humanities are less impersonal and allow more independence in developing ideas, thus suiting field-dependent holist students.[1] [1981: 242]

Hudson provided the connecting link between these research findings and Eriksonian theory.

---

[1] The suggested attraction of field-dependent students to fields permitting independence of thought may seem to be contradictory at first. The hypothesis, however, is that field-dependent students may prefer learning which is relevant to and consistent with their individual philosophies and experiences. The study of subject matter which permits or even requires individual interpretation, therefore, may provide greater opportunity for field-dependent students to experience the consistencies which they seem to prefer.

> My interest lies in the individual's capacity for choice - his freedom to select one aspect of a myth rather than another in establishing his personal identity, and in the relation of these choices to the abilities and temperamental qualities he shows.... In attempting to analyze an individual's way of life, one cannot think solely, or even primarily in terms of examination and jobs, salaries and pension schemes; rather of the conceptual framework within which his idea of himself, his past and his future are conceived. [1968: 85,87]

2.2.1.2 Choices in College

The writings of Chickering [1969], Keniston [1971], Knefelkamp [1978], and others reveal connections between choices made in college and personal development. Chickering and Keniston concentrated on Erikson's fifth stage of development, sometimes called "adolescence", and extended it to the traditional college years. Keniston proposed an additional stage of development called "youth" to specifically represent the college experience, when students make choices concerning academic major and post-graduate education which fundamentally shape their future roles in society.

Chickering described a model for the developmental process of young adults in terms of seven vectors, each with its own direction and magnitude. Chickering's vectors are similar to the developmental tasks which Keniston associated with the "youth" stage.

1. Achieving competence
2. Managing emotions
3. Becoming autonomous
4. Establishing identity
5. Freeing interpersonal relationships
6. Clarifying purposes
7. Developing integrity

Chickering posed two general hypotheses concerning the effects of college curricula, teaching, and evaluation on student growth and development with respect to these vectors. He hypothesized that providing more opportunities for students to make choices as part of their college experience would tend to enhance their personal development.

> Hypothesis A: When few electives are offered, when books and print are the sole objects of study, when teaching is by lecture, when evaluation is frequent and competitive, ability to memorize is fostered. Sense of competence, freeing of interpersonal relationships, and development of autonomy, identity, and purpose are not.
>
> Hypothesis B: When choice and flexibility are offered, when direct experiences are called for, when teaching is by discussion, and when evaluation involves frequent communication concerning the substance of behavior and performance, the ability to analyze and synthesize is fostered, as are sense of competence, freeing of interpersonal relationships, and development of autonomy, identity, and purpose. [1969: 148]

Knefelkamp et al. [1978] described several factors which help facilitate individual identity resolution in accordance with Eriksonian theory. The attributes of college curricula, teaching, and evaluation which Chickering described in Hypothesis B, above, are closely related to the facilitative factors identified by Knefelkamp. According to

Knefelkamp [1978: 6], two particular types of experiences seem to be required in order for an individual to achieve identity resolution.

1. Experiences which help the individual clarify his interests, skills, and attitudes.
2. Experiences which aid the individual in making commitments.

Knefelkamp also summarized several important attributes of the environment which foster identity formation, attributes which are evident in Chickering's Hypothesis B.

1. Opportunities for experimentation with varied roles.
2. Opportunities for experiencing choice.
3. Opportunities for meaningful achievement.
4. Freedom from excessive anxiety.
5. Time for reflection and introspection.

2.2.2 Choice and Learning Environment

The literature which the author has reviewed thus far identifies choice as one of the ingredients which is important in the personal development process, a process which is influenced by institutions of education. Erikson and Knefelkamp addressed the general importance of choice in human maturation and identity resolution. Hudson and Keniston identified major choices made in the broad educational context during the years of adolescence and youth.

Chickering referred to the importance of choice in the college environment.

The remainder of the literature which the author reviews in this section, deals with choice in conjunction with alternative learning environments. One portion of the review addresses choices among alternative schools. The other portion addresses choices within and among alternative college classrooms.

2.2.2.1 Choice Between Alternative School Environments

Smith, Barr, and Burke [1976] considered choice with respect to specific learning environments within the realm of public school education.

> The concept of matching instruction or the learning environment to the learning style of the student is very new in educational research. It may be many years before educators can diagnose an individual student's learning style and prescribe an appropriate learning environment, but promising research investigating the learning styles of students and their relationship to alternative and conventional schools is already underway. [Smith et al., 1976: 110]

For example, Hunt [1975] reported that in one community two alternative public schools have been established, providing different amounts of structure in their learning environments, so that students and parents can choose according to needs or learning styles. Hunt described student traits of cognitive orientation, motivational orientation, value orientation, and sensory orientation

which interact with characteristics of learning environments.

Samples [1967]; Sherman, Zuckerman, and Sostek [1972]; Cusick [1973]; Schrag and Divoky [1975]; and Fizzell [1975] reported various other findings concerning student traits and school learning environments. Samples [1967] hypothesized that creativity is a severe handicap for the student in the conventional curriculum, supporting the belief that traditional schools stifle creativity. Sherman et al. [1972] reported that of the various forms of underachievement studied, the form which was simultaneously most serious and most prevalent was the neurotic refusal to achieve. Both Cusick [1973] and Fizzell [1975] described various subgroups of students, finding similarities between groupings in both traditional and alternative schools. Fizzell found that student characteristics associated with success in one school were frequently associated with failure in another school.

Schrag and Divoky [1975] reported the case of a hyperactive child for whom behavior modifying drugs had been recommended by the school. The parents refused that recommendation and instead placed the child in an alternative environmental school which included a great deal of outdoor activity and work on special projects. In this environment the child showed no signs of hyperactivity; she was quiet, cooperative, and displayed a high degree of artistic talent.

Smith et al. concluded from these findings that there

> ...is strong proof that equality of educational opportunity within one school is an impossibility.
>
> More research on subgroups of students within standard and alternative schools is needed to guide the creation of effective alternative learning environments. [1976: 111-112]

They also summarized a list of crucial educational problems presented by Duffy [1974], which need to be addressed by future research efforts.

1. Too many students are not motivated to learn.
2. Too many students lack the basic learning tools necessary for becoming lifelong learners.
3. Each student possesses a unique learning style, yet is required to adapt to whatever style the school imposes.
4. Most students lack a personal relationship with the teacher as a human being.
5. Traditional staffing arrangements impede efficiency in most individualized educational programs.
6. Strengths and weaknesses in the learning abilities of students are either not identified, or they are not properly utilized when they are diagnosed.

Faced with the evidence in support of alternative learning environments, the related problems present in existing traditional schools, and the absence of effective predictors of success in alternative environments, Smith et al. [1976] advocated "choice" as an important means of addressing the situation in public education. They

summarized several potential advantages to be realized by both the teacher and the student when choice of learning environment is permitted.

1. What a student thinks of the learning environment may be as important, if not more so, than what is cognitively gained from a given learning experience.
2. The responsibility for a given choice is shifted from the institution to the teacher or student or both.
3. A new relationship between teacher and student forms a partnership in teaching and learning.
4. The concept of choice is commensurate not only with democratic expectations but also with the real world that students are preparing to enter.

Smith et al. placed special emphasis upon this last advantage in addressing the broad social implications of providing for choice in public education.

> By virtue of choice, responsibility shifts from the school or system, which is often authoritarian, to individuals.
>
> The concept of choice in a democracy is much more crucial than curricular content. Without choice, curriculum can become static, often irrelevant, and for many youngsters, totally unacceptable. But even more importantly, if adults in a democratic society are expected to make wise choices about important aspects of their lives, children and youth must learn to make decisions. Because of the encouragement to share decision making in alternative schools, students experience early the need for suitable techniques and appropriate rationale for their judgments. The impact of this single aspect of the alternative school movement is overwhelming. [Smith et al., 1976: 125-126]

2.2.2.2 Choice Among Alternative College Classroom Environments

Individualization of instruction in colleges in general, and in community colleges in particular, was on the increase during the early 1970's. K. Patricia Cross [1975] reported that between 1970 and 1974, random surveys of 22% of all community colleges nationwide indicated that there were significant increases in the number of alternative learning environments being offered. She found a predominant trend toward individualized instruction and an increased willingness of teachers to share responsibility for the education of students with fellow teachers, other students, and employers. Cross indicated, however, that in 1974 less that one quarter of survey respondents were using integrated mastery learning systems of instruction such as the Personalized System of Instruction (PSI.)

Much of the literature from this period which dealt with alternative instructional modes at the college level, either described methods of diversifying classroom learning, or compared traditional to nontraditional modes of instruction. A few specific studies addressed questions related to student preferences for and student choice of learning environment. Most of these reported only on pedagogical aspects of the studies, and tended to neglect other attributes of learning environments.

DuBois [1968] described a study of adult learners in elementary psychology at Washington University (St. Louis)

in which conventional instruction with mandatory student participation in all learning activities was compared to a setting in which students might electively participate in a variety of learning activities structured by the instructor. The author concluded that based on a significant positive correlation between membership in the experimental group and achievement, adults learned better under the condition of "elective participation."

Miami-Dade Junior College [1971] reported on an experimental section of Social Science-English in which students were allowed to choose between alternative methods of instruction. Students in the experimental section were encouraged to try a variety of the alternatives: lecture, small group, programmed instruction, directed study, and community involvement. Students in the control group received traditional instruction in the large group lecture-discussion mode. No significant differences in achievement were reported between the experimental group and a control group, but it was indicated that the control group had a higher retention rate. Further research was recommended, to include consideration of the need to prepare students and teachers for the alternative instructional technique.

Sepe and Connolly [1972, 1973] described student attitudes concerning alternative instructional modes at Harford Community College. They found that preferences for traditional versus self-instructional models were nearly equally divided, and reported no significant relationships

between preference and age, sex, quality point index, major, grade expected, or self-rating of ability. Sepe and Connolly indicated that self-pacing was the most attractive feature of the alternative program, but that teacher responsibility for learning and teacher control of learning seemed to be most important for those preferring traditional instruction.

In spite of the nearly even split in overall preferences, Sepe and Connolly reported that when eight individual characteristics of the traditional versus self-instructional systems were compared, the students indicated a majority preference for the self-instructional system characteristic in seven of the eight cases. Preferred characteristics included self-pacing, emphasis on the individual, and grading based on the achievement of objectives. It was hypothesized that a strong negative reaction to one characteristic, namely student responsibility for learning, was to blame for the inconsistency between level of preference for individual characteristics and overall level of preference for instructional mode.

Hinrichsen [1975] found that registration counts for a course offered by either the traditional lecture mode or the PSI mode at Cerritos College indicated a significant preference for the traditional mode. He hypothesized that students were reluctant to attempt experimental curricula. The PSI course had a higher dropout rate, but higher percentages of students earned A and B grades, and PSI students

completed course requirements earlier. The author noted, however, that statistical comparisons of the two groups were subject to question due to two factors.

1. The control group lacked randomization.
2. Clear statements of goals and objectives were presented in the PSI study guide, but were not provided for the students in traditional lecture classes.

Worley [1975] reported on a study at St. Petersburg Junior College to determine criteria for helping students decide if they would profit more from traditional methods of instruction or from independent and individualized methods. The author found no significant differences in levels of achievement, nor in student attitudes with respect to either method. There was no indication of correlation between success in individualized study, and the factors of age, autonomy, or endurance. It was reported that freshmen were less successful at individualized study than were more experienced learners, and that success at individualized study correlated positively with achievement and GPA.

2.2.3 Summary

In this section of chapter 2, the author has reviewed literature which addresses various types of choices in education. The author found general agreement in the student development literature that choices in education are important factors in the personal development of students.

The opportunity for making choices was reported to be an important part of the development process itself, and major educational choices made during the stages of "adolescence" and "youth" were reported to have significant and lasting affects on the individual.

Several benefits were noted in conjunction with the ability to make choices between alternative school environments. It was reported that the availability of alternative learning environments better accommodates individual differences among student learning styles. In addition, the opportunity for choice places more of the responsibility for learning on the student, which can result in greater enthusiasm and dedication. Finally, it was reported that the experience of making choices in school serves to improve the decision making skills which are needed by adults in a free and democratic society.

Scattered research studies have been conducted at the college level in which student preferences for alternative classroom environments have been a factor. For the most part, college level research into alternative learning environments has focused on comparisons between two environments. Little systematic study of choice among alternative environments has been conducted. Isolated relationships between student characteristics and environmental preferences have been reported.

2.3 SOME COMPONENTS COMMON TO ALL LEARNING ENVIRONMENTS

At this point the focus of this review shifts to some general characteristics of learning environments; characteristics which may vary among alternative environments. Much of the research dealing with alternative learning environments has addressed the variable of instructional mode, but has neglected many of the other components which comprise a total learning environment. The purpose of this section is to provide a general review of three areas of research which pertain to all learning environments: The physical, communication, and social components of learning environments. Although the design of this study is thoroughly described in chapter 4, the author provides a brief overview of that design here. This overview is intended to establish the perspective from which the author examined and selected learning environment literature for inclusion in this portion of the review.

The instructors who participated in the classroom phase of this study each fashioned their own respective learning environments. The students who participated in the study were given brief exposures to each learning environment during an orientation phase. The students were then asked to evaluate each environment and to report their preferences with respect to each.

Working from the joint perspectives of classroom learning environment design and student preference formation, the author was searching in this portion of the

literature review for answers to the second and third questions posed in the chapter overview.

2. What are the variables with which instructors work when fashioning alternative learning environments?
3. What are the general attributes of learning environments which stimulate student awareness upon first exposure?

Complete and comprehensive answers to these questions cannot be deduced from the contents of this section alone, however, for only the following selected components of learning environments are addressed here.

1. Physical environment.
2. Communications environment.
3. Social environment.

2.3.1 Physical Environment

One way of distinguishing among alternative instructional settings is through describing the physical environment and how it is used. In some cases the manner in which classroom space is used varies with the method of instruction employed by the teacher. In other cases the physical environment tends to limit instructional alternatives. In either case, the physical classroom is for many students the first and most readily apparent feature of a new learning environment. For these reasons, the author has chosen to begin his study of instructional environments with the physical component.

2.3.1.1 Historical Overview

J. W. Getzels [1975: 1-14] provided an historical overview of general changes in the appearance and use of the physical classroom environment over the past century. He described four types of classrooms, each attributable to a different era, and discussed the relationships between the physical design and the dominant educational theory associated with each environment. Although Getzels' work focused primarily on the use of physical space in the public schools, classroom environments similar to those he described can be found in college and university classroom buildings which were constructed during the respective eras. The associated learning theories which he described have also influenced college as well as public school instruction.

According to Getzels [1975: 3-4], typical classrooms in the early 1900's were long and narrow, with the teacher's desk at the front, and student desks bolted to the floor in straight rows facing the front. There were practical reasons dealing with architecture and lighting for the rectangular shape, but the furniture arrangement reflected the educational philosophy of that era. Students were expected to look straight ahead at the teacher, and to ignore all other students.

The popular learning theory in those days was based on the concept that students were empty learners. All learning was controlled by the teacher, who provided both the stimuli

of what should be learned and the response of what had been learned. The students were expected to absorb this information as the teacher presented it.

By the 1930's, the typical classroom shape had changed from rectangular to square [Getzels, 1975: 4-6.] With better lighting systems and less reliance upon natural light from windows, the square shape provided for better visibility, easier access, greater safety, and improved ventilation. In addition, the bolted desks were replaced by movable desks and chairs, and the teacher's desk was generally located in a corner of the room.

This furniture rearrangement reflected a change in learning theory, principally to the Gestalt view of the student as an active learner who brought together separate stimuli to form an idea. The teacher still orchestrated the learning activities, but these activities centered on the student. In theory anyway, students as individuals determined which stimuli they would respond to and hence determined what would be learned. Likewise, students formulated their individual responses to these stimuli, and hence determined what was actually learned.

During the 1950's, the physical shape of the typical classroom was still square, but the furniture and arrangement began to change. As Getzels [1975: 6-7] described that change, the teacher's desk was generally missing from the classroom, and student furniture was designed to permit circular groupings. Trapezoidal tables were introduced

during this era to facilitate these new furniture arrangements.

The popular learning theories during this time emphasized group dynamics and the role of social interaction in learning. Students were viewed as social organisms who both stimulated and were stimulated by every other student in the room. Teaching plans began to shift from teacher centered to group centered activities, and circular furniture arrangements were often adopted to enable each learner to face the other learners.

The open classroom, which began to appear in the 1970's according to Getzels [1975: 7-12], was usually much larger than the traditional classroom. It was frequently arranged with separate learning centers located in different parts of the room. There were no desks for either students or teacher. Tables, chairs, and movable screens are arranged by the teacher within the open space to create a variety of separate learning environments.

This most fundamental change in physical environment reflected an equally fundamental change in learning theory. The earlier theories differed in terms of the sources of stimuli and responses in the classroom, but were based on a common conception of the student as being self-maintaining and motivated to participate in tension-reduction activities. The student was viewed as an organism in search of equilibrium. Hence the teacher designed activities which produced stimuli to upset this equilibrium. In theory, this

loss of equilibrium produced tensions, and the students were naturally motivated to respond in order to reduce the tensions and thus to maintain their equilibrium.

Practitioners who endorsed the open classroom concept conceived of students as naturally curious. Rather than always seeking the security of equilibrium, it was hypothesized that students were naturally motivated to explore and to interact with their environment. Hence in the open classroom the teacher designed an environment which was intended to stimulate curiosity and lend itself to exploration and interaction.

2.3.1.2 Territoriality, Personal Space, and Spatial Arrangements

Marvin E. Shaw [1971: 117-118] defined physical environment as not only the physical surroundings and furnishings of the learning environment, but also what he referred to as the personal environment, social environment, and task environment. There are many ways in which these different aspects of Shaw's "physical" environment tend to interact. The concepts of territoriality, personal space, and spatial arrangement are discussed here. Other aspects of Shaw's "physical" environment have been integrated with related topics in subsequent portions of this chapter.

Territoriality is the tendency for persons and groups to assume proprietary rights with respect to a geographic area within the physical environment. Whyte [1949], Altman

and Haythorn [1967], Lipman [1968], Sommer [1969], and Ullrich [1971] reported on individual territoriality in humans. They found that in work situations, isolated living conditions, family and retirement homes, and public places, humans tend to both assume and defend proprietary rights to portions of their physical environments.

Whyte [1943], Mack [1954], Marine [1966], Sommer [1969], and DeLong [1970] studied groups with respect to territoriality. Whyte, Mack, and Marine reported on territoriality exhibited by street-gangs and ethnic minorities in their neighborhoods. Sommer and DeLong reported on the relationship between territoriality and dominance in group meetings.

Based upon findings such as these, Shaw hypothesized that:

> Individuals and groups typically assume a proprietary orientation toward certain geographical areas which they defend against invasion. [1971: 149]

Personal space, as distinct from territoriality, is not tied to geographic location, but refers instead to the physical space surrounding the body. As reported by Little [1965], Willis [1966], and Justice [1969], personal space seems to vary inversely in size with respect to the friendliness of an interpersonal encounter. In other words, as the friendliness of an encounter decreases, the desired amount of personal space tends to increase.

Hall [1959], Jones [1971], and Jones and Aiello [1972] found that comfortable interpersonal distance tends to vary

among both cultures and subcultures. Jones and Aiello reported that first grade black children tended to both stand closer together and to prefer a closer interaction distance than did white children. Sommer [1959] reported sex differences with respect to personal space, namely that men did not tend to sit as close to either women or other men as did women.

Horowitz, Duff, and Stratton [1964]; Argyle and Dean [1965]; McBride, King, and James [1965]; Rosenfeld [1965]; and Kleck [1969] investigated the relationship between personal space and degree of impersonality. Through a variety of techniques, these researchers demonstrated that the size of desired personal space tends to contract in impersonal situations. They also reported that desired personal space tends to expand as situations become more personal and more socially significant.

Lott and Sommer [1967] and Sommer [1969] reported that interpersonal distance tends to increase between persons of differing status, and decrease between persons of similar status. It was not clear, however, if the desire for increased personal space in the former situation was felt by the higher status person, the lower status person, or both. Dosey and Meisels [1969] concluded that personal space tends to increase as stress increases.

Other research addressed how personal space is invaded, and how people defend against such invasions. Rosenfeld [1973] concluded from the findings of Bardeen [1971] that

touching constitutes a serious invasion of personal space, in some cases visual contact is a milder form of invasion, and verbal contact does not tend to be perceived as an invasion of personal space. It was reported by McBride et al. [1965] and Sommer [1969] that individuals employ a variety of techniques to defend personal space from intrusion by others. When these defenses fail, negative feelings tend to result, and appropriate personal space tends to be regained by flight from the intruder.

Shaw advanced the following hypotheses based upon the research concerning personal space:

> Individuals typically establish personal space into which others may not enter.
>
> The boundaries of personal space vary with the personalness of the situation, the intimacy of the person-other relationship, and the status of the person relative to the other.
>
> Invasion of personal space evokes discomfort and negative feelings which are revealed by various defensive reactions on the part of the victim, the person whose space is invaded. [1971: 149-150]

The literature includes a number of studies which deal with spatial arrangements involving the way people choose positions relative to other people and things in a group situation. Strodtbeck and Hook [1961], Hare and Bales [1963], Myers [1969], and Sommer [1969] described how individual characteristics (such as socioeconomic class and degree of dominance) and nature of group activity (such as conversing, cooperating, coacting, and competing) interact with seating arrangement and seat selection. Sommer found that preferred seating arrangements tend to vary with the

activity. Myers found that particular seating arrangements tend to arouse personal feelings in individuals which contribute to seating preference.

Studies by Steinzor [1950], Hearn [1957], Hare and Bales [1963], Campbell, Kruskal, and Wallace [1966], and Russo [1967] concerned the relationships between spatial arrangement and interaction. Steinzor reported a tendency for people to talk more to those seated opposite them, than to those seated next to them. Hearn confirmed this finding, but noted that the tendency seemed to reverse in the presence of a strong directive leader.

Hare and Bales [1963] found that seating arrangement was related to degree of participation in group discussions. Whether individual differences in group participation were due to different seating positions, or seating preferences determined seating positions, could not be clearly understood from their research. The Campbell et al. [1966] and Russo [1967] studies both reported relationships between distance in the group and perceived feelings or attitudes about group members. Campbell et al. found that distant persons tend to be perceived as less friendly, and persons who feel less friendly tend to choose positions of greater distance. Russo reported that improved eye contact tends to reduce the effect of personal distance.

Research by Bass [1949], Bass and Klubeck [1952], and Howells and Becker [1962] dealt with relationships between leadership and spatial arrangements. Their combined

findings indicate that leaders tend to sit at the head position in a group, such as the head of the table, and likewise persons who sit in head positions tend to be perceived as group leaders. In addition, seating arrangements which have no head position tend not to show relationships between seating position and leadership roles.

In the early studies however, it was difficult to distinguish between the effects of seating preference and leadership roles. Howells and Becker [1962] demonstrated with seating arrangements on the sides of a rectangular table, that where the arrangement tends to channel communication, those people who sit in the most active positions tend to emerge as leaders. This finding closely relates spatial arrangement to communications patterns, a topic which will be considered during the discussion of communications environment later in this chapter.

Shaw summarized the following general hypotheses which were demonstrated by these studies:

> There is a positive relationship between status and favorability of spatial position in the group.
>
> Persons interact more frequently with persons seated facing them than with persons seated adjacent to them.
>
> Seating arrangement influences the quality of group interaction. [1971: 150]

2.3.1.3 Implications of Physical Environment Research Which Relate to Environmental Preference

One of the implications of this research is that the use of physical space by the classroom instructor varies with instructional philosophy, and the related choice of instructional mode. The instructional modes included in this study are examined in chapter 3. The uses of instructional space by the respective instructors who participated in this study are described in chapter 4.

Since instructors use space differently, the research implies that interactions may occur between those uses and student orientations with regard to territoriality and personal space. The research also indicates that different spatial arrangements of classroom furniture can effect classroom communication patterns. Furthermore, the research suggests that interactions may occur between different spatial arrangements and individual student differences. Although some mention was made in the literature pertaining to preferential seating positions within a spatial arrangement, the issue of preferences for different arrangements was not discussed.[2]

In general, the literature reveals that the characteristics, allocation, arrangement, and use of physical space

---

[2] The literature dealing with communication networks, which relates to issues raised with regard to spatial arrangements, is discussed in conjunction with the communication component of learning environments.

are interrelated with many other aspects of learning environments. These include but are not limited to instructional philosophy, instructional mode, communication patterns, social organization, group process, and individual physical and psychological comfort. Many of these interrelationships are explored further in the succeeding portions of this review.

2.3.2 Communication Environment

The various characteristics of classroom communication comprise the communication component of the learning environment. The literature reveals that the physical environment of the classroom (in conjunction with instructor pedagogy, instructor characteristics, and student characteristics) influence the quantity, quality, and types of communication which occur in the classroom. Changes in other components of the learning environment, therefore, tend to interact with changes in the communication component of that environment.

The focus of this portion of the literature review is upon those aspects of alternative communication environments which are most likely to effect student preference formation with respect to alternative learning environments. Research dealing with student characteristics which is related to classroom communication, such as self-concept, communication apprehension, and interpersonal relations orientation, is discussed in chapter 3. Likewise, research dealing with

instructor communication traits as they are perceived by students is also discussed in chapter 3.

Of primary interest here are the research findings related to alternative communication structures and patterns, namely classroom communication networks. The bulk of the other communication research concerning group formation, composition, structure, interaction, and task relates primarily to processes which occur in the classroom after the choice of learning environment has been made. This portion of the communication literature is outside the scope of this study, except to the extent that it directly relates to the specific instructional modes and goals addressed in chapter 3.

2.3.2.1 Functions of Classroom Communication

In order to better understand the communication component of learning environments, it is helpful to consider communication functions and malfunctions in the classroom. Drawing from the work of McCroskey and Wheeless [1976] and others, Hurt, Scott, and McCroskey [1978: 138-143] summarized some of the major functions of communication in the classroom learning environment. A condensed version of their summary is presented here.

1. Affinity. Most students desire to have warm relations with other students and the teacher in the classroom. Few students like to feel isolated from the class. Hence students have a tendency to

communicate for the purpose of establishing good relations (affinity) with other students and with the teacher. The extent to which students feel the need for relationships with others tends to govern the degree to which they initiate this type of communication.

2. Information and Understanding. Teachers frequently communicate information to students and solicit responses to determine to what extent that information is understood. Likewise, students communicate with the teacher to request information and to clarify their understanding of the subject. Interaction between students frequently occurs as a part of this process.

3. Influence. Teachers seek to influence student classroom behavior and study habits through communication of class policies and the like. Students may communicate with the teacher in order to suggest changes in class policy, and with other students to encourage modification of classroom behavior.

4. Decision Making. Students frequently lack sufficient knowledge of the decision making process to effectively make decisions concerning both their academic and social lives. Hence they tend to seek communication with teachers to assist in the process of making such decisions.

5. Confirmation. Many times students have already made tentative decisions, but lack confidence in the validity of those decisions. They frequently communicate with teachers in order to receive confirmation that their tentative decisions are indeed appropriate. This confirmation process can apply to decisions relating to matters external to the classroom, but also frequently deals with the student's need to confirm that learning of class material has indeed been achieved.

2.3.2.2 Communication Malfunctions in the Classroom

Hurt et al. [1978] maintained that while some forms of student communication compliment the instructor's purposes and are encouraged, other forms of communication are discouraged in some class environments because they deter from the intended learning activity. Thoreson [1966], and Burgoon and Burgoon [1974] reported that students sometimes resist communication in the form sought by the instructor, which in turn detracts from the learning process. Hurt et al. [1978: 143-145] described some of the reasons students resist classroom communication. They indicated that behaviors which reflect this resistance tend to result in communication malfunctions in the classroom. The author provides the following condensation of their list.

1. Desire to Be Left Alone. All human beings have "good days" and "bad days." These variations in

mood frequently have causes which are entirely external to the classroom environment, and yet their effects can be readily apparent in the classroom. A student who was very responsive on Monday may just want to be left alone on Wednesday. The teacher who is sensitive to this kind of change in communication behavior, tends to leave the student alone on a "bad day", and tries again later.

2. Avoidance of Disclosure and Exposure. If a student perceives a classroom environment as threatening to people who do not understand the course material, then that student is likely to avoid communication with the teacher. It appears to be safer not to communicate, than to disclose a weakness which might expose the student to punishment or ridicule.

3. Alienation. Some students feel alienated in the educational environment; some feel alienated in all social contexts. Attempts by classroom teachers to draw out these students frequently serve only to increase the feeling of alienation, and hence can cause even greater withdrawal from the class activities.

4. School Atmosphere. Certain types of schools or classroom atmospheres tend to discourage student communication. In highly authoritarian

atmospheres, students learn that the best way to avoid trouble is to avoid talking. Insensitive teachers also tend to discourage communication. If a teacher fails to provide any feedback, or else provides only negative feedback during class discussions, then students cannot sense whether or not their communications are effective. This creates stress which students learn to avoid by avoiding communication. Finally, if there is a predominant cultural group within the classroom, whether defined by race, sex, religion, or national origin, there is likely to be a tendency for members of minority groups to resist communication.

5. Communication Apprehension. Some students are generally more open to communication than are others. A communication-apprehensive student is generally fearful of the communication process itself, and feels that there is more to lose in classroom communication than there is to gain. Such students either avoid communication altogether, or else are subject to great anxiety during the communication process. Communication apprehension as a student trait is discussed in chapter 3.

2.3.2.3 Communication Networks

The literature of group dynamics and the literature of educational sociology both address topics which are related to classroom communication. One such topic is that of patterns of communication which are called networks. Small group communication patterns have been studied by Leavitt [1951]; Hirota [1953]; Macy, Christie, and Luce [1953]; Shaw [1954, 1958, 1964]; Gilchrist, Shaw, and Walker [1954]; Shaw and Rothschild [1956]; Guetzkow and Simon [1955]; Guetzkow and Dill [1957]; Schein [1958]; Shellenberg [1959]; Mulder [1959, 1960]; Cohen [1961, 1962]; Bavelas [1962]; Lawson [1965]; Burgess [1968]; and others.

Table 1 illustrates some common communication patterns for three-person and four-person groups. The symbol "0" in the table represents an individual member or "position" in the network. Lines between two positions (drawn with the symbol "•") represent two-way communication channels.[3]

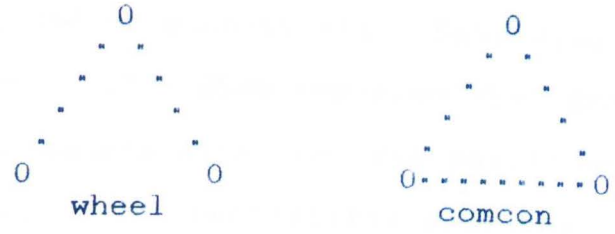
---

[3] Table 1 is based on Shaw's figure 5-3 [1971: 139] where the reader will find many other communication patterns for groups ranging in size from three to five persons.

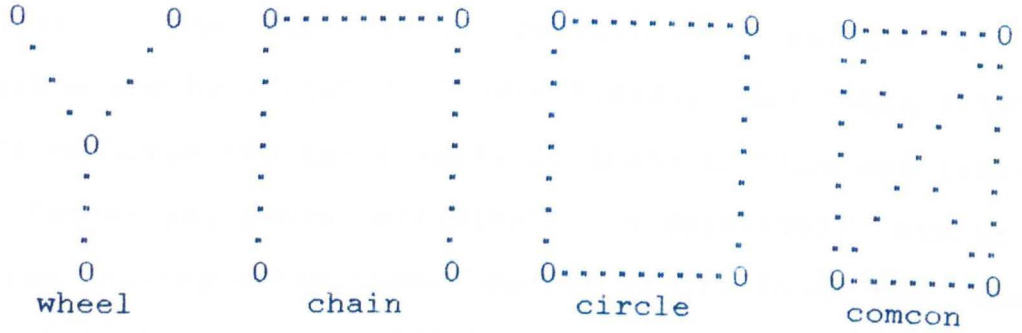
TABLE 1

Communication Patterns

Three-person networks



Four-person networks



In the patterns described as "wheel" or "chain" networks where there is a central position, Leavitt [1951] found that the person in that central position tended to be the leader. In groups using the "circle" pattern where there is no central position, Leavitt found no predictable leadership position. Studies by Hirota [1953], Shaw [1954], and Shaw and Rothschild [1956] tended to confirm these findings. Leavitt also reported that in centralized positions, those group members closer to the center expressed greater satisfaction with the group activity than did those who were further from the center. In decentralized groups, satisfaction tended to be more evenly distributed among group members. Studies by Shaw [1954], Shaw and Rothschild

[1956], Cohen [1961, 1962], and Lawson [1965] tended to confirm these findings by Leavitt.

Shaw [1954] categorized group organizations as being either centralized or each-to-all. Expanding on the initial work by Leavitt [1951], Shaw reported that groups which used communication networks with central positions tended to organize themselves in centralized patterns, while group arrangements which lacked central positions tended more similar to the each-to-all pattern of organization. Guetzkow and Dill [1957], Schein [1958], and Cohen [1961, 1962] reported similar results to those of Shaw and Leavitt.

Concerning group efficiency in relatively simple problem solving activities, Leavitt [1951] found the "wheel" network to be the most efficient communication pattern; he found progressively less efficiency in the "chain" and "circle" networks. Studies by Shaw, Hirota, Guetzkow, Simon, and Lawson generally confirmed the hypothesis that centralized groups are more efficient at performing simple tasks than are decentralized groups, because a person in a central position can gather information from other group members and then independently determine the solution to the problem.

Mulder [1960], Lawson [1964], and others, however, have shown decentralized groups to be more efficient than centralized groups at performing complex tasks. Studies by Macy, Christie, and Luce [1953]; and Gilchrist, Shaw, and Walker [1954] indicated that the more complex the task, the more

messages are sent over the communication network. In centralized groups there is a tendency for central positions in the network to become saturated, leading to communication breakdowns. The work of these researchers suggests that since decentralized groups are less susceptible to saturation, they tend to function more efficiently at complex problem-solving tasks.

Shaw summarized several hypotheses supported by the research on communication networks:

> A leader is more likely to emerge in a centralized communication network than in a decentralized network.
>
> Organizational development occurs more rapidly in a centralized than in a decentralized communication network.
>
> Group members have higher morale in decentralized than in centralized communication networks.
>
> A decentralized communication network is most efficient when the group must solve complex problems, whereas a centralized network is most efficient when the group must solve simple problems.
>
> A centralized communication network is more vulnerable to saturation than a decentralized network. [1971: 151-152]

Boocock [1972: 163-164] described the communications network in traditional classrooms as an extension of the "wheel" pattern, with the teacher at the hub participating in a series of one-to-one exchanges with students. Jackson [1968] reported that teachers in elementary school conduct over 200 interpersonal exchanges each hour. Withall [1956] earlier estimated hourly student-teacher contacts as substantial, but less that 100 per hour. To the extent that one can generalize small group and elementary school findings to

larger groups of college students, the issues of communications patterns and saturation take on special significance. Boocock concluded that:

1. The typical classroom communication pattern is most gratifying to the person in the central position (the teacher), and less gratifying to the other members of the network (the students.)
2. A large highly centralized network achieves order through relatively passive behavior on the part of many members. It performs well at highly structured tasks, but loses efficiency as active participation increases.
3. As learning activities progress to more general understanding and application of basic concepts, more flexible communication patterns, allowing for more student-to-student communication, may be more functional.

2.3.2.4 Implications of Communication Environment Research Which Relate to Environmental Preference

The analysis of the communication environment in a given classroom can be expressed, at least in part, in terms of the purposes for which the instructor and students use communication, the ways in which the instructor and students block communication, and the communication patterns which are employed. Of particular interest to this study are the structural differences among the communication components of alternative learning environments, and the implications these differences hold for differing environmental preferences among students.

Boocock described the communication network in the traditional classroom as a centralized pattern which relies upon passive communication behavior on the part of most students in order to function efficiently. As the reader will learn from the review of small group literature in chapter 3, Davidson [1970, 1971] recommended the use of decentralized small student groups for learning mathematics. Likewise, the literature reviewed in chapter 3 reveals that structured communication patterns do not generally exist in classrooms using the individual mode. Students are basically free to communicate or not to communicate with others in the environment.

Hurt's summary of classroom communication functions suggests that:

1. In large classroom groups the teacher tends to control communication functions.
2. In small groups the students have primary control over the purposes for which they use communication.
3. In the individual study environment both the instructor and the students exercise great individual freedom in determining the purposes for which they use communication.

Likewise, Hurt's summary of classroom communication malfunctions suggests that:

1. Some forms of communication resistance and blocking on the part of a few individuals in large groups can impact the learning experience for all students. Passive students in large groups may experience occasional pressure to participate.
2. With less instructor intervention and fewer participants in small-group communication networks, communication resistance can have greater impact on the members of the group in which it occurs, and yet have no effect upon students in other groups. Passive students may be more frequently pressured to contribute to small-group discussions.
3. Due to the high degree of communication freedom in the individual learning environment, students who resist communication are likely to have very

little impact on other students. Students are less likely to be pressured into unwanted communication. Students who rely on passive communication behavior may have difficulty getting the help they need from others.

Shaw, Leavitt, and others found that centralized groups tend to be more efficient at simple tasks, and less efficient at more complex tasks. This suggests that students in large groups realize some advantages over students in small groups when the learning tasks are less complex. The reverse may be true when the tasks become more complex. As a result of the centralized nature of large group classes, there may be at tendency for large group instructors to avoid complex tasks. Since it is hypothesized that greater input is needed in the performance of more complex learning tasks, there may be a tendency for students in the individual study environment to seek more communication when more complex tasks are assigned.

Interactions between the structural differences of communication environments and the instructional modes employed are implicit in the above discussion. Interactions among differences in communication structures, student characteristics, and instructor characteristics, are also relevant to this study. Selected characteristics of students and instructors are addressed in chapter 3, where the above types of interactions are also discussed.

2.3.3 Social Environment

The classroom social environment is the third and concluding component of learning environments which is discussed in this section of chapter 2. Jackson [1968], Getzels and Thelen [1971], and Boocock [1972: 154-170] describe the class as a unique social system, unique in the sense that it is one of the few places in everyday life where a relatively large group of people are confined to a relatively small space for a prolonged period of time on a regular schedule. The communication environment is but one facet of the overall classroom social environment. Other factors which effect the social environment include:

1. Class size
2. Degree of homogeneity
3. Reward systems
4. Sociometry
5. Classroom role structures and relationships
6. Facilitation of social interaction

The first four factors in the above list are described here. With reference to the design of this study, the author has concluded that most of the factors related to social interaction in the classroom pertain to post-choice activities in the learning environments, rather that the preference formation process prior to making a choice of learning environment. These social environment factors are addressed in chapter 3 to the extent that they relate to alternative instructional modes and goals. Classroom role

structures are also discussed in chapter 3 with respect to instructor traits, students traits, and instructional modes. The role of education in society, societal impacts on the structure of the educational system, effects of educational systems with respect to sociological development of individuals, and other such broad concerns of educational sociologists are generally beyond the scope of this study.[4]

2.3.3.1 Class Size

Class size has always been a significant issue for teachers. Small classes represent not only less work for the teacher, but also reduced problems of control and coordination [Boocock 1972: 155]. Teachers generally claim (and believe) that class size is inversely related to productivity, but research by McKeachie [1962], Watson 1963, Husen [1967], Fox [1968], Dubin and Taveggia [1968], and Begle [1973] has failed to establish a consistent pattern of support for this claim.[5]

---

[4] The author notes, however, that some of the broad effects of the educational system on the personal growth of individuals were addressed at the beginning of this chapter, and that personal and sociological development are closely related.

[5] Recent use of meta-analysis techniques to reanalyze the data from earlier class size studies has led to some alteration of the original findings of those studies. The reader is referred to Moos [1979] for the results of the new analyses. The original findings are described here.

Findings by Husen [1967] and Fox [1968] tended to discount the assumed superiority of small classes. Begle [1973] reported that small classes appeared to be more effective in learning mathematics in elementary school, but that larger classes appeared to be superior in junior high. Small group research by South [1927], Shaw [1932], Hare [1952], Perlmutter et al. [1952], Taylor and Faust [1952], Bales and Borgotta [1953], Ziller [1957], Slater [1958], Lorge and Soloman [1959, 1960], McKeachie [1962], and Weick [1969] suggested that size in conjunction with other factors has much more to do with the level of productivity than does size alone.

Boocock [1972: 156] summarized some examples of such other factors which were found to interact with class size in traditional classrooms.

1. Classes in central city areas tend to be larger and less productive than classes in the suburbs.
2. Classes in urban areas tend to be larger and more productive than do classes in rural schools.
3. In general, increase in class size both increases the pool of available resources, and decreases the opportunities for individual participation.

Another way to address the issue of class size is to consider the size of working "sub-units" within the total class. The small-group research cited above indicates that the optimum size for a working unit (group or individual) tends to depend upon the nature of the task. Shaw [1971:

345-346] summarized the following general hypotheses, but noted that there were some inconsistencies among various research findings.

1. Individuals probably perform better than groups on highly structured tasks; no consistent pattern has been found to predict optimum group size for the performance of structured tasks.
2. Members of smaller groups tend to be more satisfied than members of larger groups.
3. There is an indication that five members may be an optimum size for discussion of human relations issues.

Boocock [1972: 158] concluded that while teachers tend to have little control over class size, the small-group literature does suggest various optimum grouping options based upon the nature of learning activities and goals.

2.3.3.2 Homogeneity Versus Heterogeneity

One of the major issues of class organization, whether among classes or within classes, concerns homogeneous versus heterogeneous ability grouping. Boocock [1972: 158-160] reported that teachers tend to prefer homogeneous groups, probably because they are easier to teach. The research conclusions of Shaw [1960], Goldman [1965], Atkinson [1965], Goodlad [1966], Goldberg [1966], Richer [1967], and Laughlin, Branch, and Johnson [1969], concerning heterogeneous and homogeneous effects in groups, were mixed.

The Goldberg study [1966] addressed the effects of individual ability level, relative ability level, class ability range, and presence or absence of gifted and/or slow learners in class on individual achievement. Boocock [1972: 160] summarized some significant findings from the Goldberg study.

1. In science classes, the presence of gifted students had some upgrading effect on bright but not gifted students.
2. In social studies classes, the presence of gifted students had some upgrading effect on the less able students.
3. The presence of slow learners did not have any consistent effect.
4. Gifted students tended to do best with gifted peers.
5. Non-gifted students tended to benefit from greater heterogeneity, but the differences were neither large nor consistent.
6. Relative ability level in a class had no consistent affect upon test performance.
7. Comparisons of heterogeneous and homogeneous classes showed no consistent trends.
8. Differences between classes with similar ability groupings tended to be greater than differences between ability groups within the same class.

Boocock [1972: 160-161] also summarized three factors which were not controlled in the Goldberg study, and which may tend to explain the strength or weakness of certain patterns.

1. Atkinson [1965: 25-66] reported that students with high need-achievement and low test anxiety tended to show greater interest and perform better on reading and arithmetic tests in homogeneous classes. Students with higher test anxiety than need-achievement tended to show less interest but consistent achievement in homogeneous classes.
2. Richer [1967] indicated that the extent to which less able students develop feelings of inferiority in heterogeneous groups, depends upon their reference groups, and that the Goldberg study did not establish what their reference groups were. Only if low-ability groups tend to compare themselves to high-ability groups is one justified in predicting a decrease in self-esteem. Richer [1967] hypothesized that ability groups and reference groups are inclined to be more similar than different in certain circumstances.
3. Goldberg [1966] reported that when teachers taught low-ability homogeneous groups, they tended to simply teach less of the same traditional course content, rather than to especially orient their instruction to the ability-level of the group.

The potential advantages of offering special curricular content and materials to low-ability groups were not tested in the context of the Goldberg study.

The research by Shaw [1960], Goldman [1965], and Laughlin et al. [1969] addressed issues of ability and personality homogeneity/heterogeneity in small groups. Shaw proposed two hypotheses which were generally supported by this research.

> Other things being equal, groups composed of members having diverse abilities perform more effectively than groups composed of members having similar abilities.
>
> Groups whose members are heterogeneous with respect to personality profiles perform more effectively than groups whose members are homogeneous with respect to personality profiles. [Shaw, 1971: 230-231]

2.3.3.3 The Reward System

One common feature of most traditional reward systems in American schools is competition. Much of the research dealing with competition and cooperation involved small-group interaction and problem solving. Other research reviewed here was conducted with elementary age children, but is relevant to this study for two basic reasons. First, the traditional reward system (grades) is commonly used at all levels of the American educational system. Secondly, the literature shows that competition between students is commonly reinforced in traditionally structured learning environments at all levels of the system, beginning in the elementary schools and continuing through the college years.

Research by Johnson, Johnson, and Bryant [1973], Johnson [1973], and Johnson [1974] concluded that most elementary students perceive school as being competitive.[6] Nelson [1970], Madsen [1971], Madsen and Conner [1973], and Nelson and Kagan [1972] concluded that American children become more competitive the longer they are in school or the older they become. Nelson and Kagan also reported that American students are apparently given few if any school experiences which might sensitize them to possibile advantages of cooperation. They found that some Anglo-American children were willing to reduce their own rewards in order to reduce the rewards of peers. Stuab [1971] found that American children often believed that helping others in distress was inappropriate behavior.

Johnson and Johnson [1975] attributed part of the high degree of competition present in the classroom today to the following collection of "myths" which teachers tend to believe, but which are contradicted by research findings.

Myths:

> Our society is highly competitive and students must be educated to succeed in a "survival of the fittest" world.
>
> Achievement, success, outstanding performance, super-human effort, the rise of the great leader, drive, ambition, and motivation depend upon competing with others.

---

[6] Some of the findings of more recent research by Johnson, Johnson, and Scott [1978] have been challenged by Robertson [1982]. The reader is referred to those publications for further information.

> Competition builds character and toughens the young for life in the real world.
>
> Students prefer competitive situations.
>
> Competition builds self-confidence and self-esteem. [Johnson and Johnson, 1975: 45-49]

These authors maintained that while there are appropriate uses for competition in schooling,

> ... the vast majority of research indicates that the cooperative goal structure should be the most frequently used goal structure in the classroom. [Johnson and Johnson, 1975: 57][7]

Deutsch [1949], Blau [1954], Naught and Newman [1966], and Haines and McKeachie [1967] found that competition increased anxiety. Haines and McKeachie also reported that students in cooperative discussions were less tense and more task oriented than those in competitive discussions. These and many others studies established that competitive classroom goal structures tend to effect interpersonal relations negatively, while cooperative structures tend to have positive effects.

Studies by Johnson and Johnson [1972]; Blanchard, Adelman, and Cook [1974]; Weigel, Wiser, and Cook [1974]; and others indicated that people tend to like those who facilitate goal accomplishment and dislike those who

---

[7]Some more recent studies using meta-analysis techniques have identified some appropriate uses of competitive goal structures. Some studies have also revealed that due to individual differences, some students do much better than others in competitive situations.

frustrate goal accomplishment. DeVries, Edwards, and Wells [1974] reported that low achievers who reduce group performance are not disliked or alienated in cooperative situations. DeVries and Mescon [1974] found that social isolates are more frequently integrated in cooperative classrooms.

Deutsch [1949], Deutsch and Krauss [1962], Johnson [1971], Bonoma, Tedeschi, and Helm [1974], and others indicated that cooperative goal structures contribute to open, effective, and accurate classroom communication. Competitive structures tend to have the opposite effects. Blake and Mouton [1961] reported that competition biases individual perceptions and comprehension of other points of view. Deutsch [1958, 1960, 1962] and others found that cooperation builds trust and competition destroys it. Deutsch [1949], Crombag [1966], DeVries and Edwards [1974], and others indicated that cooperation contributes to mutual influence, which is vital for effective problem solving. Some studies reported stronger orientation of students with respect to academic involvement and academic achievement in cooperative situations.

Deutsch [1949] found that in cooperative groups there was more behavior directed towards improvement of group functioning. In competitive conditions, students attempted to obstruct each other's success. Deutsch and others found that students become more involved in cooperative instructional activities. Hulten [1974] reported that students in cooperative groups considered achievement to be more

important than in competitive groups. Johnson, Johnson, and Bryant [1973], Johnson [1973], Johnson [1974] and others indicated that students both preferred and liked cooperative learning environments. Wodarski et al. [1973], and DeVries, Edwards, and Wells [1974] concluded that cooperative goal structures promoted study behavior, decreased apathy, decreased disruptive behavior, and decreased talking on the part of teachers.

Boocock [1972: 164] concluded that the reward system, based upon competitive goal structures, often "seems designed to produce anxiety, antagonism, and alienation in the teacher-student relationship." Three specific aspects of many reward systems were cited in this regard.

1. Rewards (grades) tend to be external to classroom learning activities; there is little incentive provided for active involvement by students.
2. Competition for a limited number of high grades tends to discourage cooperative learning activities between students.
3. Passive assimilative behavior is encouraged, while active creative behavior tends to be discouraged.

Johnson and Johnson indicated that just as competitive classroom structures tend to be perpetuated by "myths", other "myths" contribute to teacher resistance and discouragement with respect to cooperative classroom structures. The "myths" which follow are clearly contradicted by research findings such as those cited above.

More myths:

> When cooperation is used, all students must work together, and the student who wants to work by himself for a while is forbidden to do so.
>
> Cooperation among students will enslave the gifted while giving the stupid a "free lunch".
>
> Students who do not contribute to the group's work or who in some way reduce the group's performance will be punished or brutalized.
>
> Many students will (through apathy) do no work, learn nothing, and yet receive the benefits of the work of other students.
>
> Cooperative goal structures will result in students doing the things they are good at and never working on skills and knowledge that are difficult for them.
>
> If students work together cooperatively they will lose their personal identities because the group will force them to conform to its standards. [Johnson and Johnson, 1975: 54-56]

Boocock [1972: 165-168] reported that in the most serious attempt to change the reward system in American schools, theories of behavior modification were applied in some classrooms, as described by Krasner and Ullman [1965], and Hamblin et al. [1969]. Rewards were programmed to reinforce correct or attempted correct behavior, and punishment was eliminated.

> Behavior modification is an approach which focuses upon the exchange relationship between teacher and student. The teacher still retains control over the giving and withholding of rewards, although the reward itself is made more relevant to the learner and its allocation is tied directly, and impersonally, to his performance. [Boocock 1972: 167]

Behavior modification can also be employed to stimulate cooperation rather than competition among students, by rewarding all members of working groups for successful

completion of projects, rather than providing differential rewards based upon individual contributions. Boocock [1972: 167-168] concluded from the studies of Deutsch [1949] and Blau [1955] that cooperative groups show higher coordination of effort, attentiveness, friendliness, and more favorable group evaluations, than do competitive groups. These studies, however, did not report increases in content interest, involvement, or mastery. Blau found that the highest levels of individual achievement tended to be attained in competitive groups, while Deutsch detected no such tendency.

Davidson [1984] summarized studies by Edwards and DeVries [1972, 1974]; Edwards, DeVries, and Snyder [1972]; Hulton and DeVries [1976]; Slavin [1980, 1983(A & B)]; Slavin and Karweit [1981, 1982]; Slavin, Leavey, and Madden [1983, 1984]; and Madden and Slavin [1983] in which various team approaches to learning were employed. In general, various forms of team rewards are used to encourage cooperation between members of heterogeneous teams. These team approaches are examples of constructive uses of reward systems to promote competition between teams, which in turn fosters cooperation within teams. Davidson reported that in nine out of eleven studies which compared team approaches to small group learning with traditional instruction, significant achievement gains for the small-group treatments were found.

2.3.3.4 Sociometric Structure

Sociometry deals with both positive and negative feelings among group members. When groups members have generally positive attractions for each other then that group is said to have good sociometric structure. Moreno [1934] hypothesized that good sociometric structure leads to satisfying intragroup relations. This in turn hypothetically leads to high individual motivation and achievement, and a high level of group performance.

Sociometry is of interest in this study for two reasons. In reference to the study design, differing group sizes, group organizations, and communication structures among alternative learning environments imply differing effects of sociometric structure during the instructional phase. In addition, existing student relationships and new relationships established during the pre-choice orientation phase imply that sociometry may play a role in the formation of preferences for alternative learning environments.

Bonney [1947], McLelland and Ratliff [1947], Young [1947], and others all conducted classroom sociometric studies in the late 1940's. Bonney reported that teachers tended to overrate the social acceptance by peers of students who actively participated in class activities, who were amenable to teacher directions, who were socially inhibited, or who had desirable personality traits. Likewise, Bonney found that teachers tended to underrate the social acceptance by peers of students who were academically

inept. Young [1947] indicated that seventh-grade students tended to use the same criteria when picking friends, team members, and class leaders. McLelland and Ratliff [1947] reported that small-group activities which encouraged and developed social relationships had a positive effect on classroom social acceptance of students by their peers.

Dysart [1952], Buswell [1953], Polanski [1954], Withall [1956], Gronlund [1959], and Damrin [1959] continued the study of sociometry in the classroom during the 1950's. Dysart reported that sociometric techniques could be usefully employed in improving teacher-pupil rapport. Withall [1956] indicated that differential amounts of attention by the teacher to individual students influenced the social acceptance of those students by their peers. Polanski [1954] found that teachers with "good climate" classrooms tended to support the group status system. Buswell [1953] reported that classroom achievement was positively linked with peer acceptance; that social acceptability was in many instances based on learner achievement.

According to Boocock [1972: 168-169], the popularity of classroom sociometric analysis died out after the 1950's. While it has been generally established that "good" sociometric group structure leads to satisfying intragroup relations, it does not necessarily follow that high performance and achievement will result [Kahn 1956]. Good sociometric structure can either benefit or detract from high

performance, depending upon the degree to which the group is unified for or against high productivity.

Boocock reported that the class sociometry tends to be less important in classes with highly centralized communications networks, such as the traditional large group classroom, but is probably more significant in classes with less centralized and more open communications patterns. In the presence of individualized reward systems which promote competition, such as that described by Coleman [1962], Boocock suggested that good sociometric structure tends to detract from high productivity.

2.3.3.5 Implications of Social Environment Research Which Relate to Environmental Choice

The social environment can be described, at least in part, in terms of class or group size, degree of heterogeneity, communication patterns, the reward system, and class or group sociometry. Of particular relevance to this study is the degree of variation among the social components of the alternative learning environments. In addition, the degree to which students perceive and take into consideration these differences during the orientation and choice processes is relevant. Finally, the effects which existing sociometric structures among students and between individual students and instructors have upon the formation of environmental preferences is also of interest.

The research suggests that class and group size can be expected to have differential effects among alternative learning environments.

1. In the traditional large group classroom, increased class size may reduce the amount of student communication and social interaction within the classroom.
2. In the small-group environment, increased class size results in either more groups or larger groups. Increased group size can be expected to effect group organization, communication, and efficiency. An increased number of groups can be expected to reduce the amount of interaction the instructor has with each individual group.
3. In the individualized setting, increased class size can be expected to reduce the amount of interaction between individual students and the instructor.

In all environments, class size also holds implications for use of the physical environment, territoriality, personal space, and spatial arrangements.

The effects of class heterogeneity can be expected to differ between environments. Whereas a traditional large group instructor can do relatively little about class heterogeneity, a small-group instructor can consider the heterogeneity/homogeneity factor during the group formation process. In the individualized setting, the instructor can

vary the amount of time spent with individual students in accordance with their individual needs.

The author indicates in chapters 3 and 4 that reward systems can and do vary among alternative learning environments. With these variations come differences in the amount of cooperation and competition which may occur in different environments. The research shows that while traditional reward systems tend to foster competition among students, alternative reward systems can do more to encourage cooperation among students.

Differing group structures within alternative learning environments can also be expected to produce differing opportunities for social interaction, resulting in potential differences in the degree of sociometric structure. The interaction of these variables with student and instructor characteristics is discussed more fully in chapter 3. Finally, there is a clear potential in the college environment for existing acquaintanceships to have either positive or negative effects on preferences for specific learning environments. The author presents data in chapter 5 which suggests that brief new acquaintanceships may affect preferences for specific learning environments.

Chapter III

REVIEW OF RELEVANT RESEARCH - PART II

3.1 OVERVIEW

The author indicated in chapter 2 that this review was divided into two parts, with two major sections in each part. Part I of the review, which was presented in chapter 2, included major sections entitled:

1. Choices in Education.
2. Some Components Common to All Learning Environments.

Part II of the review, which is presented in this chapter, includes major sections entitled:

1. The Community College Environment.
2. Instructional Modes and Goals.

The author's general criterion for selection of literature to be reviewed was to include pre-1977[1] studies which addressed the following questions.

1. What is known about the issue of choice with respect to education?
2. What are the variables with which instructors work when fashioning alternative learning environments?

---

[1] While some post-1977 studies have been included in this review, the author has not attempted to systematically survey all pertinent research developments which were published after 1977.

3. What are the general attributes of learning environments which stimulate student awareness upon first exposure?

4. What are the general traits, characteristics, and orientations of community college instructors and students, which interact with each other and with other characteristics of learning environments in the formation of initial preferences?

5. What are the general characteristics and educational goals of the alternative modes of instruction employed in this study; those being the large group (LGM), small group (SGM), and individual (IM) modes of instruction?

In chapter 2, the author primarily addressed the first three of these questions, through a discussion of research dealing with the following topics.

1. Choice and personal development.
2. Choice and the learning environment.
3. Physical environment.
4. Communications environment.
5. Social environment.

In chapter 3, the author considers literature which addresses the last two questions which were posed above.

The author begins chapter 3 by considering of the community college environment, the setting within which this study was conducted. A brief review of pertinent community college history leads to consideration of community college

instructor identity and professionalism. Additional instructor traits which are discussed include:

1. Creativity.
2. Flexibility.
3. Authoritarianism.
4. Communication Behavior.

Student characteristics which may interact with characteristics of instructors and learning environments are also addressed in chapter 3. The author identifies and discusses those characteristics listed below because they bear potential relevancy to this study of the Choice Model.

1. Self-concept.
2. Communication Apprehension.
3. Interpersonal Relations Orientation.
4. Mathematics Attitude.

The author concludes chapter 3 with a discussion of alternative instructional modes and goals. In addition to an overview of the general differences between various instructional models, the following specific modes are addressed.

1. Large group mode instruction (LGM).
2. Small group mode instruction (SGM).
3. Individual mode instruction (IM).

3.2 THE COMMUNITY COLLEGE ENVIRONMENT

One of the principal goals of this literature review was to describe the community college environment, although the author does not contend that the Choice Model described in chapter 4 is only applicable in community colleges. The Model was developed and tested in that environment, however, so the author focused on community college literature in this portion of the review. The literature which was selected for inclusion in this review primarily addresses issues relating to the fourth question posed in the chapter overview.[2]

4. What are the general traits, characteristics, and orientations of community college instructors and students, which interact with each other and with other characteristics of learning environments in the formation of initial preferences?

It became clear to the author while studying of the physical, communications, and social components of the learning environment, that the population within the environment, namely the students and the instructor, play roles of unquestionable importance in determining the nature of

---

[2]While the literature reviewed is relevant to the community college, not all the research reported in this section was actually conducted at the community college level. Pertinent research studies conducted at both secondary and post-secondary levels, including high school, two-year and four-year college, and university populations were reviewed.

the total environment. The literature also suggests that the presence of the classroom learning environment within a community college environment is a significant factor, for the community college philosophy, population, and mission differ from those of both secondary and four-year schools.

Independent of the instructional mode, the literature identifies the instructor as a very significant individual in the learning environment. The instructor is considered here with respect to his/her identity as a community college instructor, and her/his personal characteristics as they impact the nature of the social and communications environments. Consideration of instructor traits with respect to specific instructional goals and modes is deferred, however, to a later section of chapter 3.

The student population in community colleges is also examined here. The author concluded from his study of the literature that self-concept, communications apprehension, interpersonal relations orientation, and mathematics attitude are specific individual characteristics of students which may be relevant during the preference formation process. Following a general description of community college student identity, these selected characteristics are addressed. Since interaction patterns and group processes primarily develop after choice of learning environment has been made, research related to these issues has not generally been included in this literature review.

Before examining the learning environment population within the community college setting, a brief overview of the community colleges' evolution in American society is provided. Philosophical issues pertaining to community college origins, social functions, funding, and diverse roles in the local community are not directly relevant to this study, and thus are not discussed in detail. Philosophical issues more directly related to the teaching-learning process are addressed as they relate to student and instructor identities and characteristics.

3.2.1 A Brief History

The term "community college" refers to any institution which grants the associates degree as its highest degree. Other names given to such institutions include "junior college", "two-year college", and "city college". While there are historical and regional differences between these various types of institutions, the term "community college" has been used in this study to include all such institutions without regard to these differences.

The forerunners of modern community colleges were founded at the end of the last century. Such institutions steadily increased in number until the mid-1970's, at which time there were over twelve hundred community colleges nationwide. The history of their growth was described by many authors, including Eells [1931, 1941], Bogue [1950], Zwerling [1976], and Cohen and Brawer [1972, 1982]. The

Carnegie Commission on Higher Education [1970: 1-2] issued a special report entitled The Open-Door Colleges which recommended a national policy for the growth and development of community colleges. It characterized the "ideal" community college as a two-year institution offering the degree of Associate of Arts in academic transfer programs, occupational programs, and general education programs. Further, the Commission embraced the concepts of open admissions to high school graduates, low or no tuition for students, and the right for qualified community college students to transfer to state colleges and universities.

One of the prime motivations for the Carnegie Commission report was that community colleges experienced extreme enrollment growth after 1960. Cohen and Brawer [1982: 11-33] reported that during the decades of the 1960's and 1970's, community college enrollment was growing rapidly, with annual increases sometimes as high as 15%. Average institutional enrollments increased from approximately one thousand students in the early 1960's to over four thousand students by 1980. Total enrollments increased from about one-half million students in 1960 to over four million students by 1980. During this period, while the traditional college-age population (18-24-year-olds) increased by approximately 80%, the community college population increased by approximately 700%. While Cohen and Brawer cautioned that some of this change can be attributed to changes in enrollment reporting, such as removal of

distinctions between degree seeking, non-degree seeking, adult, and non-credit students, the growth rate was none the less substantial.

According to Cohen and Brawer, part of this trend was due to the increased tendency of high school graduates to attend college, up from about 50% in 1960 to over 75% percent by 1980.[3] They also reported that many older students began attending community colleges during the 1970's. By 1980, the median age had reached twenty-three, indicating that approximately one-half of the community college population today is above the traditional college student age range. Increased enrollment of older students was accompanied by a decrease in full-time student enrollments, down from about 50% in 1970 to under 40% by 1980.

Rapid growth in institutional size over the past two decades was accompanied by rapid growth in community college faculties during the same period. A great deal has been written about community college faculties by Garrison [1967], Cohen and Brawer [1972, 1977, 1982], O'Banion [1972], Cohen [1973], and others. Medsker and Tillery [1971] reported that during the 1960's about one-third of community college faculty had taught previously in the

---

[3] It is clear from the community college literature that many factors interacted during the growth years for community colleges, including: more institutions, lower cost, closer proximity, increased perception of need for post-secondary education, smaller classes, and alternative programs.

public school system. Phair [1975] noted that the percentage of new community college faculty in California with public school experience began to drop in the 1970's, and that the corresponding percentage of new faculty with experience in four-year institutions began to increase over the same period. Rapid growth also led to increasing reliance upon part-time faculty. Cohen and Brawer [1982: 71] indicated that the proportion of part-time faculty rose from about one-third in the late 1960's to over one-half by the mid-1970's.

With an eye to the future, K. Patricia Cross [1976: 3-23] described unique features of the community college system within the total American system of education. According to Cross, the feature which perhaps best distinguishes the overall system of public secondary education in America from systems in other countries is the American commitment to education for all. Similarly, the feature of community colleges which has best distinguished them from traditional colleges and universities over the past quarter century is the commitment to educational opportunity for all. Cross suggested that a change of emphasis for community colleges during the last quarter of the twentieth century from educational opportunity for all to education for each would be both desirable and appropriate.

3.2.2 The Instructor

With this brief historical overview of the growth and development of community colleges in mind, coupled with Cross' proposal for future emphasis, the author turns his attention to literature dealing with the instructor. The first issue to be discussed in this regard is that of community college instructor identity. Who are community college instructors and how do they differ professionally from both secondary teachers and university professors? Following this, the author considers instructor traits of creativity, flexibility, and authoritarianism, as well as that of communication behavior.

3.2.2.1 Identity and Professionalism

Arthur M. Cohen and Florence B. Brawer [1972: 12-16] contended that the teaching profession in community colleges as a whole had not attained professional maturity by 1972. Few community college instructors had attended community colleges themselves, nor had many received teacher training specifically geared to community college teaching. One decade later, community college professionalism was still a topic of concern for Cohen and Brawer [1982.]

Community college instructors have been slow to create a unique identity of their own, according to Cohen and Brawer. This slowness is due in part to the lack of a clear delineation of role for the community college, as distinct from both secondary schools and universities. Medsker and

Tillery [1971] reported that many community college professors emulated or would have actually preferred to be university professors. Cohen and Brawer [1972: 25] contended that the community college would not achieve its identity until "its faculty attain[ed] their own sense of professional - and personal self." It is this merger of professional and personal self which the authors referred to as maturity.

Cohen and Brawer [1972], as well as Cross [1976], described general differences between the roles teachers play in various types of educational institutions, and differences in the problems with which they must cope. Secondary school teachers must by law deal with virtually all students in the appropriate age ranges on a daily basis, regardless of the students' capabilities, achievements, or interests. Traditional college and university professors, on the other hand, have the relative luxury of dealing with only the most capable segment of the student population. Due to the general absence of compulsory attendance, uninterested students cause few problems in university classrooms.

Community college instructors do not usually have to cope with classroom disruptions caused by uninterested students. They are faced daily, however, with the task of teaching classes of students whose capabilities and achievements are highly diverse. With this in mind, Cross [1976: 3] proposed that community colleges shift their

emphasis from that of "attaining minimal educational rights for everyone ... to maximizing learning for each individual."

The community college literature makes it clear that the instructor is the key to maximizing individual learning, and Cohen and Brawer [1972, 1977, 1982] have consistently stressed that professionalism in the community college faculty is an essential ingredient. Whereas professionalism at the university level tends to emphasize research, scholarship, and academic disciplinary concerns, Cohen and Brawer [1982: 88] suggested that professionalism organized around the discipline of teaching would better suit the community college faculty. Cohen and Brawer [1977: 108-110] addressed a variety of concerns which they contend are indicative of a lack of professionalism with regard to teaching in community colleges. A summary of those concerns follows.

1. Faculty do not tend to police themselves. Rather than working towards the identification and removal (or remediation) of substandard teachers, faculty are more inclined towards protectionism within their ranks.
2. The increasing use of technology and other innovations, accompanied by reduced instructor-student interaction, tends to challenge faculty authority in providing instructional services to students.

3. A theoretical basis for teaching is yet to be achieved. Teaching is more of a craft which is developed through experience rather than through training.

4. Faculty activities outside the classroom tend to revolve around issues of job security, rights, and welfare on the local campus, rather than professional involvement and interaction concerning the academic and teaching disciplines.

5. Society recognizes community college teachers as professionals because of the academic credentials required, rather than by a clearly defined and articulated purpose and function.

6. Status is gained by the acquisition of higher level degrees rather than by achievements in the teaching function, in spite of the fact that there is little evidence of correlation between higher degrees and teaching skill.

7. Community college faculty have no generally accepted code of ethics to which all members are held accountable.

8. Teaching faculty have not developed tools which can assist average teachers to excel in the field of instruction.

In their more recent work, Cohen and Brawer [1982: 92] outlined some key issues which impeded progress towards community college instructor professionalism during the

decade of the 1970's. A summary of those issues is provided below.

1. Faculty-administrative relations tend to be adversarial, and may pertain to more self-centered concerns than "the essence of the institution".
2. The work environment tends to lead to "teacher burnout"; "moonlighting" and "early psychic retirement" are common escapes.
3. Faculty fail to recognize paraprofessional aides and media materials as economic necessities which "are important for their well-being over the long term".
4. Heavy administrative reliance on part-time instructional staff detracts from faculty professional development due to "the annual influx of teachers".

Faculty and administrators must work together, according to Cohen and Brawer, in order to overcome the obstacles to faculty professionalism, and to clarify the role and purpose of the institution. These authors concluded that a significant key to the success or failure of this effort concerns:

> ... whether college leaders perceive their institutions as labile structures responding readily to the whims of all comers or as centers of teaching and learning with an ethos of their own. [1982: 92]

It is clear from the literature that the involvement of individual instructors is also a key to success or failure. Cohen and Brawer quoted James Allen [1970], but suggested

substitution of the words "community college" for the word "university." So changed, Allen's remarks read as follows:

> Education should fundamentally concern only two people: the student and the teacher. Anyone else whose presence is considered necessary to make the community college work is subordinate to these two and must remain so. The power working between the student and teacher is the only power that can exist in a community college, the only power that can define the community college and hold it together. [Cohen and Brawer, 1972: 25]

If community colleges are to focus on offering "all students the opportunity for high level achievement", as proposed by Cross [1976: 4], then community college instructors are essential to making that focus a reality; only they have the power to achieve that goal. And striving for that goal will provide the identity for both the institution and the instructor, an identity which Cohen and Brawer find lacking. Cohen, Brawer, Cross, and others feel that community college instructors must seek and value (and earn) identification as teachers of individuals, rather than either teachers of the masses or teachers of the select.

3.2.2.2 Creativity, Flexibility, and Authoritarianism

In one of their earlier works specifically addressing the community college instructor, Cohen and Brawer [1972: 30-39] concentrated on three dimensions of the instructor: Creativity, flexibility, and authoritarianism. As this author noted earlier in chapter 2, Boocock found that traditional reward systems tend to discourage creativity in students, and that the typical large group organization in the classroom tends to discourage communication between students. Heist and Wilson [1968] indicated that college faculty need to be sensitive to the personal characteristics of students if they are to effectively teach creative students. Cohen and Brawer contended that creative teachers are needed in the community college in order to stimulate creativity in their students.

Cohen and Brawer [1972] concluded that highly structured institutions are no more likely to encourage creativity in instructors, however, than highly structured teachers are to encourage creativity in their students. They reported that some highly creative individuals are seen as "emotional, critical of others, stubborn, negativistic, and domineering", although others are described as "cooperative, social, and friendly .... [1972: 31]" Foster [1968] concluded that the nature of the work environment seems to be largely responsible for how the creative person behaves, and is hence seen by others.

A precise definition of creativity is elusive at best, but Kneller [1965] and others attempted to sort out the variety of definitions proposed by different researchers. No clear consensus was reached on a single definition; Kneller reported that creativity must be viewed as a complex collection of individual characteristics. Cohen and Brawer [1972: 33] hypothesized that creativity is linked closely to flexibility, a trait that is more readily measurable. They found that the new teacher in the community college is in transition from the role of student to that of teacher. The experienced teacher moving from secondary school of the university to the community college is likewise in transition.

Cohen and Brawer [1972] contended that the degree to which teachers new to the community college environment are inclined towards flexibility has a great deal to do with how they react to the new challenges of community college instruction. Research by Sprinthall et al. [1966], and Cohen and Brawer [1967] suggested that flexibility might be such an important personality trait for instructors to possess, that it deserves to be considered strongly in the teacher selection and evaluation process.

> If flexibility is a necessary quality of the beginning instructor, assessment of flexibility among new instructors should relate to supervisors' ratings. The more flexible person should be judged the "better" teacher. [Cohen and Brawer 1972: 34]

The expression of both flexibility and creativity in teachers seems to occur with innovation. Cohen and Brawer

cautioned, however, that "innovation" does not always imply either flexibility or creativity. The term "innovation" is frequently used to justify implementation of untested changes, either to appease those frustrated by the present state of instruction, or to simply convey the impression of being in tune with the latest instructional methods. Wygal's [1966] findings from a survey of community college instructors were discussed by Cohen and Brawer [1972: 35-36]. Those findings are summarized below.

1. With respect to local college norms for innovativeness, previously identified "innovators" see themselves as deviant, while "traditionalists" do not.
2. There is no significant difference in self-perceived innovativeness between the previously identified innovative and traditional instructors.
3. The only significant trait found to differentiate between innovative and traditional instructors is age; innovators are younger than traditionalists.

Just as flexibility is a personality trait closely associated with creativity, authoritarianism is closely associated with dogmatism. Adorno et al. [1950] described authoritarian and dogmatic individuals as those who:

1. Employ stereotyped and conventional thinking.
2. Lack original responses to projective techniques.
3. Use crude generalizations.
4. Are compulsive, critical, and emotionally inhibited.

Authoritarianism and dogmatism were viewed by Cohen and Brawer [1972] as general traits in many teachers. Wittmer and Webster [1969] found that counselor trainees with prior teaching experience tended to score higher on the Rokeach dogmatism scale, than did trainees without such experience.

> Scratch the surface of the collective faculty and it would appear you reach a substratum of authoritarianism only slightly disguised in moments of noncrisis by a thin patina of liberalism and intellectualism. [Axen 1968: 11]

Ryan [1970] concluded that many new teachers adopt authoritarian behaviors because those are the traditional teacher characteristics with which students are most familiar.

Several effects related to authoritarianism in the classroom have been studied, using students at various age levels. Stern [1962: 692-697] found that students with high authoritarian needs were especially uncomfortable in informal, egalitarian classrooms. Biddle and Ellena [1964] reported that teacher dominance tended to create unhappiness and frustration. Darley and McNamara [1961] found differential effects of teacher authoritarianism on group problem solving; bright students tended to be hindered by authoritarian control of the activity, while less intelligent students seemed to benefit from greater control. White and

Lippitt [1962] reported that quality of group work tended to be slightly higher in autocratic settings, but that output dropped off when the autocratic leader was not present. In groups with more democratic adult leadership, group members tended to take the leadership role when the adult was absent. Productivity tended to increase in those settings.

Hurt et al. [1978] contended that the leadership style of the teacher is related to satisfaction of student needs. They maintained that students interpersonal needs are more likely to be served by a democratic leadership style, leading to better adjustment and a more favorable assessment of the learning environment. According to Hurt et al., more autocratic leadership styles may satisfy the academic needs of the students, but are less likely to address interpersonal needs. Cohen and Brawer maintained that authoritarian behavior specifically effects student-teacher interaction with potentially critical consequences.

> Just as the creative instructor may foster creativity among his students, the authoritarian instructor has his own effect, encouraging either countervailing authoritarianism or subordination. Each type of person employs different types of controls in the classroom. The controls, as a major determinant of classroom climate, probably have a greater effect on the students than does the content covered in the course. The undemocratic classroom stimulates students' subsequently accepting authoritarianism as a socially sanctioned mode of approach to interpersonal relationships.
>
> Subordination is the other side of the coin. When one person acts authoritatively and the other submits, fragmentation of personality results. [Cohen and Brawer, 1972: 37-38]

Cohen and Brawer [1972] continued with the assertion that many teachers use authoritarian behavior to defend against fears of being exposed as less than perfect masters of the subjects they teach. They contended that teachers tend to hide their imperfections rather than to admit them in a humble and mature manner. Sanford [1966] maintained that there are distinct advantages to be realized from letting students see the human qualities of their instructors.

> Teaching can make a contribution by giving the student a glimpse of the variety and complexity of the social world, by showing how people feel and what it means to be human, by forcing self-awareness through empathy with many kinds of people, real and fictional, by confronting the student with some of the deficiencies of his old, automatically adopted values and thus inducing conflict and requiring decision .... But college is not always a perfect culture for the ego. There may be authoritarianism in teaching, with rewards for doing precisely what one is told, or authoritarianism in the regime - perhaps in the student government - with its invitation to substitute external control for inner direction. [Sanford, 1966: 288-289]

Cohen and Brawer [1972] concluded that teachers must learn to recognize and distinguish between appropriate exercise of authority, necessary for maintenance of the learning environment, and excessive dogmatism and authoritarianism. Teachers must recognize the tendency for authoritarianism to surface in their profession, and to guard against it. Sanford cautioned against excesses to either extreme, for

> ... ego development is hampered both by authoritarian or overprotective regimes and by permissive-chaotic ones. The former do not give the synthesizing functions of the ego a chance for exercise; the latter, through too much stimulation of impulse with consequent

anxiety, may put too heavy a strain upon the developing ego. [1966: 288]

3.2.2.3 Communication Behavior

The author of this study was particularly interested in the students' perceptions of instructor characteristics during the early stages of preference formation. Hurt et al. [1978: 165-173] discussed the "expectancy effect" which deals with how human beings learn to expect specific responses from specific behaviors. In particular, Hurt et al. described the effect with regard to student expectancies concerning teachers. Their description is been summarized below.

1. Students are sensitive to both verbal and non-verbal teacher behavior.
2. Students develop an initial set of expectancies based upon what they infer from teacher behavior.
3. Students base their initial behaviors upon this initial set of expectancies.

Good and Brophy [1972], and others, discussed how teachers disclose attitudes through classroom behavior. Teachers tend to reveal in the classroom, those personal and professional qualities and opinions which generally characterize them as human beings. Some examples of such qualities, in addition to authoritarianism, flexibility, dogmatism, and creativity; include conservatism, liberalism, sexism, feminism, elitism, egalitarianism, racism; and degrees of warmth, caring, concern, and openness.

Teachers tend to communicate clues to their personal characteristics through both verbal and nonverbal messages, from which the students infer meanings.

> For example, the well-dressed child might conclude as a function of the way the teacher looks at him that the teacher will behave positively toward him. By contrast, the unkempt child, unable to avoid looking at the teacher any longer, might sense or think that the look on the teacher's face is one of disgust and associate it with his appearance. [Hurt 1978: 169]

Walberg and Anderson [1968], and Walberg [1969] discussed the relationship between "classroom climate" and both teacher personality and individual learning. Hurt et al. concluded that supportive communication behavior is an important instructor characteristic.

> It is crucial, then, that teachers communicate with their students as supportively as possible....
>
> A teacher's communication behavior ... has a tremendous impact on a student's self-esteem. [1978: 186]

Brophy and Good [1970], and others, also reported on ways in which teachers communicate their expectancies of student performance through verbal and written messages and evaluations. Hurt et al. [1978] maintained that few teachers are fully aware of the impact their evaluations have on individual students, especially the impact of their verbal messages.

> ... a student's expectancies about his or her own capabilities in a specific subject matter are very often a function of teacher evaluations.
>
> The verbal message contains much more information and is richer in meaning, because it carries with it the emotions and desired emphasis the teacher has in mind, ... [1978: 170,171]

Hurt et al. [1978] stressed that the extent to which the instructor promotes both dependency and centrality is important to student interpersonal growth. By dependency, the authors referred to the need for students to see themselves as members of a group. They indicated that instructors can foster dependency by stressing that individual success is related to group success. Hurt et al. used the term centrality to signify that individuality within the group is also necessary. They maintained that it is important for instructors to stress the value of a positive self image for each class member in order to foster centrality.

This author found a clear indication in the literature that instructors exert significant if not primary influence over the nature and characteristics of the learning environments in which they teach. The structure and goals of the alternative learning environments included in this study are reviewed in the next major section of chapter 3. Research studies reviewed in this section, however, suggest that the professional philosophies and personal characteristics of community college instructors strongly interact in many ways with the characteristics of the learning environments they create.

1. The finding that many community college instructors tend to emulate university professors implies that they may be inclined to imitate learning environments traditionally found in four-year institutions.

2. The literature suggests that instructors who tend to be authoritarians are less likely to be flexible and creative, and more likely to teach in traditional authoritarian learning environments.
3. Flexible and creative instructors are more likely to create alternative learning environments which encourage greater creativity on the part of the student.

The communication literature suggests that teachers tend to reveal their personal characteristics, philosophies, and expectancies through both verbal and nonverbal means. Instructor communication traits can effect both the self-esteem of individual students and the interpersonal relationships between class members. With reference to the design of the Choice model, however, the author concluded that it would be of particular interest to consider:

1. What messages the instructors communicate to their students during the orientation phase.
2. How these messages are communicated.
3. How the instructors' communication traits influence student preferences for alternative learning environments.

3.2.3 The Student

While it is apparent to the author from the literature he reviewed that the influence of the instructor on the learning environment is unquestionable, it is also evident that the combined influences of all the students who study within an environment are also important. The diversity of personal traits and characteristics of community college students, coupled with their varied capabilities, profoundly effect community college learning environments. These effects are evidenced both in terms of the instructional goals to which instructors aspire, the environmental structures they adopt, and the activities which ultimately occur in community college classrooms.

The author begins this discussion of community college students by describing their identification within the general post-secondary student population. This description is followed by a review of a research study in which both community college and university student conversations pertaining to their college experiences were recorded and synthesized. A brief selection of student comments relating to various aspects of the general college learning environment is presented in the body of the chapter. Additional longer and more detailed comments are contained in appendix A.

Following this overview of student identities and experiences, several specific student characteristics are considered, including:

1. Self-concept.
2. Communication Apprehension.
3. Interpersonal Relations Orientation.
4. Mathematics Attitude.

The ways in which these characteristics are related to preferences for alternative learning environments were of particular interest to the author of this study. While interactions between these student characteristics and activities within specific learning environments are certainly of potential importance to educators, the review of research into such interactions has generally been left to other studies.

3.2.3.1 Identity

Clark [1960] reported that community colleges draw students from all strata of society, and that they more closely represent a cross section of the communities in which they reside than do any other types of higher learning institutions. Cross summarized the research of the 1960's pertaining to the community college student population.

1. Carefully designed research studies find that junior college students in national, regional, or statewide samples achieve lower mean scores on academic ability tests than comparably selected students at four-year colleges and universities. Some junior college students, however, score high on measures of academic aptitude. Little is actually known about patterns of special abilities among junior college students.
2. The junior college is presumed to play a significant role in the democratization of American higher education. The parents of these students tend to have lower socioeconomic status than parents of students in four-year colleges and

universities.* But much more information is needed about junior college students' home environments, parental encouragement, financial standing, and related matters.

3. Clear-cut differences in occupational aspirations exist among non-college, junior college, and four-year college groups, with junior college students generally appearing less settled about future plans than either of the other two groups. However, little is known about those junior college students who do not subsequently transfer to four-year colleges - for example, the vocationally oriented students, the dropouts, or the older students returning to pickup new skills simply to revitalize their education.

4. Junior college students hold more practical orientations to life and to college than their four-year college peers. They are less intellectually disposed, score lower on measures of autonomy and non-authoritarianism, appear more cautious and controlled, are less likely to be adventurous and flexible, and are less sure of themselves. Yet research on the personality characteristics of junior college students is meager, and more information is needed regarding their values , feelings about self, and interpersonal relationships.

*Jencks and Riesman disagree with this point, suggesting "The parents of students who enroll at community colleges are slightly richer than the parents of students at four-year institutions." [Cross, 1968: 485][4]

Cross reserved the term New Students for those who rank in the lowest third of high school graduates on traditional academic achievement tests, and she distinguished between the social challenge of educating capable nontraditional students, and the educational challenge to effectively teach

---

[4] The reader is referred to Inequality [Jencks, 1972] for a broad and detailed analysis of the varied relationships between socioeconomic status and schooling, and to Second Best [Zwerling, 1976] for an opposing point of view concerning specific economic issues and community college education.

New Students. In Beyond the Open Door, Cross [1971] provided a detailed description of the New Student population.

1. Two thirds were first-generation college students.
2. Roughly sixty percent were white, twenty-five percent were black, and the remaining fifteen percent represented other minorities.
3. In spite of the white majority among New Students, blacks and minorities were overrepresented; approximately two thirds of the blacks entering community college fell in the New Student category.
4. New Students tended to come from the lower socio-economic levels, but not all came from disadvantaged homes; about one fourth had college educated fathers.
5. New Students, whether financially disadvantaged or not, tended to see themselves as "below average" or "failures"; they tended to be both passive and uncomfortable in the classroom.
6. New Students tended to be motivated by relatively realistic notions of the value of college credentials in society today, rather than by anticipation of academic achievements or intellectual development.

Cross [1976], after additional research during the early 1970's, described the general student population in community colleges as a blend of traditional and

nontraditional students, nontraditional students being those who are admitted to open door colleges, but

> ... who were previously underrepresented in higher education: adults, students from lower socioeconomic levels, ethnic minorities, and women. [Cross, 1976: 4]

Cross [1976: 5-6] also described great controversy concerning open admissions policies. Cross highlighted some of the issues and conflicting points of view.

1. High school and college grade point averages were rising while aptitude test scores were falling.
2. Critics of open door institutions charged that the college degree was being cheapened by passing students in spite of their failure to achieve; that academic standards were being lowered.
3. Proponents of open access to higher education charged that too few nontraditional students were earning degrees; that exit standards discriminated in favor of whites from the higher socioeconomic levels.
4. Critics of traditional college standards saw college degrees as essential credentials for "better" jobs, but claimed there is little relationship between college performance and life success.
5. Some educators expressed pride at the suggestion that 10% to 20% of the New Students were successful; others expressed dismay due to the

implication that 80% to 90% of New Students failed to succeed.

3.2.3.2 Comments Concerning College Experiences

DeCoster and Mable, in Understanding Today's Students [1981], reported on an extensive series of student interviews conducted during the late 1970's. Over six hundred students representing twenty-eight colleges and universities participated in small group discussions for the College Student Life Project between the years of 1977 and 1981.[5] DeCoster and Mable synthesized the recorded comments of these students in an effort to

> ... utilize their thoughts, ideas, and words, to capture the intensity of their emotions and feelings as well as to chronicle their experiences. [1981: 1]

A selective sample of these comments are presented here, in order to provide greater insight into the nature and concerns of the college students of the 1970's. A larger selection of comments are provided in appendix A.

Historically, colleges in general and community colleges in particular have been viewed as vehicles for social

---

[5] The author notes due to the context of this discussion that only 15% of the interview sample was at or above the median age of the community college population, and only 10% of the interview sample was drawn from two-year colleges. On the other hand, the course used for this study of the Choice Model, which is described in chapter 4, was intended primarily by students desiring to transfer to four-year institutions, and the age data presented in chapter 5 reveals that the majority of the students in the study were concentrated at the "younger" end of the College age range.

mobility. Open enrollment policies have increased the opportunity for nontraditional students to gain access post-secondary institutions. Cohen and Brawer pointed out, however, that the social function of higher education

> ... loses much of its force when a majority of the high school graduates go on to college because they have nowhere else to go. [1972: 99]

Jerome [1969] considered college education to be more compulsory than voluntary due to both social and economic pressures. One collection of student comments presented by DeCoster and Mable [1981] tends to confirm the view that higher education was essentially unavoidable during the 1970's.

> Female: It's accepted in society that you go to college. It's like going to the bathroom; you have to do it.
>
> Female: College was a conscious decision because the job market is the way it is for high school graduates. People are becoming so materialistic and money-oriented that college is a necessity.
>
> Female: My situation is somewhat the same. I found myself at home with nothing to do and not being able to get a job doing what I wanted to do. I wanted a job as a dental technician, and there weren't any jobs available so I decided to take a course in teacher's aide training. It was also a good time to get away from home and do something different and worthwhile. After I got started, I liked it so well that I am majoring in early childhood education.
>
> Male: I came to college because that was the only place to go once I got out of high school. In high school, you're in a basic academic program and not taught in a certain field so you have to go to college to figure out what it is you want to do. And that's the only way to get anywhere nowadays - to have a college education. [DeCoster and Mable, 1981: 8]

Students frequently mentioned career and financial issues during their discussions. DeCoster and Mable

reported that students revealed strong and consistent concerns about having personally satisfying lifestyles and careers. Extracts from one discussion contrasted the more self-centered mood of students of the 1970's, with that of the more issue-centered students of the 1960's. DeCoster and Mable cautioned, however, that while students expressed a general lack of interest in political and social issues, it was a mistake to assume that they did not have any concerns. Students showed that they recognized their needs to develop confidence and to establish their identities, needs addressed by Erikson, Keniston, Chickering, and others.[6]

Another set of issues discussed by students participating in the College Student Life Project concerned the college learning environment. DeCoster and Mable [1981] presented student perspectives concerning faculty, grades, and cheating. The following discussion reveals general disdain for faculty who just teach their subject matter and tend to forget the students within the learning environment.

> Male: Professors just throw work at you, come to class and bull; you have to get the knowledge yourself. Academic freedom is so evasive. Professors have just about all the rights they want, even the right to screw you over!
>
> Female: The classes I enjoy most are the ones that I can really express myself in. I don't like classes where the professor lectures to the class about all this stuff, and a lot of it doesn't even make sense.

---

[6] See chapter 2 for references to the works of these developmental theorists.

No interactions. No questions. The professor just talks for the whole period.

Male: I pay a lot of money, and I want to be satisfied with the teachers. I have this one teacher who is ripping off the school and me too. I am paying for him to be there. He says, "You are students and you will regurgitate and give back what I say. Nothing else about you is important to me."

Female: It doesn't really matter what I write on student evaluations of instructors. The deception makes me feel bad. I didn't even fill them out this year. [DeCoster and Mable, 1981: 11]

Other comments and discussions revealed the importance of individual student-faculty relationships. DeCoster and Mable found that students tended to stereotype faculty as "intimidating, stuffy intellectuals." Not all of the comments reported by DeCoster and Mable, however, were negative. Some students reported that not all college professors are as bad as they had been lead to believe. Students showed from their comments that they tend to judge faculty members in terms of how they present themselves in the classroom. DeCoster and Mable illustrated the importance of classroom image with the following anecdote:

I can get along a lot better with professors that keep me relaxed. Those guys in the economics department know their stuff - if they could just be comfortable with people. I think there's a lot of difference when you have a guy up there talking to you who is relaxed, opposed to the guy coming on in a three-piece Botany 500 suit, with his custom attache case, engraved Cross pen set, and the whole bit. He puts in his fifty minutes and leaves. I say, "Man I wouldn't go talk to you for anything, mister." They're talking at you instead of to you .... Last semester I had to go up and get my final grade in economics before I went home. I was looking at the grades posted on the professor's door when he walked up. He grabbed me and we sat down and talked for an hour. I just kicked myself for not doing it earlier. There's a guy who knows his stuff, and it was the most enjoyable class because it was new

material, and he was really well prepared. I'm just sorry that I didn't go in and talk to him earlier because he was a whole different person out of the classroom situation. [DeCoster and Mable, 1981: 46]

In addition to their opinions concerning the quality and characteristics of classroom instruction and instructors, students expressed differing points of view regarding the ultimate purposes and outcomes of taking college courses, learning versus grades.

Female: I don't think about learning anything, really. I think I want to get a good mark in this course. I want to keep my average up. That's all I think about. I have to do this and I have to do that for the course. And that's what I do. It's so stupid - I'm doing all this work for a grade and I'm not even thinking about what I'm learning or even if I'm learning anything.

Male: No one ever asks if you learned anything from a course. They ask what grade did you get in the course. That's just like swallowing the material instead of really thinking about it.

Female: Well, I have to enjoy the classes and I have to enjoy what I'm doing no matter what grades I get. It doesn't bother me as long as I enjoy the class and learn something.

Female: Grades drive me nutty. It's almost like the essence of my whole education. They really do put a lot of pressure on me. I need to get good grades.

Male: I think, for me, grades aren't really that important. They're only important in that I don't want to flunk out and I don't want a low average or anything like that. School is more than just grades. Like there are a lot of other things around campus that students can get involved in. I think that I learn a lot by being involved with things or just talking to another person. These things matter just as much to me as grades. [DeCoster and Mable, 1981: 10]

In part because of the emphasis on grades, many students were particularly concerned about cheating. Based upon student discussions like the one which follows, DeCoster and Mable concluded that academic dishonesty on

college campuses was both open and widespread. DeCoster and Mable summarized that students often get the massage that some cheating is okay, as long as it is not too obvious. They cited "poor teaching, arbitrary grading systems, and the general lack of interest on the part of faculty members to prevent dishonesty ..." as the principal means by which this message is transmitted to students. The authors found a resulting confusion and resentment which carries potential negative consequences for moral development in college students today.

> Female: The only person who is rewarded is the best ... they never take the honest person, they take the best person ....
>
> Male: The thing that disturbs me is that somewhere along the line we've lost the rules.
>
> Female: From our youth we have been taught to be honest, that we should think of other people. Yet when we get into college and start interacting with society, the family rule no longer holds up. We start competing and become selfish. [DeCoster and Mable, 1981: 33][7]

---

[7] These and other student quotations in support of the findings of DeCoster and Mable [1981] can be found in appendix A.

3.2.3.3 Self-Concept

Having established this overview of the general college student population, the author next shifts his attention to selected student characteristics. The first of these characteristics to be discussed is self-concept. Various research findings concerning the social environment, communications environment, and student characteristics make reference to such terms as self-esteem, self-image, and self-concept. Combs [1981] defined the term "self-concept" as it is understood by modern humanistic psychologists:

> ... the individual's personal experience of self.
>
> ... an organization of meanings or perceptions comprising the person's experiential self. [1981: 5-6]

William Purkey [1970: 7] earlier suggested that self-concept be envisioned as as a system of beliefs which form a large spiral representing the complete "self". Those beliefs which hold the most value to the individual are located closest to the center of the spiral, while beliefs holding lesser values are located further from the center. Purkey also indicated that values can be either positive or negative. He used the example of an individual who is a member of a racial minority. The person may consider his or her minority status to be a very important part of his or her identity, and yet if that racial minority is subject to discrimination in society, then membership can have a very negative value.

Purkey also maintained that the beliefs which make up a person's self-concept are interconnected and unique to each

individual. When the person succeeds at an activity which is highly valued, that success raises the self-evaluation of not only related abilities, but seemingly unrelated abilities as well. Conversely, a failure in an area held to be important leads to a general decrease in self-assessment in many different areas.

A variety of self-reporting instruments were recommended by Fox [1966], Purkey [1970], and Silvernail [1981], for possible classroom use.

1. Bledsoe Self-Concept Scale, Bledsoe and Garrison [1962]
2. Self-Concept of Ability Scale, Brookover [1965]
3. Self-esteem Inventory, Coopersmith [1967]
4. Q-Sort, Cummins [1963]
5. Self-appraisal Scale, Davidson and Greenberg [1967]
6. How-I-See-Myself-Scale, Gordon [1968]
7. Semantic Differential, Osgood [1957]
8. Piers-Harris Children's Self-Concept Scale, Piers and Harris [1969]
9. Self-Concept Inventory, Sears [1963]
10. Thomas Self-Concept Test, Thomas [1969]

Purkey [1970: 14-27] summarized the research findings which compared self-concept measured by self-reports with academic achievement. Purkey reported that:

1. There was a clear, persistent, and significant relationship between self-concept and academic achievement.
2. Sex differences appeared to influence the relationship between self-concept and achievement. Elementary age girls, using a self-report inventory, showed consistently higher self-concepts than did boys.
3. High achievers had generally high positive self-concepts, but high self-concepts did not assure high achievement.
4. Underachievers and non-achievers tended to have more negative self-concepts, and demonstrate less mature behavior that did achievers.
5. There was an ongoing interaction between academic achievement and self-concept.
6. Self-concept tended to be a better predictor of classroom achievement than did IQ.
7. Poor performance tended to lower self-esteem, while successful performance tended to raise it.

Purkey [1970] concluded that enhancement of self-concept at all age levels is essential to improvement of academic achievement. In addition to these findings, Rosenfeld [1973: 156] concluded that members of groups who report high self-concepts are usually perceived as highly productive, friendly, outgoing, and generally effective.

Rosenfeld found that the opposite was true for group members who reported low self-concepts.

Combs [1981] maintained, however, that self-concept has been confused and misunderstood as a behavior rather than a perceptual organization, due in part to several generations of primarily behavioral psychological research. In particular, Combs took exception with the "self-report" as a technique for measurement of self-concept.

> Self-report ... is a behavior representing what a person is willing, able, or can be seduced to say about self. Like any other behavior, it is, of course, affected by self-concept. It cannot, however, be accepted as identical with it. Too many other variables intervene between self concept and self-report to modify or distort what a person is able or willing to say about self.
>
> These sources of inaccuracy are so great and so difficult to eliminate that I do not know of any self-report device that I would currently accept for serious research requiring assessment of self-concept. [Combs, 1981: 6-7]

Drawing from the research of Combs and Soper [1957]; Combs, Courson, and Soper [1963]; Arbuckle [1958]; Pinneau and Milton [1958]; and Coller [1971]; Combs [1981] reviewed several of the variables which have been found to intervene between self-concept and self-report.

1. The willingness of the subject to cooperate.
2. The subject's possession of adequate language to express his or her experiential self.
3. Social expectancies impinging upon the subject at the time he or she is asked for self-descriptions.
4. The subject's own goals or purposes in the encounter.

5. The relationship with the requester, and the subject's freedom from threat or coercion.

Combs [1981] reported his belief that trained observers should be used in the study of self-concept. He expressed the opinion that self-concept can better be inferred from these observations than from self-reports. Combs went on to indicate, however, that behavioral psychologists tend to reject this point of view, due to the fact that inferences are not observable events.

Bills [1981: 17-25] summarized a variety of problems which contribute to the confusion concerning self-concept.

1. Due to the evolutionary nature of the concept, a variety of different perceptions of self-concept exist. Not all of these perceptions overlap, so agreement on a definition is difficult.
2. Behavioral scientists view the behavior of people from an external point of reference. Their purpose for psychology is to predict and control behavior; some maintain that self-concept has not proven to be a useful tool in this regard. Humanistic psychologists like Combs are not interested in prediction and control; they tend to view self-concept as a tool to free people to see the personal meanings of their own experiences. Thus, psychologists have difficulty agreeing on the purpose of self-concept.

3. Most psychological investigators have pursued their own directions oblivious of the directions of others. Many have designed instruments, and then defined self-concept to be that which their instruments measure. As a result, there is great diversity in the definitions of self-concept.

4. There is disagreement as to which procedure, measurement based upon definition or the reverse, is appropriate.

5. It is unclear whether or not it is possible to arrive at a definition which is generally acceptable to a broad group of psychologists by using what is presently known about the characteristics of different existing definitions.

Bills [1981] suggested that perhaps through the use of synonyms and antonyms to replace present terminology used in the various alternative definitions, some movement towards the center might be achieved. He concluded that a desirable resolution would be an operational definition of self-concept which excludes neither the technique-centered nor the inference-centered group.

> An adequate operational definition would describe how self-concept works, how it manifests itself, how it affects behavior, and how it might be measured.
>
> ... it would force the technique-centered group to to improve its techniques and the inference-centered group to become more specific about the manifestations of self-concept. Until a common definition is agreed upon, self-concept researchers will each be like the Red Queen in Alice's Adventure in Wonderland Carroll [1968] who insisted that when she used a word it meant

exactly what she intended it to mean. [Bills, 1981: 24-25]

David Silvernail [1981] concluded from his review of the self-concept literature that there was general agreement among researchers that the key dimensions of self-concept are a sense of:

1. body self
2. cognitive self
3. social self
4. self-esteem

Silvernail noted that while some researchers use the terms "self-concept" and "self-esteem" interchangeably, self-esteem represents the evaluative dimension of self-concept. He maintained that young children first develop their self-concepts in terms of "self-images." Self-esteem develops later as the child grows and begins to evaluate those self-images. Thus, according to Silvernail [1981: 10], it is possible for a person to "have an accurate self-concept and either a positive of negative self-esteem concurrently."

Silvernail proposed the following definition of self-concept, which while not all-inclusive, does identify salient features of which all teachers should be aware.

> ... a <u>self-concept is defined as a person's perception of himself/herself</u>. This perception is multidimensional, hierarchical, fairly stable, and evaluative. [1981: 10]

Silvernail [1981], in basic agreement with Combs, cautioned that accurate diagnosis of student self-concept is

very difficult due to its inherently private nature. Some of the major problems Silvernail mentioned, include:

1. One must make inferences based upon overt behavior.
2. Teachers are not necessarily trained observers.
3. Observers are limited by their own perceptions and interpretations.
4. Observer judgements may be influenced by personal biases.
5. The student may not wish to project a true self-image.
6. Self-reporting instruments frequently lack the desired levels of reliability and validity.

While Silvernail seemed to recognize clear advantages of self-concept diagnosis by trained observers, he also maintained that teachers can obtain useful self-concept information from both careful observation and administration of self-reporting instruments. He listed the following guidelines for use of self-reporting instruments:

1. Read the items to very young students.
2. Stress that there are no right or wrong answers.
3. Administer the scale in a nonthreatening manner.
4. Maintain confidentiality of the results.

Robert Fox et al. [1966] prepared Diagnosing Classroom Learning Environments as part of a series of three teacher resource booklets on classroom social relations and learning. With regard to self-concept, Fox reported that

the Bledsoe Self-Concept Scale [1962] was useful in helping the teacher analyze the students' views of themselves. Based upon this recommendation, the Bledsoe scale was used in this study.[8]

Bledsoe and Garrison [1962: 37] described their scale as an adaptation of an earlier instrument used with college students "to measure the way the subject says he thinks of himself." The original form of the instrument, the Index of Adjustment and Values [Bills et al., 1951] measured forty-nine traits, and was tested on college students. Lipsitt [1958] adapted the Bills index for use with children, using twenty-two adjectives and a five-point response scale.

The Bledsoe [1962] instrument consists of twenty-five positive adjectives and five negative adjectives, using nineteen of the original adjectives from the Lipsitt scale. Each subject is instructed first to indicate on a three-point scale how (s)he sees herself/himself with respect to each adjective. The three possible responses are "nearly always", "about one-half the time", and "just now and then." Subsequently, the subjects are directed to repeat the

---

[8] Fox neglected to mention in Diagnosing Classroom Learning Environments [1966] that the Bledsoe instrument was adapted primarily for use with older elementary age children. Purkey [1970] reported that the scale had been used successfully by Bledsoe with third through eighth grade children. Fox recommended many other tools as well, for teachers to use in diagnosing their classroom environments, but he provided few specifics regarding the intended age or grade levels for their utilization.

procedure to report how they would like to be. Bledsoe and Garrison [1962] referred to the first measurement as "self-concept" and to the second as "self-ideal-concept."

For the purposes of this study, the Bledsoe Self-Concept Scale (SCS) was used to measure those traits described by Bledsoe and Garrison in their research as "self-concept" and "self-ideal-concept." It cannot be assumed that this scale accurately measures self-concept as it is described by Combs, Bills, Silvernail, or Purkey. Of principal interest in this study is the manner in which Bledsoe self-concept measurements are distributed with respect to preferences for alternative learning environments. Since the Bledsoe scale has apparently not been used previously with a community college student population, it is of secondary interest to examine its usefulness with older subjects.[9]

---

[9]The following research findings were summarized from the report by Bledsoe and Garrison [1962]:

> In a study of fourth and sixth grade children, mean self-concept was lowest for fourth grade boys, and increased sequentially for sixth grade boys, fourth grade girls, and sixth grade girls. They found no generally significant differences in self-concepts between grade levels, but they did find significant differences between sexes. Correlations between boys self-concepts and intelligence measures were generally positive and significant, while similar correlations for girls were positive but not significant. Correlations between self-concept and interest measures were reported to be generally negligible, but correlations with a "manifest anxiety" measure were consistently negative and generally significant. Self-concept and self-ideal-concept tended to correlate

(Footnote Continued)

3.2.3.4 Communication Apprehension

Communication apprehension was generally described by Hurt, et al. [1978] as a student trait which tends to block communication in the classroom.[10] McCroskey and Wheeless [1976: 81-90] and Hurt, Scott, and McCroskey [1978: 147-156] described some characteristics, effects, and causes of communication apprehension. In part, they summarized the extensive research of: Bashore [1971]; Belmont and Marolla [1973]; Breland [1973]; Burgoon and Burgoon [1974]; Burgoon [1976]; Daly and Leth [1976]; Daly and McCroskey [1975]; Falcione, McCroskey, and Daly [1976]; Fisher and Infante [1973]; Freimuth [1976]; Garrison and Garrison [1976]; Hamilton [1972]; Hurt and Joseph [1975]; Hurt, Preiss, and Davis [1976]; Knutson and Lashbrook [1976]; Lehman [1971]; McCroskey [1970, 1975, 1976A-D, 1978A]; McCroskey and Andersen [1978]; McCroskey, Daly, Richmond, and Cox [1975]; McCroskey, Daly, and Sorensen [1978]; McCroskey and Richmond [1976, 1978]; McCroskey and

---

(Footnote Continued)
positively, and in most cases correlations between self-ideal-concept and the other measures were higher than the respective correlations between self-concept and those other measures. One exception to this tendency was that correlations between self-ideal-concept and manifest anxiety tended not to be significant. The research indicated that discrepancies between the self-concept and self-ideal-concept tended to correlate with feelings of inadequacy and lesser degree of adjustment.

[10] The reader is referred to chapter 2 for an earlier discussion of communication malfunctions in the classroom.

Sheahan [1976A, B]; Pederson [1968]; Quiggins [1972]; Randolph and McCroskey [1976]; Richmond [1976]; Richmond and Robertson [1976]; Scott, McCroskey, and Sheahan [1978]; Scott and Wheeless [1976]; Sorensen [1972]; Sorensen and McCroskey [1978]; Thoreson [1966]; Wheeless, Nesser, and McCroskey [1976]; Witteman [1976]; and others.

Although there is much additional research dealing with writing apprehension, stage fright, and speech anxiety, only the general findings relating to oral communication apprehension are discussed here. Communication apprehension refers to a general fear of communication in most settings, whether in public, a small group, or even with just one other person. This fear includes communication with teachers, parents, and peers, as well with strangers.

> Extensive research has indicated that between 10 and 20 percent of all college students and adults suffer from extreme communication apprehension, and the percentages may be somewhat higher in secondary and elementary schools.
>
> There are more severe communication apprehensives in the schools than there are students <u>with all other handicaps combined</u>. [Hurt et al. 1978: 148,151]

Hurt et al. [1978: 148-151] reviewed a variety of effects which have been found to result from high communication apprehension. A summary of those effects is presented below.

1. <u>Withdrawal Behavior</u>. The primary behavior attributed to communication apprehension is that of withdrawal from or avoidance of communication and interaction situations. Research shows that adult

apprehensives choose housing which isolates them from the social environment. In traditional classrooms, when forced into small group situations, and in most public gatherings, communication apprehensives choose seating positions which are associated with low interaction; generally at the periphery of the available space.

2. Occupational Choice. Research indicates that high apprehensives tend to choose occupations which require very little human interaction, while low apprehensives tend to select jobs which involve a great deal of interaction. It is also reported that in our society, high-status and high-income jobs tend to require high levels of communications interaction however, and thus high apprehensives tend to select lower paying jobs with less status than those chosen by low apprehensives.

3. Communication Behavior. When forced into group communications situations, high apprehensives communicate differently; they tend to communicate little of relevance, and hence usually do not significantly influence group decisions. Researchers report that apprehensives seem to recognize that relevant input solicits increased and unwanted communication. Apprehensives are hard to get to know; they disclose very little about themselves because they tend to have low

self-esteem, and because they simply do not like to talk to other people.

4. Personal Consequences. Classroom research shows that high apprehensives generally have few if any friends; they are perceived by others as being less attractive and less credible; they seldom fill leadership positions. Although researchers report no relation between levels of intelligence and communication apprehension, high apprehensives tend to achieve less in school than do low apprehensives. Apprehensives tend to be much less satisfied with school as students and with their jobs as adults than are non-apprehensives.

Hurt, Scott, and McCroskey [1978: 151-156] reported that most teachers are not aware of communication apprehension, and may unknowingly aggravate the problem for their apprehensive students. They summarized the research findings relating directly or indirectly to communication apprehension.

1. Communication apprehension is only weakly correlated (.30) with general anxiety. Many otherwise normal persons have high communication apprehension, while highly neurotic individuals may have low communication apprehension.
2. Communication apprehension is not related to intelligence and is not hereditary.

3. Belmont and Marolla [1973], Breland [1973], Lehman [1971], and others reported that differences in family size contribute strongly to differences among children from different families. In particular, family size has been found to be strongly and negatively correlated with the level of intelligence of children.

Hurt et al. [1978] hypothesized that communication apprehension may also be related to family size. Communication apprehension may be caused by a pattern of reinforcement in the home, a pattern which is influenced by the number and spacing of children in the family.

1. Reinforcement for communication in childhood results in increased confidence in the child about her or his communication; lack of reinforcement and/or aversive response to communication attempts results in reduced confidence ergo increased communication apprehension.
2. A child who develops and exhibits skill in communication early will receive more reinforcement from adults than from other children.
3. With biological maturation held constant, the acquisition of language and communication skills is a function of the child's interaction with communication models in the child's environment and the amount and quality of reinforcement the child receives from that interaction.

4. On the average, the best available models for a child are the child's parents. The more children present in the family, however, the lower the percentage of the total interaction of the child with the parents, and the higher the percentage of total interaction with other children.

5. In the typical family, the models that will provide the most discriminating reinforcement for the child's developing communication skills will be the parents (other children are more likely to provide indiscriminate reinforcement according to their own needs or to ignore communication attempts of younger children). But the more children present in the family, the lower the percentages of the total interaction of the child with the parent.

6. As children are born more closely together, the negative impact on younger children is increased. If children are widely spaced, the negative effects decreased.

7. In single parent homes, the effects of family size are heightened.

Hurt et al. [1978] reported that home and school environments can each contribute to the problem of communication apprehension. In some homes the old adage "Children are to be seen but not heard," may be negatively reinforced by punishment for too much communication. In many schools,

the quiet child is encouraged, while more verbal children are often punished for talking at the wrong time. The authors maintained that while this is unlikely to cause communication apprehension, it is likely to reinforce that trait in children who are already prone toward communication apprehension. They also suggested that role of modeling of communication apprehensive teachers may contribute to the problem of apprehensive students.

> It is well known that students tend to model their teacher's behavior, particularly at the lower grade levels. A large number of communication-apprehensive individuals become teachers, particularly elementary teachers. These individuals tend to set negative examples for the younger people in their classes. They do not want interaction themselves, and thus cut the child off from interacting with them. [Hurt et al. 1978: 153]

Hurt et al. [1978] concluded that some of the common educational practices, such as show-and-tell in elementary school, or a public-speaking requirement in high school, terrify the apprehensive student. Regardless of the teacher's evaluation, the student tends to feel a sense of failure due to his or her low self-esteem. Hurt et al. reported that forced communication reinforces apprehension in these cases, and motivates the individual to seek other forms of withdrawal behavior. The authors wrote that the practice of "chastisement is even more damaging."

> The child who exhibits communication-apprehensive behavior is scorned by the teacher. Such a "solution" flies in the face of almost everything we know about learning. Negative reinforcement and punishment do not have much effect on extinguishing student behavior. The only effect these types of teacher behaviors should be expected to have is to force the child to withdraw even further. [Hurt 1978: 154]

Hurt, Scott, and McCroskey [1978] recommended that the best way for schools to overcome the problem of communication apprehension, is to positively reinforce classroom communication by apprehensive children, especially in the early years, regardless of whether the communication is correct, incorrect, appropriate, or disruptive. In theory, schools can avoid teaching young children to fear communicating, by reinforcing the process whenever it occurs. The authors proposed that a second partial solution is to provide positive models for the apprehensive child.

> In most classrooms, the child observes negative models: children who talk a lot are punished. The communication apprehensive quickly learns that communicating in the classroom is a bad thing, although that is certainly not what the teacher is trying to communicate to the class. Consequently, not only should the communication-apprehensive student be rewarded for communicating, but other students should be rewarded as well in the presence of the communication apprehensive. Communication behavior should never be an object of punishment in the classroom [Hurt 1978: 154][11]

McCroskey [1975, 1978B] developed and validated a Personal Report of Communication Apprehension (PRCA) which he reported has been used successfully with several thousand high school students, college students, and other adults. Two forms of the PRCA, the short form with ten questions and

---

[11] Teachers were further cautioned, however, that since the primary source of communication apprehension is believed to be in the home, progress in the schools can be expected to be slow. For older students, the authors suggested a behavior therapy technique called "systematic desensitization", which can be learned and then administered without a trained clinician.

the long form with twenty-five questions, have been used. McCroskey reported that while the validity of both forms has been established, the long form is more reliable and more precise. He recommended use of the short form only when time constraints do not permit use of the longer form.

The findings of many researchers were summarized by McCroskey with regard to the validity of the PRCA:

> The results of these studies suggest that the PRCA: (1) is capable of predicting behavior that is theoretically consistent with the construct of oral communication apprehension, (2) is correlated with other personality variables at a level theoretically consistent with the communication apprehension construct, and (3) provides a measure of a stable characteristic of an individual that can be altered through substantial intervention. [McCroskey, 1978B: 203]

McCroskey [1978B: 193] concluded that the validity of the PRCA is dependent upon both the context in which it is administered, and the value assigned to accurate responses which are not otherwise influenced. He commented on the conditions under which the PRCA had been found to be susceptible to inaccurate self-reporting. McCroskey agreed in principle with Combs [1981] and others that invalid data can be derived from self-reports both when the subject is not aware of his or her own true feelings, and when the individual is not motivated to report accurately. McCroskey reported two types of situations in which inaccurate self-reporting had been discovered.

1. In a situation where the subjects were first told that communication apprehension is bad, there was a tendency for some individuals to falsify

responses to the PRCA, in an apparent attempt to hide the fact that they were highly apprehensive.

2. When the PRCA was used to select students with high communication apprehension for special programs, some students falsely reported high apprehension in order to qualify. In one case, some students perceived a special instructional program as easier than the normal program, and apparently falsified their responses in order to qualify for the special program. In a second case, a special program for desensitization of apprehensive students was perceived as highly successful and desirable, even for students who were not highly apprehensive. In this case too, there was evidence of false reporting in order to qualify for the program.

Of particular interest to the author of this study is how students with different levels of communication apprehension, as measured by the PRCA, are distributed with respect to preferences for different learning environments. Evidence pertaining to the reported tendency for apprehensive students to self-select low-interaction environments is also of interest. Likewise, he is interested in any evidence of the reported relation between high communication apprehension and low self-esteem, derived from comparison of the Bledsoe SCS and McCroskey PRCA measures. Finally, the author is interested in investigating differences between

pre-instruction and post-instruction communication apprehension measures.

3.2.3.5 Interpersonal Relations Orientation

William C. Schutz introduced the theory of Fundamental Interpersonal Relations Orientation (FIRO) in 1958. The original instrument (FIRO-B), which consists of six Guttman scales of nine items each, was designed to measure six behavior traits which Schutz used to characterize individual orientations with respect to interpersonal relations. These six traits consist of two behaviors, wanted behavior and expressed behavior, each with respect to the three interpersonal dimensions of inclusion, control, and affection.

Schutz [1966: 59] proposed use of the measures of wanted and expressed behaviors to predict an individual's expected orientation in an interpersonal situation with respect to each of the above dimensions. He reported that if the individual measured high on both the wanted and the expressed scales for the same dimension, then one would expect that individual to be oriented towards high interchange relations with others along that dimension. Schutz reported that if, on the contrary, the person measured low on both scales for the same dimension, then a low interchange orientation would be expected. Persons with high expressed behaviors and low wanted behaviors in the same dimension, would be expected by Schutz to be oriented towards originator only interpersonal roles with respect to

that dimension. On the other hand, persons with low expressed behaviors and high wanted behaviors, with respect to one of the interpersonal dimensions, would be expected to be oriented toward receiver only interpersonal roles pertaining to that dimension.

Schutz [1966: 60] provided the following characterizations for people with high or low scores on the six scales of FIRO-B.

1. A person who scored high on the wants inclusion (WI) scale was characterized as a social-compliant, and a person who scored low on the WI scale was characterized as countersocial.
2. A person who scored high on the expressed inclusion (EI) scale was characterized as oversocial, and a person who had a low EI score was characterized as undersocial.
3. A person who scored high on the wants control (WC) scale was characterized as rebellious, and a person who scored low on the WC scale was characterized as submissive.
4. A person who scored high on the expressed control (EC) scale was characterized as an autocrat, and a person who had a low EC score was characterized as an abdicrat.
5. A person who scored high on the wants affection (WA) scale was characterized as personal-

compliant, and a person who scored low on the WA scale was characterized as countersocial.

6. A person who scored high on the expressed affection (EA) scale was characterized as oversocial, and a person who had a low EA score was characterized as undersocial.

Evidence of the validity of FIRO-B was presented by Schutz [1966: 66-80], in which he summarized a variety of validation experiments which took place during the ten previous years. Subsequent to the establishment of content validity, through the development and cross-validation of the six Guttman scales using approximately 1500 college students, various studies of concurrent validity were conducted. In these studies, populations with known attitudes, such as certain political and occupational groups, were sampled and given the FIRO-B. Their known attitudes were then compared with orientations measured by the FIRO-B. The comparisons which Schutz presented demonstrated a general consistency between FIRO-B measures and known attitudes. Other data presented showed that the six FIRO-B scales were highly reproducible using another population, and that classification of individuals on initial and subsequent FIRO-B retests was acceptably stable. Seventy percent of those classified as low after the first test, were also classified as low after the retest. Likewise, 70% of those classified as high, remained in the high classification after the retest.

In addition to general characterizations of individual interpersonal behavior orientations, Schutz [1966: 107-112] described two main types of interpersonal compatibility, based upon whether comparison of the six measured traits for two individuals yields similarities or complementary differences. Corresponding to each of the following types of compatibility, Schutz described an incompatibility which occurs when the comparison yields dissimilarities or non-complementary differences.

1. Interchange compatibility refers to similarities between the two individuals with respect to their high-low interchange orientation; low-interchange people for instance, tend to be interchange compatible with other low-interchange people.
2. Originator compatibility describes the condition when two people complement each other in their originator-receiver orientations; one person prefers the originator role while the other prefers the receiver role.
3. Reciprocal compatibility occurs when the expressed behaviors of one individual closely match the wanted behaviors of the other individual with respect to the same dimension.

One of the principal educational applications of Schutz's theories of compatibility, has been in the area of classroom grouping. Schutz hypothesized that compatible groups function more efficiently than incompatible groups,

and the research he reported [1955, 1966, 1967] tended to support this hypothesis. Shaw, however, expressed some reservations.

> Schutz's need scales are moderately satisfactory, but some of the formulas for computing compatibility are of questionable validity. [1971: 35]

Thelen [1966] indicated that the importance of compatibility grouping, while significant in small leaderless class subgroups, was less so in large group lecture oriented classrooms. Thelen also addressed the issues of homogeneous and complementary grouping, while expressing some reservations concerning FIRO.

> The only published experiments I have found in which the complementation principle was tested are those by Schutz in connection with his development of FIRO, but the dependent variables by which he assessed the results are not very convincing to me.
>
> I believe that the most effective grouping for classroom purposes will ultimately make use of all three principles: compatibility, homogeneity, and complementation. But it may be that in each teaching situation the variables will enter the principles in different combinations; that is, in one teaching situation, the class will be homogeneous with regard to work-orientation but heterogeneous with regard to emotional reactions to stress; whereas in another situation, the picture would be reversed. [1966: 143-144][12]

It is of primary interest in this study to determine if any patterns are evident in the distribution of Schutz's six

---

[12] The reader is referred to Grant [1975] for further literature references and original research comparing Schutz's FIRO-B compatibility grouping techniques to other methods for forming leaderless small groups in the classroom.

FIRO behavior traits with respect to student preferences for alternative learning environments.

3.2.3.6 Mathematics Attitude

At the time this study was conceived, the term "mathematics anxiety" had not yet received widespread public attention. Monke [1978: 2-7] described how public interest in the concept was first detected when Sheila Tobias received 1500 letters in response to her article in Ms. Magazine [1976] entitled "Math Anxiety: Why Is a Smart Girl Like You Counting on Your Fingers?" As the title implies, Tobias was especially concerned with mathematics anxiety as it manifests itself in females in American society. Mathematics anxiety and sex differences in mathematics are both topics of potential relevance to the the choice of learning environment. At the time this study was designed, prior to the increase of attention paid to mathematics anxiety, the related concept of mathematics attitude was selected for consideration. The numerical distribution of male and female students was added later in the design of this study in order that sex differences might also be studied.[13]

---

[13] The reader is referred to Becker [1978], and Canada [1979] for a overview of research related to sex differences, and Monke [1978] for an overview of research related to the general area of mathematics anxiety.

As a result of the increased public and professional awareness and discussion of mathematics anxiety since the mid-1970's, various descriptive terms have become more widely used: mathematics anxiety, mathematics phobia, mathematics avoidance, mathematics attitude. Although all these terms can be found in the literature, their use is not consistent, nor is there general agreement as to their definitions. The terms are not necessarily synonyms, and as is the case with self-concept, differences exist among their assumed meanings and accepted validities in educational and psychological publications. For the purposes of this discussion, the following general distinctions between the four terms are provided.

1. Mathematics anxiety refers to a general feeling of distress or uneasiness which occurs in response to a mathematical stimuli.
2. Mathematics phobia implies a more severe form of anxiety, an obsessive fear or dread of mathematics.
3. Mathematics avoidance describes the behavior of keeping away from contact with mathematics.
4. Mathematics attitude refers to one's general disposition with regard to the subject of mathematics.

Whereas the first three terms have negative connotations, mathematics attitude implies neither a positive nor a negative disposition.

The literature provides descriptions of various techniques for assessing the individual characteristics associated with mathematics anxiety, phobia, avoidance, and attitude. These techniques range from monitoring physiological responses to mathematical stimuli, to clinical observation and analysis, to self-reporting. Once again, as has been reported regarding self-concept, alternative methods of measurement are associated both with the use of the different descriptive terms, and the definitions of those terms. This study primarily addresses mathematics attitude as measured by a selected self-report instrument.[14] Specific distinctions and correlations between the characteristics of mathematics anxiety, phobia, avoidance, and attitude are beyond the scope of this study. The author has perceived a the general implication in the literature, however, that these four characteristics are related.

Kahn and Weiss [1973] summarized the common elements of alternative definitions of attitude with the statement

> ... that attitudes are selectively acquired and integrated through learning and experience; that they are enduring dispositions indicating response consistency; and that positive or negative affect toward a social or psychological object represents the salient characteristic of an attitude. [1973: 761]

---

[14] Consistent with the position expressed by Combs [1981] regarding self-report of self-concept, self-report of mathematics attitude may be viewed as a measurement of the student's behavior of reporting feelings and attitudes associated with mathematics.

They also provided a list of different types of instruments used to measure attitudes towards mathematics education and courses.

Likert scales (summated ratings):

1. Revised Mathematics Attitude Scale [Aiken, 1963].
2. Mathematics Attitude Questionnaire [Alpert, Stellwagon, and Becker, 1963].
3. A. V. Scale [Adams and Von Brock, 1967].
4. Pupils' Attitude toward Arithmetic [Dutton and Blum, 1968].

Thurstone scales (paired comparisons):

1. Inventory of Prospective Teachers' Attitudes [Dutton, 1951].
2. Attitudes of Junior and Senior High School Students toward Mathematics [Malone and Freel, 1954].
3. Attitudes of Junior High School Pupils toward Arithmetic [Dutton, 1956].

Projective scales (sentence completions, essays, and ambiguous drawings):

1. Mathematics Affect [Alpert, Stellwagon, and Becker, 1963].
2. Pupil Attitude toward Mathematics [Nealeigh, 1968].

Physiological scales:

1. Number Anxiety Test [Dreger and Aiken, 1957].
2. Situational Anxiety Expression Test [Milliken and Spilka, 1962].

Guttman scale (scalogram analysis):

1. Students' Attitudes toward Arithmetic [Anttonen, 1968].

Monke [1978: 11-13] described the Dreger and Aiken [1957] Number Anxiety Test as the first published pencil and paper instrument to measure mathematics anxiety. Construct validity for the instrument was established through the comparison of number anxiety measures with galvanic skin responses, measuring an accepted physiological anxiety response to the stimulus of an arithmetic test. Dreger and

Aiken also reported correlations between number anxiety and mathematics course grades in the 1957 study.

Aiken and Dreger [1961], using a twenty-item Mathematics Attitude Scale (MAS) which includes ten positive and ten negative Likert items, reported significant contributions of MAS scores to the prediction of grades for college women, but not for college men in the same study. They also reported significant MAS contributions to the prediction of gain scores on a mathematics achievement test. Aiken [1963] reported correlations between various personality characteristics and scores on the Revised Mathematics Attitude Scale (RMAS).

Aiken [1970] reviewed studies which indicated that consistent reinforcement of specific attitudes toward mathematics leads to a particular student self-concept, which in turn influences expectation with regard to future achievement. Aiken also reported findings concerning development of positive mathematics attitudes, and modification of negative attitudes. Aiken [1974] described an expansion of his attitude scale to include measures of the perceived value of mathematics. This scale included twelve enjoyment items, eleven value items, and seventeen other items concerning interests, achievement, and biographical information. Aiken reported significant correlations of measures derived separately from both the value and enjoyment scales of his instrument, with both high school mathematics grades and mathematics ability. Gallicchio [1976]

reported, based upon her survey of studies concerning the relationship between mathematics achievement and mathematics attitude, that while research conclusions in this general area of concern are mixed, there appears to be a low positive correlation between mathematics attitude and mathematics achievement.

The Aiken and Dreger [1961] Mathematics Attitude Scale (MAS) was selected for use in this study, representing the instrument of choice at the time the selection was made. In the remainder of this study, the term mathematics attitude is used to refer to a student's self-reported MAS score. Of particular interest to this study are the distributions of mathematics attitudes with respect to preferences for alternative learning environments and course grades, and the effects of the learning experiences provided through the Choice Model on mathematics attitudes.

3.2.4 Implications of Community College Environment Research Which Relate to Environmental Preference

The Choice Model, which is described in detail in chapter 4, calls for the instructors to design their respective learning environments, and to orient all students to these environments. It can be inferred from the literature that the individual characteristics of instructors influence both the nature of the environments they design, and the manner in which they present them to the students. The

Model presumes that environmental preferences exist with or are formed by individual students who assess the learning environments from their individual perspectives. It can be inferred from the literature that these perspectives are influenced by the students' past experiences and by their personal characteristics.

Cohen and Brawer [1982] reported that community college faculty need to place greater professional emphasis on the discipline of teaching. Cross [1976] stated that this emphasis should be focused on teaching all students as individuals. The present lack of this emphasis in community colleges implies that the Choice Model might be difficult to implement broadly, due to limited faculty interest in providing alternative learning environments for students. It can be inferred from the literature that progress toward meeting the professional development goals of Cohen, Brawer, and Cross might enhance the appeal of the Choice Model to community college faculty.

Axen [1968] and others reported that the majority of community college instructors tend to be authoritarian classroom teachers who are inclined to adopt dogmatic teaching styles. Cohen and Brawer [1972] reported that flexible instructors are inclined both to be more creative and to adopt more democratic teaching styles. Hurt et al. [1978] reported that while dogmatic teachers serve the academic needs of some students, democratic teachers better serve the interpersonal needs of students. These and other

findings imply that while both dogmatic and democratic learning environments may be appropriate alternatives for the Choice Model, it may be difficult to find flexible teachers who are inclined to create the democratic alternatives.

The communication behavior of the instructor appears to be significant to both the orientation and instructional phases of the Choice Model. Hurt et al. [1978] reported that students' initial expectancies concerning a learning environment are influenced by both the verbal and nonverbal messages sent by the instructor. They also indicated that while teacher communication behavior can strongly influence student self-esteem, few teachers are aware of the strength of that influence. Hurt et al. reported that due to the great power of verbal communication from the teacher to the student, supportive instructor communication behavior is a very important instructor characteristic. These findings imply that differences in the communication behavior of the instructors during the orientation phase of the Choice Model may have a significant effect on the preference formation process. In particular, the literature implies that instructors who communicate supportively may be more attractive to students than are those who communicate less supportively.

Cross [1968, 1976] reported that both traditional and nontraditional college student populations are represented in the community college environment. She indicated that

adults, women, minorities, students from lower socioeconomic backgrounds, students from the lowest third of high school graduates, and first-generation college students are generally, but not exclusively, included in the nontraditional population. One can infer from the literature that while individual student differences clearly exist within the traditional college student population, the blend of both traditional and nontraditional populations in the community college environment results in a wider range of individual differences which those institutions must attempt to accommodate.

The implication can be drawn from the choice literature reviewed in chapter 2, that the opportunity for choice between alternative learning environments might be of general benefit to the personal development of all students. The literature concerning community college students, coupled with the literature of individual differences, which was reviewed in chapter 1, implies that the provision of alternative learning environments from which to choose has the potential of better serving the diverse personal needs and learning styles of community college students. The implication can also be drawn from community college student research, that provision of the opportunity for choice among alternative learning environments might be of collective professional benefit to those community college faculty who strive to accommodate individual differences within the student population.

The work of DeCoster and Mable [1981] primarily addressed the traditional college student population. It can be inferred, therefore, that their findings which address features shared by community and traditional colleges are applicable to the traditional portion of the community college student population. DeCoster and Mable reported that many of the students interviewed expressed negative feelings concerning faculty who showed little concern for students, and tended to be put off by professors who projected lofty and intimidating classroom images. It can be inferred from these findings that instructor participation in the Choice Model might serve as a potentially useful vehicle for improving classroom image, demonstrating concern for students, and thereby improving student-faculty rapport.

The literature concerning the accuracy and reliability of self-reported self-concept is basically pessimistic. This pessimism does not extend, however, to the importance of self-concept itself. Purkey [1970] reported an ongoing interaction between between academic achievement and self-concept. He specifically indicated that enhancement of self-concept is essential to improvement of academic achievement. Self-reported self-concept was included in this study in order to study possible relationships between self-concept and environmental preference. Measurement of change in self-concept was not attempted. The literature implies, however, that if the Choice Model were to be

employed as a vehicle for improving self-concept, through accommodation of individual differences, then improvement in achievement might also be expected to occur.

The literature pertaining to communication apprehension indicates that highly apprehensive students tend to avoid situations which require high levels of interaction. When presented with opportunities for interaction they tend to withdraw. This implies that when presented with a choice between alternative learning environments, communication apprehensive students may tend to select the environment in which they perceive the level of required interaction to be lowest. Hurt, Scott, and McCroskey [1978] reported that instructors can be trained to desensitize communication apprehensive students. While the Choice Model, as described in chapter 4, may enable apprehensive students to avoid those learning environments in which they would be most inclined to withdraw from interaction, desensitization might be considered as a future addition to the features of at least one environment, in order to specifically attract apprehensive students.

Schutz [1966] reported on three dimensions of interpersonal relations: affection, control, and inclusion. He indicated that an individual's orientation with respect to each dimension can be measured both by behavior which expresses that orientation to others, and by ways in which the individual wants others to behave. In the Choice Model, students are required to report their relative preferences

for alternative learning environments. While the students know the identity of the instructor for each environment before reporting their preferences, they do not know the environmental preferences of most of the other students. It is not known that interpersonal relations orientation is a factor at all in the formation of environmental preferences. To the extent that interpersonal relations orientation is a factor, however, the literature implies that students might tend to prefer environments in which they perceive that desired interpersonal behaviors are most likely to be satisfied.

The literature pertaining to mathematics attitude in general, and mathematics anxiety in particular indicates a strong tendency for females to have negative mathematics attitudes. With respect to the Choice Model, this implies that there may be a relationship between the distribution of environmental preferences for female students and the distribution of environmental preferences for students with negative mathematics attitudes. The literature also indicates that positive mathematics attitude is weakly correlated with high achievement. The research suggests that through modification of negative mathematics attitudes and reinforcement of positive mathematics attitudes, it may be possible to improve student self-concepts and enhance mathematics achievement. It is not known that mathematics attitude is a factor in the formation of environmental preferences. To the extent that it is a factor, the Choice

Model described in chapter 4 provides the opportunity for students with negative mathematics attitudes to avoid those environments which they find most threatening. It can be inferred from the literature that help in modifying negative mathematics attitudes is a feature which might in the future be offered in at least one of the alternative environments of the Choice Model in order to specifically attract those students who have negative mathematics attitudes.

3.3 INSTRUCTIONAL MODES AND GOALS

Thus far in this review of the literature, the author has focused on the physical, communication, and social components of learning environments, as well as on various characteristics of the instructors and students who populate the community college environment. The literature suggests that many instructors may not be fully aware of the significance of and interactions among these different components and characteristics. In spite of this apparent lack of awareness, research findings imply that instructors profoundly influence the nature of the learning environments in which they teach.

In this final section of the literature review, the author considers the modes of instruction which teachers employ, and the instructional goals which they strive to achieve. The author begins this section with a general discussion of the alternative patterns of instruction after which teachers model their behaviors, and alternative ways

in which these patterns can be categorized or classified. Following this general discussion, specific literature pertinent to each of the three instructional modes employed in this study is reviewed.

3.3.1 Methods and Models of Teaching

Norman Wallen and Robert Travers [1963: 448-505] used the term teaching method to mean a pattern of teacher behavior. They indicated that the literature prior to 1950 tended to focus on limited aspects of teacher behaviors, such as permissive versus authoritarian behavior, or project methods versus subject-matter methods of instruction. The authors reported that during the decade of the 1950's, education writers and researchers moved toward more comprehensive classifications of teaching methods.

Wallen and Travers [1963: 452-453] classified teaching methods according to origin of the respective instructional patterns.

1. Teaching Traditions. Some teachers adopt teaching behaviors according to existing traditions (e.g. the way they were taught.)
2. Teacher's Social Background. Some teachers adopt a method which reinforces the behavior of pupils which conforms to the ideology of their social class (e.g. the middle-class.)

3. Philosophical Traditions. Some teachers adopt patterns in line with a traditional educational philosophy (e.g. Froebel or Rousseau.)

4. Teacher's Needs. Some teachers adopt a teaching method which satisfies their own personal needs (e.g. a lecture method because they need to be self-assertive.)

5. Existing Local Conditions. Some teachers adopt a behavior pattern to fit the conditions in the school or community (e.g. a pattern required by the principal.)

6. Scientific Research. Some teachers adopt a teaching method derived from the literature of learning research.

The authors noted that educational research through the 1950's contributed very little to the development of new teaching methods. Rather it dealt primarily with the description, comparison, and classification of existing methods. They indicated further that the teaching methods most widely advocated in the literature of that decade were based upon either personal needs of teachers or philosophical tradition. Wallen and Travers maintained that teaching methods of the 1950's in general were based upon "folklore", not research, and that while many of the advocated learning principles may in fact have been sound, that soundness had not yet been proven at the time of their review.

Graham Nuthall and Ivan Snook [1973: 47-76] reported on the models of teaching studied during the decade of the 1960's. They used the term model to describe a conceptual structure which has been the subject of research and debate. Nuthall and Snook identified three predominant models.

1. Behavior-Control. A set of concepts and claims about teaching resulting from attempts to apply concepts from behavioral psychology in the classroom.
2. Discovery-Learning. A collection of views of teaching which emphasize self-directed student activities.[15]
3. Rational. A nonpsychological model based upon the claim that teaching involves rational and intentional interaction between the teacher and the students.

The authors reported that while each of these models had stimulated extensive research, that research had not influenced the relative status of models themselves. They reported that the research had tended to examine different aspects of specific models, rather than to collect evidence concerning the "correctness" of the models. While such

---

[15] Davidson [1985] described a form of small-group discovery-learning in mathematics in which the instructor provides more structure and direction than is suggested by Nuthall and Snook's description of discovery-learning. The Davidson model is discussed later in this chapter.

research results might have led to the modification of a specific model, the authors believed it unlikely that the findings would have persuaded anyone to drop one model in favor of another.

Researchers of the 1960's tended to assume the validity of one specific model, and in some cases the invalidity of some other model, in undertaking their investigations. Nuthall and Snook [1973] maintained that most of this type of research was "prejudiced", and attempted to "persuade" the educational community that the preferred model was desirable. They pointed out that such research was only useful in the context of the specific model studied, and that as soon as that model lost popularity, the associated research was soon forgotten.

Arthur Cohen and Florence Brawer [1982: 147-168] examined developments in the area of instruction in community colleges during the decades of the 1960's and 1970's. While they primarily limited their attention to community college developments, they reported conclusions of Koos [1924], Eells [1931], Blocker [1965, 1966], and Thornton [1972] to the effect that instructor quality and classroom procedures in community college compared favorably with instruction at the freshman and sophomore level in four-year colleges and universities.

The authors reported a finding by Johnson [1969] that virtually all forms of instructional innovation and technology were in use at some community college at the time of

his survey. Cohen and Brawer [1982] indicated that television became one of the most widely used instructional media during the 1970's, evolving from closed-circuit classroom presentations, to open-circuit broadcasts in the local community, and high-quality production of video materials. In the late 1970's, computers began to come into use as an innovative instructional tool. The authors summarized examples of the three common patterns of computer use: computer-based instruction, computer-managed instruction, and computer-assisted instruction.

Cohen and Brawer concluded, however, that in spite of the community college emphasis on instructional quality and innovation, "most students still meet traditional methods of instruction" [1982: 153]. The Center for the Study of Community Colleges [1978 A, B] reported that while over half of the teachers in humanities, science, and social science surveyed used some kind of recorded media with their students, the most prevalent form of teaching was the lecture, followed in second place by class discussion.

A variety of reasons were presented by Cohen and Brawer to help explain the limited transition from traditional to innovative teaching techniques [1982: 155-157]

1. Changing techniques is difficult and time consuming.
2. The manager of student learning must put in more hours than the instructor who delivers ad hoc lectures.

3. Innovators must prove the positive effects of their techniques, while traditionalists can usually go their way without question.

4. Many innovations resulting from individual initiatives have encountered faculty apathy; they die when the interested individuals grow tired of the innovations.

5. Some innovations are promoted by administrators who are then unable to persuade faculty to use them.

6. Some innovations are too expensive to maintain in operation.

Cohen and Brawer [1982] concluded, in harmony with the remarks of Nuthall and Snook [1973], that the teaching profession is not yet able to either specify or enforce "proper" instructional practices in light of the variance of practice between individual teachers, and in the absence of conclusive research results.

Ohmer Milton [1972] contended that faculty in colleges and universities are inclined to deny the applicability of educational research to their own teaching beliefs and practices. He presented the following essay by Francis Bacon as an analogical comment on the situation.

> In the year of our Lord 1432, there arose a grievous quarrel among the brethren over the number of teeth in the mouth of a horse. For 13 days the disputation raged without ceasing. All the ancient books and chronicles were fetched out, and wonderful and ponderous erudition, such as was never before heard of in this region, was made manifest. At the beginning of the 14th day, a youthful friar of goodly bearing asked

> his learned superiors for permission to add a word, and straightaway, to the wonderment of the disputants, whose deep wisdom he sore vexed, he beseeched them to unbend in a manner coarse and unheard-of, and to look in the open mouth of a horse and find the answer to their questionings. At this, their dignity being grievously hurt, they waxed exceedingly wroth; and, joining in a mighty uproar, they flew upon him and smote him hip and thigh, and cast him out forthwith. For, said they, surely Satan hath tempted this bold neophyte to declare unholy and unheard-of ways of finding truth contrary to the teachings of the fathers. After many days of grievous strife, the dove of peace sat on the assembly, and they as one man, declaring the problem to be an everlasting mystery because of a grievous dearth of historical and theological evidence thereof, so ordered the same writ down. [1972: 18-19]

Milton cited research studies and reviews by Macomber [1957], the Experiment on Independent Study [1958], Gruber and Weitman [1962], Dubin and Traveggia [1968], and McKeachie [1970] as contributing to the belief that research has shown that there is no strong reason to prefer one method of instruction over another. Milton assessed the research of the previous decades in the following statements.

> ... most of the research in teaching-learning with young college men and women has tended to center upon single and easily manipulated surface conditions. Consistently, however, such variables as class size, frequency of class meetings, and manner of presentation, when considered in isolation, have been demonstrated to wield no major impact upon learning as measured by the usual tests. Even when some of these variables have been combined, their influence appears to be quite minimal. Because the variables are gross simplifications of an extraordinarily complex activity, however, it should not be surprising that there are no significant differences. [1972: 23]

> Little research has been devoted to such matters as retention and application of subject matter, although application is one of the major goals in most instruction.... [1972: 26]

> Most courses are not taught for the sole purpose of having students perform well only at the termination of the course; yet most instructional research has been the end-of-course type: It is easier to conduct than the long-range type! [1972: 27]

In their text entitled Models of Teaching, Bruce Joyce and Marsha Weil [1972] presented a guide to alternative instructional patterns after which teachers may model their own behaviors. Rather than placing emphasis on either one specific aspect of instruction or one specific model, the authors presented a wide variety from which to choose. Joyce and Weil provided not comparative research, but a "present state of the art" description of alternative instructional patterns, which was intended to stimulate further activity by creative teachers in the field and curriculum-makers [1972: 24].

Joyce and Weil hypothesized the nature of teaching in the following way:

> Teaching should be conceived as the creation of an environment composed of interdependent parts. Contents, skills, instructional roles, social relationships, types of activities, physical facilities, and their use all add up to an environmental system whose parts interact with each other to constrain the behavior of all participants, teachers as well as students. Different combinations of these elements create different environments eliciting different educational outcomes. [1972: 24-25]

Educational outcomes were categorized by Joyce and Weil in terms of both instructional or direct effects, and nurturant or indirect effects. The instructional effects are derived from the learning activities which occur in the environment. The nurturant effects occur as a result of the

student's total experience in the environment over a period of time [1972: 17].

Joyce and Weil [1972: 5-11] used the term model to describe a set of educational procedures which meet two criteria:

1. There exist identifiable foci on specific instructional and nurturant effects.
2. There exist corresponding rationale for creating specific educational environments to elicit these outcomes.

They described four basic families of teaching models; families based upon fundamentally different theoretical orientations toward students as human beings and the universe in which they live.

1. Social Interaction. These models emphasize the relationship of students to society and to each other. They give priority to the development of better social relationships as a way of creating a better society.
2. Information-Processing. This family of models emphasizes the manner in which students handle stimuli from the environment, organize data, sense problems, generate concepts and solutions to problems, and employ verbal and nonverbal symbols.
3. Personal. These models emphasize the processes by which students construct and organize their own versions of reality. They tend to deal with the

personal development of the student as the principal priority.

4. Behavior Modification. In this family of models, efficient sequences of learning activities, designed to achieve specific behavioral goals, are seen as the key element. Student behavior in these learning sequences is shaped by manipulation of reinforcements.

3.3.2 Modes of Instruction

The literature reviewed above reveals that consensus has not yet been reached concerning either the terminology used to describe teaching approaches, or the categories into which alternative approaches are classified. Not only do authors use differing terms such a pattern, method, role, and model to label alternative instructional processes, but they frequently ascribe different definitions to those terms which are in common use.

In this study, the term "model" is used in an even more comprehensive way than that of Joyce and Weil. The Choice Model encompasses all aspects of an instructional system which is comprised of three separate instructional components. The term "learning environment", as used in this study, encompasses all aspects of a single instructional component of the Choice Model. The author classifies the "instructional mode" employed within each learning environment according to the size of the predominant group

with or within which interaction occurs. The classification of instructional modes is used to distinguish between the three learning environments in the Choice Model; the names Large Group Mode (LGM), Small Group Mode (SGM), and Individual Mode (IM) serve as labels for those environments.

The literature reviewed thus far has established that instructional environments are complex, multifaceted, and highly individualized constructs which instructors frequently create in accordance with their own personal instructional philosophies. Instructional mode is but one aspect of the instructional environment. Wallen and Travers [1963] reported a common flaw in much instructional research is that of the experimenter's failure to recognize the importance of other aspects of the instructional environment in addition to instructional mode or method.

> In many studies the experimenter has decided in advance which teacher is to teach according to which teaching method. The assumption is made that a teacher can manifest, at will, one or another pattern of teacher behavior. In a few studies the same teacher may be expected to manifest different patterns of behavior with different classes.
>
> Although the ad hoc assignment of teaching methods to teachers or to the same teacher at different times is a common experimental technique, little evidence has been produced to show that teachers actually switch from one pattern of behavior to another. Indeed, evidence reported earlier indicates that such a switch is far from easy.
>
> One can hardly expect a teacher to put full effort into the utilization of a teaching method which he does not consider sound or personally congenial. The latter factor may become a much more important determinant of what happens than differences in the prescribed patterns. This basic weakness characterizes all studies that use this particular approach to the study of teaching. [1963: 467]

In chapter 4 this author describes how individual instructor preferences and philosophies were accommodated in the design of the alternative learning environments used in this study. In the remainder of this chapter, however, the author provides an overview of the literature pertaining to each of the instructional modes employed in the Choice Model. This overview begins with a general discussion of large group instruction, as it pertains to this study.

3.3.2.1 Large Group Mode (LGM)

Large group instruction refers to those teaching patterns, methods, or models in which the instructor functions with an entire class as a single group in the principal learning activities. The term "large" is used not to imply some specific number of students in the group, but rather in contrast with the term "small", as it is used in the small group mode instruction. Small group instruction, which is discussed later in this chapter, refers to those teaching patterns, methods, or models in which the class is subdivided into small working groups which each conduct their own independent learning activities.

As has been previously reported, the traditional forms of instruction, namely lecture and discussion, are predominant in higher education. Wallen and Travers indicated that neither the lecture nor the discussion methods of instruction have been subjected to careful definition in the relevant studies they reviewed. Most of that research dealt

with comparisons between lecture and discussion methods. It was generally presumed in the research that lecture involved teacher "talking to" students, while discussion involved comparatively more more student "talking." The authors cautioned that care is needed when interpreting this comparative research, since "one man's 'lecture' may be another man's 'discussion' [1963: 481]." For this reason, this author now presents some later more descriptive material from the literature, prior to presenting a general review of large group research findings.

Paul Dressel and Dora Marcus [1982: 1-13] described four traditional teacher orientations with respect to teaching style, which were originally identified by Hardy [1976] and Dressel [1980] after extensive discussion with a variety of professional educators. All of these orientations lend themselves to, but are not necessarily restricted to, large group instruction.

1. Discipline Centered. Course content is rigidly defined according to the subject-matter discipline, and is not subject to modification. The professor's obligation is to present material in a scholarly way, and the student's obligation is to learn. The classroom tends to be formal, with the instructor as authority figure. Students are objectively evaluated and graded on specific skills and knowledge; neither individuality nor creativity is encouraged. This teaching style,

which is frequently found in mathematics and science classes, can be very effective with interested and capable students. Toward such students, the professor may be a vital and warm human being.

2. Instructor-Centered. Course content is selected by the teacher, according to his or her interests. Instructional procedures are chosen to highlight the professor's personality. Students are regarded as an admiring audience. The instructor is the authority figure; discussions and assignments are oriented towards his or her interests and views. Students tend to be evaluated according to how closely their work resembles that of the teacher; originality and creativity are often ignored or even resented. Some of the best and some of the worst teaching is the instructor-centered type.

3. Student-Centered-Cognitive. Student intellectual maturation is the goal; both content and teaching techniques are selected to to be interesting, stimulating, and to foster cognitive growth. The classroom environment is relaxed, and yet may be exciting, in order to stimulate creative, analytical, and logical thought. Student discussion and interaction is used to encourage understanding. The professor represents a model to be

emulated by the students; objectivity, individualization, and adaptation are all encouraged. Standards for evaluation and grading are high, but course objectives are broader and more inclusive than those in discipline-centered teaching.

4. Student-Centered-Affective. Student emotional and social development are the primary goals, and are considered prerequisite to intellectual growth. Content and activities are selected to foster affective growth. Student involvement and interaction characterize these activities, with actual content learning of secondary importance. Evaluation is based upon self-expression, affective growth, and personal satisfaction, rather than traditional academic achievement of subject matter. This form of instruction is usually found in the social sciences, and rarely in mathematics or the natural sciences.

Kenneth Hoover reported in College Teaching Today: A Handbook for Postsecondary Instruction that "lecture is currently the most widely used, yet the most highly criticized, instructional method in colleges and universities [1980: 175]." The author maintained that while in his opinion it makes no sense to present material by lecture which students can readily obtain from their textbooks, that is what is frequently done. Wesley and Wronski [1964: 367] suggested that appropriate purposes for lecture include

motivation, clarification, review, and expansion on content. Hoover described the following circumstances in which he finds lecture appropriate.

1. When the needed background information is not readily accessible to students.
2. When the facts or problems are conflicting or confusing in nature.
3. When the unique experiences of an individual (teacher, student, or resource person) will substantially contribute to clarification of issues.
4. When time is of the essence and the sources of data are widely scattered.
5. When a change of pace is needed. Many oral reports and demonstrations fall into this category.
6. When the best way to understand a topic is through oral presentation. Movies and demonstration, for example, are often informative. Sometimes "viewing" material is the best way to understand it. [1980: 176]

Hoover also described several limitations and problems with the lecture method.

1. Information-giving methods encourage the retention of facts as ends in themselves.
2. Lecture methods, by themselves, are inadequate for teaching certain types of concepts. (Attitudes, feelings, and skills, for example, are not learned through pure telling or showing procedures.)
3. Some teachers have difficulty adapting their presentations to the comprehension levels of their students. (A passive audience is less able to indicate its lack of understanding.)
4. Social learnings are minimized during oral presentations.
5. The lecture approach to teaching tends to encourage acceptance of the teacher as the final authority. Because of this factor, a teacher's bias and prejudices may be accepted at face value.
6. Exposition processes are extremely difficult to adapt to individual differences among students. Superior students, for example, frequently complain of boredom "after about the fifth explanation." Similarly, less able students often charge that lectures present too much information too quickly. [1980: 194]

Pertaining to the discussion method, Hoover [1980: 121] maintained that "class discussion is designed to develop group agreement through talk and reflective thinking." He expressed the belief that discussion is best suited to the exploration of controversial issues, and perhaps least suited to dissemination of information. Hoover summarized three types of class discussion identified by Gall and Gall [1971: 171].

1. Subject-Matter. Preliminary discussion on an area of common knowledge, followed by assigned reading, and concluded by class discussion of the assigned material which focuses on higher cognitive processes.[16]
2. Issue-Oriented. Ideally used to analyze value-related activities, so that several objectives can be met: increased awareness, understanding, analysis, evaluation, and modification of other students' attitudes, beliefs, feelings, and behavior. An optional final objective may be to reach group consensus.
3. Problem-Solving. Most effectively used when the leader presents a carefully worded problem, and

---

[16] Hoover maintained that classroom discussions are frequently limited to "reciting" the material which was read, more appropriately labeled the recitation mode of instruction, and that this is not generally accepted as a true discussion mode of instruction.

then systematically leads the group discussion through the steps of critical thinking.

Hoover summarized both the values and the limitations and problems commonly associated with group discussion. He listed the following principal advantages of the discussion method.

1. Group discussion involves the process of compromise essential to a democratic system.
2. Prejudices and biases are frequently modified when subjected to the scrutiny of the peer group.
3. When individuals in a group pool their ideas they are much more likely to correct deficiencies in evidence and reasoning than they could on their own.
4. The processes of discussion involve cooperation and sharing of ideas; thus judgements tend to improve.
5. Group discussion tends to make the leader and participants progressively less dependent on the teacher.

Concerning the drawbacks to group discussion, Hoover wrote:

1. Discussion presupposes adequate preparation.
2. The permissive characteristic of discussion tends to encourage digression.
3. The discussion leader may be unable to maintain an open mind.
4. Even when carefully organized, discussion is unpredictable.
5. Group agreement or consensus does not insure accomplishment of goals.

Wallen and Travers [1963] concluded that the large majority of the studies they reviewed, which compared lecture and discussion methods of instruction, found no significant differences in immediate mastery of factual information. They noted that those studies which did report significant differences tended to favor the lecture format. With regard to retention of "understanding-type" learning, Ward [1956] reported that higher ability students tended to

retain more under discussion procedures, but that lower ability students retained more under the lecture method. Wallen and Travers noted that although advocates of the discussion method characteristically claim advantages in the areas of problem-solving and application of knowledge, the research provides little direct evidence to that effect.

Concerning the learning process itself, Bloom [1953] found that college students in lecture classes reported the occurrence of significantly more "irrelevant" and "simple comprehension" thoughts, but significantly fewer "self," "other persons," and "problem-solving" thoughts than did students in discussion classes. Braddock [1941] reported that observed levels of attention among secondary school students were both relatively high and generally consistent between lecture and discussion classes. Brinkley [1952] prepared a composite list of ten academic learning activities, as they were ranked by college students with regard to the amount of elicited "mental activity." Although there was great variability between individual students, lecture was ranked eighth in the composite ranking, while discussion was ranked second.

Haines and McKeachie [1967] compared competitive and cooperative forms of class discussion. They reported that the competitive method resulted in higher tension, poorer achievement, and less satisfaction. Tallmadge and Shearer [1967, 1969] reported no significant interactions between student characteristics and method of instruction when the

content of instruction was fixed, but significant interactions when subject matter was also a variable. Hoover, Baumann, and Shafer [1970] reported no significant differences in either cognitive or affective learning between lecture-discussion groups of 20 members and those of 50 members.

Arthur Cohen, Clare Rose, and James Trent [1973: 1028-1030] reviewed additional lecture versus discussion research. They indicated that studies found those students who were characterized by moderate achievement, moderate social needs, and low creativity achieved most in conventional lecture situations, while students who were high in either social needs or creativity tended to perform best in small discussion groups. They hypothesized that this finding was consistent with the trend reported by Heist [1968] that the most creative students were the least likely group to complete bachelors degree programs.[17]

---

[17] Studies comparing large group instruction with the other modes of instruction included in this study are reviewed in the discussions of individual and small group modes which follow.

3.3.2.2 Small Group Mode (SGM)

Small group instruction refers to the practice of subdividing a class into small working groups. Hoover [1980: 66] indicated that five is the optimum group size, with a minimum of three students necessary for an effective group. He reported that in groups of five or fewer students, all members tend to interact with all other members, but that there is a tendency in groups of seven or more for a few of the more outgoing students to dominate conversation, and the more inhibited students to interact only with the dominant talkers. Davidson [1985] reported that in practice, small groups in mathematics classes range in size from two to six members.

Small group instruction techniques can be employed within the social interaction classification of models described by Joyce and Weil [1972], as well as both the student-centered-cognitive and student-centered-affective orientations described by Dressel and Marcus [1982]. Hoover [1980] described mainly short-lived small group activities in instructional settings, which serve to "bridge the gap" between teacher-led and individualized instruction. Cross [1976] primarily addressed "sensitivity" types of training in the small-group format.

Davidson [1985] indicated that cooperative learning procedures, including a variety of small-group interaction techniques of instruction, have been used at various levels of mathematics instruction since the late 1960's. These

techniques include both small working groups of three to six members, and dyad variations of partner learning and peer tutoring. Davidson [1985: 2] indicated that leadership roles and management functions vary between different models of small-group instruction, but that the following set of functions, many of which are performed by the teacher, is basic to most models.

1. Initiate group work.
2. Present guidelines for small-group operation.
3. Form groups.
4. Prepare and introduce new material in some form. (Orally to the entire class or to separate groups; or else via written worksheets, activity packets, conventional text materials, or special group texts.)
5. Interact with small groups. (Observe, check solutions, give hints, clarify notation, ask and answer questions, point out errors, provide encouragement, help group functioning, and furnish overall classroom management.)
6. Tie ideas together.
7. Assign homework or in-class work.
8. Evaluate student performance.

Of particular interest to this study is the work by Davidson [1970, 1971, 1979] concerning long-lived small groups utilizing a discovery method to study mathematics. In the Davidson model, the instructor briefly introduces new material at the beginning of class. For the majority of the class time, students work in four-member groups in their own group sections of the room, with or without chalkboard, discussing principles and concepts, solving problems, proving theorems, and constructing examples and counter-examples. The instructor moves from group to group checking student work and providing assistance. Small group process

is structured by the following guidelines for group behavior [1985: 3].

1. All students in the group work together.
2. All group members cooperate with others.
3. Students achieve a group solution for each problem.
4. Everyone must understand the solution before the group goes on.
5. Students listen carefully to others, and try to build on the ideas of others.
6. Students share leadership of the group.
7. Everyone participates and on one dominates group activities.
8. Students take turns writing problem solutions on the board.

Davidson reported no significant differences between experimental and control students on a uniform final exam, but he did measure highly positive attitudes in the small-group class. Loomer [1976], and Brechting and Hirsch [1977] studied modifications of the Davidson model. In the latter study, "small-group" students scored significantly higher than "traditional" students on a test of manipulative skills, but there was no significant difference on a concept measure.

Other categories of small-group studies summarized by Davidson [1985], included laboratory and data collection; computer assisted instruction; remedial mathematics; review for diagnostic tests; cooperative, competitive, and individualistic goal structures; group rewards for individual learning; internal dynamics in cooperative learning group formation procedures; group process and aptitude-treatment interactions; group testing; brainstorming; and cognitive

development. Also included were a summary of findings from this diverse collection of research studies, and Davidson's recommendations for further research.

As was the case with the large group lecture and discussion methods of instruction, Hoover [1980] discussed values, limitations, and problems associated with small group instruction. He reported the following advantages which can be realized in small group learning.

1. The small group provides each member with an opportunity to participate and thereby to influence decision making.
2. Such face-to-face learning situations promote an atmosphere of cooperation and empathy seldom achieved in other learning situations.
3. Empathy does not mean uncritical acceptance of ideas but rather the ability to "feel" why people believe as they do.
4. A basic strength of small-group techniques is their contribution to open-mindedness. Many students tend to take extreme positions and to jump to conclusions. Some experience difficulty in listening to other points of view. Small groups thus contribute to patience, tolerance, and eventually to modification of one's stand if it cannot withstand the test of scrutiny.
5. Small-group techniques necessitate skills in communication. Since advocacy is not a goal, ideas are not attacked. Opposing views are better expressed as questions; the right to full self-expression is assured; and differences are reconciled as nearly as possible. Consequently, clarity of expression is encouraged as well as the art of listening - actually hearing what the other person is saying.

Pertaining to the potential disadvantages, Hoover continued:

1. Small-group techniques relegate the instructor's role to that of a recorder-observer. When used as a vehicle for problem solving, the small group forces the teacher to accept problem solutions with which he or she may not agree. Some teachers have difficulty withholding judgement pertaining to matters of extreme controversy.

2. There is the danger of overcooperation; each member may become so solicitous of the feelings of others that direct action is avoided for fear of offending someone.
3. Sometimes individual members play destructive roles. Such roles, identified as blocker, special interest peddler, and aggressor, may originate from one's failure to maintain an open mind.
4. Small-group techniques require adequate time and resources for investigation of issues. They presuppose adequate preparation. Too little or too much structuring may be destructive to this instructional approach.
5. Appropriate evaluation of small-group processes is extremely difficult. The intrusion of any sort of individual evaluation while students are interacting in small-group situations is likely to have undesirable effects on the outcome.
6. Teachers must avoid group therapy since this is a task for a specialist. Small-group procedures emphasize task goals (for example, problem solving), whereas the therapy group emphasizes individual feelings and attitudes as they relate to self-concepts. [Hoover 1980: 80-81]

Wallen and Travers [1963: 479-480] indicated that using the dynamics of student discussion as a teaching method was considered "new" among educators in the early 1960's. Although they discussed some of the major assumptions found in the literature, and posed several questions to be addressed by future research, little distinction was made between small and large group discussion. As indicated earlier in the discussion of communication environment issues, group dynamics research was being conducted prior to 1960, but its findings had not yet been systematically integrated into the general body of teaching methods research reviewed by Wallen and Travers.

McKeachie [1963: 1118-1172] reviewed research on teaching at the college level, but provided little evidence of the use of "small" discussion groups other than for buzz

sessions. In this method, classes were temporarily split into small subgroups for brief discussions of a problem. McKeachie indicated that while many teachers viewed buzz groups as a valuable change of pace from large group discussion techniques, little research had been conducted to test their effectiveness. Most of the early research pertaining to instructional groups seems to have dealt either with the issues of instructor-centered versus student-centered methods, as summarized above by Dressel, or with class size in reference to lecture versus discussion methods of large group instruction.

As was reported earlier, Nuthall and Snook [1973: 47-76] identified the behavior-control, discovery-learning, and rational models of instruction as being the contemporary alternatives to the traditional forms of instruction in the literature which they reviewed from the 1960's. While they indicated that a great deal of traditional comparative research was conducted during that period, their review focused mostly on the theoretical aspects of these alternative models. Nuthall and Snook made no reference to small group methods of instruction, relative to any of these models.

Donald Dessart and Henry Frandsen [1973: 1177-1195] reviewed research on teaching secondary school mathematics. While they indicated that some research into patterns of classroom organization was conducted during the 1960's, that research tended to deal with issues of ability grouping,

class size, and time utilization. They too reported no specific research dealing with small group instruction. In their summary, Dessart and Frandsen [1973: 1191] related the observation by Mayor, Henkelman, and Walbesser [1965] "that the decade ending with 1965 was marked by intensive work in curriculum innovation, whereas the following 10-year period would be dominated by research efforts in the learning and teaching of mathematics."

Concerning teaching methods in higher education, Cohen, Rose, and Trent [1973: 1028-1035] identified research from various subject fields in the following categories: lecture versus discussion, team teaching, independent study and tutorials, cognitive approaches to instruction, curricular studies, and experimental colleges. Within the lecture versus discussion category, some small group research was reported. Doty [1967], and Hovey, Gruber, and Terrell [1963] concluded that students characterized by either high social needs or high creativity tended to perform best in small discussion groups.

Beach [1970] studied interactions in small self-directed learning groups in social psychology. He compared "experimental" students who were assigned to small learning groups, with "control" students who were not assigned to small groups. Beach reported small but significant achievement differences in favor of the control students, but significant improvements in critical thinking among experimental students. Self-reports by student with lower grade-

point averages indicated that small-group students consulted more books in preparing their papers, and experienced greater increases in subject-matter interest than did similar non-small-group students. Based on the Bales [1950] system for interaction analysis, Beach indicated that interaction in the small group meetings was positive, but that general learning in the groups was subject to the orientation of the group. He concluded that learning tended to be enhanced when group members were "other-oriented," but tended to be inhibited when group members were "self-oriented."

The Experiment on Independent Study at Antioch College [1958] compared the alternative instructional methods of lecture-discussion, small groups without the instructor, and independent study, in a variety of content areas. Reduction of "formal" class time ranged from 30% to 80% in different alternatives to traditional instruction, but no generally significant differences in content understanding between different sections of the same course were reported.

In her book entitled Accent on Learning, Patricia Cross [1976: 233-239] summarized the results of a nationwide survey comparing remedial or developmental services available in a 20% random sample of community colleges in the years 1970 and 1974. That summary indicated the following trends in applications of "group" techniques with "developmental" students in community colleges during the early 1970's.

1. The use of groups in counseling increased from 33% to 51%.
2. The use of group sensitivity sessions for faculty declined from 9% to 8%.
3. Twenty-five percent reported experimental use of T-groups, sensitivity training, or other similar small-group sessions for students.
4. Fifty-two percent reported experimental use of peer counseling (indicated to be one of the more popular experimental techniques.)
5. Twenty-three percent reported experimental use of human potential seminars.

There was no indication of the use of small group instructional methods in content areas, although 12% reported "other" instructional methods from those enumerated in the summary.

Cross did address the use of small groups in higher education, but her focus was on encounter groups, T-groups, and other forms of sensitivity training. While she did not consider more general uses of the small group mode, Cross reported that the American College Personnel Association (ACPA) issued several statements concerning the use of groups in educational settings: "A Statement of Position" [1972], "Guidelines for Group Facilitators in Higher Education" [1974], and "Guidelines for the Preparation of

Professional Group Facilitators" [1975]. The 1972 and 1974 ACPA statements are summarized in appendix B.[18]

3.3.2.3 Individual Mode (IM)

The literature contains various references to the historical roots of individual modes of instruction. William Driscoll [1975] wrote that although no thorough study of the origins of independent study has been conducted, the provision for "elective" courses at Harvard in 1869, and "honors" courses at Princeton in 1905 evolved into "independent study" courses for high ability resident students at many institutions across the nation. "Correspondence" courses, which were first offered by the University of Chicago in 1892, likewise led to the availability of "independent study" courses for nonresident students from a wide variety of institutions.

Driscoll also reported two other definitions of independent study found in the literature which were more general in nature. One definition described independent study in terms of:

> Instructional systems which make it possible for the learner to pursue the study of personally significant areas in an independent manner - freed of the bonds of time, space, and prescription usually imposed by conventional instruction. [Gleason, 1967]

---

[18] While the ACPA statements contained in appendix B do not specifically focus on instructional uses of small groups, the author believes that they are of general relevance to any professional who uses small groups in an educational setting.

The second definition identified two different categories of independent study.

> The first retains the idea of the necessity for teacher-direction and guidance in the learning process; the second puts emphasis solely on the learner and upon the fact "... learning can, and often does take place in the absence of the teacher." [Dubin and Taveggia, 1968: 29-30]

Nuthall and Snook [1973: 54-59] credited teaching machines and the works of Pressey [1926, 1932], and Skinner [1954, 1968] with the origins of educational technology and the behavioral science of teaching. The topical headings in Current Research on Instruction by Anderson, Faust, Roderick, and Cunningham [1969] reveal the directions in which behavioral instruction research evolved: instructional objectives, prompting and fading techniques, student response, reinforcement and feedback, facilitation of concept learning, organization and sequence, and evaluation of instruction.

The contents of the Second Handbook of Research on Teaching, edited by Robert Travers [1973], reveals the impact of technology on education. Major sections were devoted to the technology of instructional development, instrumentation of research in teaching, instrumentation for teaching and instructional management, analysis and application of media, and educational technology and related research viewed as a political force.

The teaching machine and other types of Programmed Instruction (PI) were but one form of individual instruction to evolve in the wake of educational technology.

Postlethwait [1975: 220-231] described how the Audio-Tutorial (AT) system of instruction, which began at Purdue University in 1961, enables teachers to use a combination of printed and audio-visual materials in a sequence of individualized learning activities, to involve students in a "symphony of learning."

Of particular interest to this study is the Personalized System of Instruction (PSI), or "Keller Plan". Fred Keller, in his article entitled "Good-Bye, Teacher...." [1968] described PSI as an approach in which course content is subdivided into short modules of instruction. Individual students progress at their own respective speeds through written activity packets corresponding to each module. "Unit-perfection" or "mastery" (usually indicated by a score of 90% or higher on a module achievement test) is required before a student can progress from one module to the next. Keller summarized five features of PSI which tend to distinguish it from conventional teaching.

1. The go-at-your-own-pace feature, which permits a student to move through the course at a speed commensurate with his ability and other demands upon his time.
2. The unit-perfection requirement for advance, which lets the student go ahead to new material only after demonstrating mastery of that which preceded.
3. The use of lectures and demonstrations as vehicles of motivation, rather than sources of critical information.
4. The related stress upon the written word in teacher-student communication.
5. The use of proctors, which permits repeated testing, immediate scoring, almost unavoidable tutoring, an a marked enhancement of the personal-social aspect of the educational process. [Keller, 1967]

With special reference to her review of the Keller Plan, Cross reported that:

> It is rare, in educational research, to find such clear findings as those reported in the PSI literature. There is substantial agreement in the research that students learn more under PSI approaches than they do in conventional classes, and they like it better. In reviewing PSI research, I started to take careful notes on the design and findings of various research studies, so that agreements and conflicts could be reported and conclusions, if any, teased from this analysis. I soon discovered that if PSI is working in the class at all - that is, if students continue to move toward completion of the units - PSI students do perform better than students in conventional classes on typical content-oriented final examinations, and they are quite unequivocal in their endorsement of PSI over conventional approaches. Most of these highly favorable findings, however, have occurred in science classes, or classes with equally concise subject matter, and mostly with students who are above average in academic achievement (for instance, in university classes rather than community college classes). [1976: 94-95]

Cross distinguished between PSI (the Keller Plan) and SLI (Something Like It.) She indicated that there have been failures, although those seem to be far outnumbered by the successes. She cited the advice of Sherman [1974] that instructors should avoid departure from the standard Keller format when they first attempt to teach by the PSI method, and that they should be aware that success is not automatic.

Cross [1976: 98-99] identified self-pacing as both the greatest asset and the greatest problem with PSI. While students tend to rank self-pacing as highly desirable rather than frustrating, according to Nelson and Scott [1974] and Hoberock et al. [1974] respectively, large numbers of faculty reported problems with student procrastination according to a survey in the PSI Newsletter [June, 1974].

Cross reviewed a variety of alternatives involving both rewards and punishments, which were described in the literature as methods to deal with procrastination.

Cross reported that the problem of student withdrawals from PSI courses is closely related to that of procrastination. Cross [1976: 100-101] alerted community college faculty working with "New Students"[19] to the fact that:

1. Studies by Born, Gledhill, and Davis [1974], and Sheppard and MacDermot [1970] showed that poor to mediocre students withdraw from PSI classes in greater numbers than do good students.
2. Born [1971], Keller [1968], McMichael and Corey [1969], and Sheppard and MacDermot [1970] all reported that withdrawal rates for PSI classes tend to be higher than for "courses with greater external controls."

Other "problems" with PSI instruction which Cross [1976: 101-107] identified include:

1. Selection of appropriate criteria to signify "mastery" of unit objectives.
2. Institutional acceptance of class grade distributions which are dominated by A's and B's, rather than being "normally" distributed.

---

[19] The term "New Student", as defined by Cross, was discussed earlier in the chapter, in conjunction with community college student identity.

3. Finding, training, and funding of student tutors, especially in community colleges.

Cross concluded that the most serious challenge to PSI, however, involves the issue of "mastery of subject matter."

> Where mastery of subject matter is the goal, it would be hard to find a more promising approach on the scene now than PSI.
>
> Mastery of subject matter [however] is not the ultimate goal of all education. In fact, most educators do not accept a mission of turning out "walking encyclopedias" - even if they could stimulate that much factual learning. While most teachers are trapped by tradition into teaching content and measuring achievement in terms of content, few believe that knowledge of the content of their discipline is an adequate measure of the student's education. [1976: 107]

Cross indicated that PSI is often attacked as inadequate or inappropriate by those who teach courses in which students are provided with an "experience", and courses which focus on "high-order intellectual skills." While Green [1974] admitted that PSI is inappropriate for "experience" courses, he expressed the belief that PSI can be effectively used to teach certain skills in the areas of analysis, problem solving, and creativity. Cross cautioned that "traditional" faculty should analyze the effectiveness of their own methods of teaching intellectual skills, before condemning PSI on that score.

As indicated earlier in this section, PSI is but one example of an instructional system which can be classified as an individual mode of teaching. Cross expressed the belief that the early 1970's witnessed the beginning of an "instructional revolution" in community colleges. Referring

to individual modes of instruction included in the 1974 survey of remedial and developmental programs, she stated:

> The use of programmed instruction increased from 44 percent of the colleges in 1970 to 74 percent in 1974; the use of self-paced learning modules increased from 31 percent to 68 percent; and skills centers spread from 36 percent of the colleges in 1970 to 67 percent by 1974.
>
> The speed with which individualized programs of instruction have been adopted is one sign of the instructional revolution. The upsetting of traditional ways of thinking about education is another indicator. Mastery learning is the revolutionary concept that lies at the heart of the new teaching strategies. [1976: 11]

This author uses the term "individual mode" to encompass those instructional methods which generally focus on content presentation to the "individual" as opposed to the "group", and which do not rely upon group interaction as an essential element of the instructional process. A related but not necessarily synonymous term, frequently found in the literature, is "individualized" instruction. Cross [1976:52-54] described five principles which she maintained were widely accepted as basic to all effective forms of individualized learning.

1. The student must be active rather than passive.
2. The goals and objectives of learning must be presented clearly and explicitly to the student.
3. Course objectives are addressed through small single-concept lesson units or learning modules.

4. Effective learning requires feedback and evaluation.

5. Self-pacing permits the learner to exercise some degree of control over the pace of content presentation.

The examples of "individualized" instruction which Cross [1976: 55-110] summarized (programmed, computer-assisted, computer-managed, personalized, and audio-tutorial) are generally viewed in the literature as "individual" modes of instruction. Cross indicated, however, that lecture and small-group discussion techniques are sometimes used within individualized instructional programs.

Although Hoover [1976: 55-64] used the term behavioral to label instructional procedures similar to those of PSI, he did not seem to differentiate between the "behavioral" and "individualized" classifications of instruction. Hoover summarized the following advantages of behavioral instruction.

1. The learner can progress at his or her own pace.
2. The approach tends to be self-motivating, since learning is broken into small units and continuous self-assessment of progress is emphasized.
3. Behavioral self-instruction represents a systematic effort to apply the most basic principles of learning, that is reinforcement, feedback, behavior shaping, frequent review, and practice.
4. Learning programs emphasize progressive levels of learner independence. The teacher is relegated to a diagnostician and facilitator of learning.
5. Group cooperation replaces group competition for grades. A student's mastery is based on achievement of a predetermined level of performance and not on comparison with with the performances of other class members.

6. Behavioral instruction seems superior to conventional methods in both initial learning and retention of concepts.

Pertaining to the disadvantages of behavioral instruction, Hoover continued:

1. Behavioral instruction demands careful, extensive preparation of materials to meet the various learning needs of students.
2. The programs limit teacher flexibility. Once a learning alternative has been selected, the activities are prescribed and outlined for the learner with few opportunities for adjustment.
3. Behavioral instructional programs demand a restructuring of existing facilities and personnel relationships.
4. The approach is not appropriate when the objective is familiarization or orientation to a broad field of study.
5. Behavioral instruction will probably not be effective for the professor who views his of her role as a provider of information.
7. When mastery learning is emphasized, less content coverage is possible. This, of course, is a reflection of mastery learning levels established.
8. Dropout rates in behavioral instruction classes are high. Apparently, the procrastinator and the anxiety-ridden student have difficulty coping with the specific requirements involved.

It is not clear from the literature that all forms of "individual" instruction, embrace either the basic principles of "individualized" instruction, as Cross enumerated them, or the characteristics of "behavioral" instruction to which Hoover referred. While Driscoll [1975] acknowledged the contributions of technology and instructional innovation to "independent" study, his emphasis was on the evolution of the home, as opposed to the campus, as "an effective and efficient learning center." Driscoll spoke of credit for life experience, credit by examination, and independent

study as important contributors to new types of "external" degree programs.

> In the most flexible ones, the student, with faculty guidance, plans his degree to meet his own goals and interests. Others, somewhat more structured, allow the student to plan his work around several broad topics or areas. The programs are truly student centered.
>
> These newly developing programs may help bring together the divergent branches of independent study, internal and external, by using the best of each, combining the freedom of goal selection with self-pacing and individualized instruction. [1975: 237-238]

3.3.2.4 Implications of Instructional Mode Research Which Relate to Environmental Preference

The literature pertaining to alternative instructional modes reveals major flaws and shortcomings in much of the comparative research which has been conducted. Traditional forms of large group instruction have tended to be accepted as the standard to which more innovative approaches must be compared, and yet these traditional forms of instruction have often not been subjected to the same degree of description and scrutiny as have the alternative modes. Many researchers have attempted to oversimplify the complexities of educational research by focusing only on the mode of instruction, and failing to recognize other important aspects of learning environments which interact with instructional mode.

The literature also reveals that educational research has had little real impact on college instruction. In many cases research has been based upon the presumed superiority

of one particular model, and has been ignored by those who do not already share in that presumption. Many instructors tend to deny the applicability of research results which conflict with their own beliefs and practices. Other teachers believe that research has established that there are no significant advantages to be realized in using one instructional method instead of another. These faculty tend to use this belief as rationale for teaching by their respective methods of choice. Milton [1972] expressed the belief, however, that the previously mentioned research flaws, primarily that of oversimplification, are responsible for the failure to find significant differences among alternative modes of instruction.

The broad scopes of both this literature review and this study are directly attributable to the complexities of the teaching-learning process to which Milton referred. In chapter 4 the author describes the evolution of this study from that of a tightly controlled comparison of choice versus no choice of instructional mode, to that of a loosely controlled but carefully described study of preferences for alternative instructional environments. As the reader will learn in chapter 4, the author's experience in developing the Choice Model has tended to confirm the hypothesis of Joyce and Weil [1972] concerning the nature of teaching. The author was unable to satisfactorily accommodate student preferences for alternative instructional modes until

research controls were eased and other aspects of each alternative environment were permitted to vary and interact.

The author indicated in chapter 1 that the three basic instructional modes for the Choice Model (individual, small group, and large group - described in chapter 4) were selected because they were already in use at the community college where this study was conducted. The primary purpose of the study was to accommodate student preferences for these existing instructional alternatives, rather than to develop or adopt new alternatives. While the literature reviewed here suggests that the three instructional modes employed in this study represent a broad cross-section of the available options, it also implies that many different instructional methods, models, and goals might be accommodated in other versions of the Choice Model. Not only might other models of LGM, SGM, and IM instruction be employed, but the alternatives might be selected on the basis of different classification criteria, such as the model types suggested by Nuthall and Snook [1973], or the families of models described by Joyce and Weil [1972.]

Cohen and Brawer [1982] and others have indicated, however, that development and implementation of alternative instructional models is difficult. In the absence of conclusive research results, experimentation with alternative instructional models has failed to produce substantial changes to the traditional manner in which the bulk of community college courses are taught. This finding carries

the implication that in the foreseeable future, the Choice Model may best be used as a vehicle for accommodating student preferences for existing instructional alternatives, whatever those may be at the institution where the Model is employed.

3.4 SUMMARY

In chapters 2 and 3 the author has reviewed literature pertaining to a wide variety of topics which are relevant to the Choice Model. In chapter 2, following a survey of the literature pertaining to choice itself, the author presented a general discussion of the the physical, communication, and social components of all learning environments. Chapter 3 began with a discussion of the community college environment, including its history, its faculty, and its students. The literature review concluded with a general discussion of the literature alternative instructional methods, models, and goals, followed by specific consideration of the large group, small group, and individual modes of instruction.

In chapter 4 the author describes the general evolution of this study during the mid-1970's. This is followed by specific descriptions of the final designs of the Choice Model and its three alternative learning environments. Chapter 4 concludes with a description of the data collected during the study, and a final revised set of research questions which are addressed in the remaining chapters of the study.

The data collected during final testing of the Choice Model are presented in three chapters. Pre-instruction orientation and preference data are discussed in chapter 5. Pre-instruction student characteristics, including both measured and academic archive data, are presented in chapter 6. Post-instruction data are discussed in chapter 7. Answers to the research questions, recommendations for further study, and general conclusions are summarized in chapter 8.

PLEASE MAKE THIS THREE VOLUMES.

THIS IS VOLUME TWO.

THANK YOU.

Student Choice Among Large Group, and Small Group, and individual Learning Environments in a Community College Mathematics Mini-Course.

by

Eldon C. Baldwin

Maryland
LD
3231
.M70d
Baldwin,
E. C.
Vol. 2
Folio

Chapter IV

STUDY DESIGN

4.1 OVERVIEW

In this chapter the author describes not only the final design of the Choice Model, but also the evolutionary process through which that design was achieved. It is the author's opinion that this evolutionary process is of sufficient importance to justify significant attention. He has therefore provided a narrative description of design stage of the study, as well as a more detailed description of the final Choice Model design.

The design stage of the study occurred in two major segments, which spanned a period of five years during the mid-1970's. These two segments are described in the following two sections of chapter 4. Although some data are presented in these sections, detailed discussion and analyses of these data have not been included. The emphasis have instead been placed on the lessons learned during the design stage, and how these lessons effected later versions of the Choice Model.

Following this narrative description of the design stage, the author describes the resulting Choice Model as it was implemented during the spring 1977 semester. Data collected during this final implementation are presented and discussed in chapters 5, 6, and 7. In the concluding section of chapter 4 the author presents an expanded set of

research questions. Based upon the data which are presented and discussed in chapters 5, 6, and 7, brief answers to these research questions are summarized in chapter 8.

4.2 EARLY DESIGNS

The Choice Model evolved during a series of three pilot studies, which preceded testing of the final design during the spring semester of 1977. The first two pilot studies were conducted during the 1973 academic year. Study of the Choice Model was then suspended for several years while the courses used for the study were converted from a sequence of two three-credit one-semester courses to a series of six one-credit five-week mini-courses. The third pilot study was conducted during the fall 1976 semester.

4.2.1 First Pilot

During the Spring 1973 Semester, the author tested the original design of what was to become the Choice Model. Three mathematics classes in Finite Mathematics I (MAT 109) were scheduled at 1:00 pm on Monday-Wednesday-Friday. One instructor taught a self-paced class (Individual Mode, IM) using a programmed text. Another instructor offered an instructional method employing small student discussion groups (Small Group Mode, SGM). A third instructor offered a traditional lecture-discussion class (Large Group Mode, LGM), which included occasional individual and small group activities. The students who registered at this hour were

allowed a free choice of their preferred instructional environments.

In order to allow students to change sections later if desired, the instructors agreed to use the same (programmed) text, and to coordinate time schedules for the semester as much as possible, without detracting from their respective instructional methods. All instructors agreed to the same grading methods so that "administrative" differences between the sections would not influence the students' choices.

On the first two days of class, the students met in a large lecture hall. The program was explained, and the students were tested to be sure that they met the course prerequisites. The students were then asked to participate in a "round-robin" style orientation on each of the next three class days, attending class in a different room with a different instructor on each day. Algebra review topics were covered during the orientation period, although much of the class time was used for non-instructional purposes.

On the sixth class day, the students were asked to indicate their environmental preferences on a survey form. (See appendix C.) Based upon the survey results, the class was divided into three preference groups:

1. Individual Mode (IM)
2. Large Group Mode (LGM)
3. Small Group Mode (SGM)

The students began attending class in their respective preference groups on the seventh class day.

In completing the survey form, students were asked to rank order their overall environmental preferences, based upon the three available instructor/mode combinations, as well as their independent preferences for instructor and mode. The survey data are presented in table 2. The table is divided into three sections, pertaining to the IM, LGM, and SGM preference groups respectively. Section A of table 2 presents the survey results for those students who chose to study the course in the IM environment, section B presents the survey data for those who preferred the LGM environment, and section C presents data for those students who chose the SGM environment.

Each section of table 2 presents a summary (by frequency and percentage) of the preference rankings for the various instructional alternatives, as reported by the students in one preference group. The three columns under the OVERALL heading indicate the preference rankings for the actual environmental choices presented to the students, with mode and instructor combined. The MODE and INSTRUCTOR headings indicate the respective preference rankings for mode (independent of instructor) and instructor (independent of mode.)[1]

---

[1]Not all students provided rankings for all environmental choices. These students were assigned rankings of "NONE" in table 2. In this way, the total number of student rankings in each separate column always equals to total number of students in the preference group.
(Footnote Continued)

TABLE 2

Spring 1973 Choice Questionnaire

Section A - IM Preference Group

RANK	OVERALL IM	OVERALL LGM	OVERALL SGM	MODE IM	MODE LGM	MODE SGM	INSTRUCTOR IM	INSTRUCTOR LGM	INSTRUCTOR SGM	TOTAL
1	13	0	0	12	3	2	6	7	6	
	100%	0%	0%	92%	23%	15%	46%	54%	46%	
2	0	7	5	1	1	3	2	0	1	
	0%	54%	38%	8%	8%	23%	15%	0%	8%	
3	0	4	6	0	3	2	0	2	1	
	0%	31%	46%	0%	23%	15%	0%	15%	8%	
NONE	0	2	2	0	6	6	5	4	5	
	0%	15%	15%	0%	46%	46%	38%	31%	38%	

NUMBER OF STUDENTS 13
PERCENT OF SAMPLE 26%

(CONTINUED)

Several lessons were learned from this first attempt to offer students a choice between alternative instructional modes. As indicated in section B of table 2, 42% of the students chose the most traditional LGM section, as opposed to 32% and 26% for the alternative SGM and IM classes respectively. An undetermined (small) number of students were apparently overwhelmed by the orientation process, and

---

(Footnote Continued)
The percentage which appears below each ranking count is the corresponding percent of the preference group. The percentages in each separate column always total 100%. The total of the row percentage entries for a single ranking, however, is not generally equal to 100%. Some students indicated more than one first ranking for mode or instructor, and some students did not report second or third rankings.

immediately dropped the course. Only one student changed sections, from IM to SGM, during the semester.

Spring 1973 Choice Questionnaire

Section B - LGM Preference Group

RANK	OVERALL IM	OVERALL LGM	OVERALL SGM	MODE IM	MODE LGM	MODE SGM	INSTRUCTOR IM	INSTRUCTOR LGM	INSTRUCTOR SGM	TOTAL
1	0	21	0	2	17	1	3	13	5	
	0%	100%	0%	10%	81%	5%	14%	62%	24%	
2	6	0	7	4	1	3	1	3	3	
	29%	0%	33%	19%	5%	14%	5%	14%	14%	
3	7	0	6	4	0	4	4	0	2	
	33%	0%	29%	19%	0%	19%	19%	0%	10%	
NONE	8	0	8	11	3	13	13	5	11	
	38%	0%	38%	52%	14%	62%	62%	24%	52%	

NUMBER OF STUDENTS 21
PERCENT OF SAMPLE 42%

Section C - SGM Preference Group

RANK	OVERALL IM	OVERALL LGM	OVERALL SGM	MODE IM	MODE LGM	MODE SGM	INSTRUCTOR IM	INSTRUCTOR LGM	INSTRUCTOR SGM	TOTAL
1	0	1	16	0	1	15	3	5	10	
	0%	6%	100%	0%	6%	94%	19%	31%	63%	
2	5	8	0	3	8	0	4	3	4	
	31%	50%	0%	19%	50%	0%	25%	19%	25%	
3	8	4	0	9	3	0	4	4	0	
	50%	25%	0%	56%	19%	0%	25%	25%	0%	
NONE	3	3	0	4	4	1	5	4	2	
	19%	19%	0%	25%	25%	6%	31%	25%	13%	

NUMBER OF STUDENTS 16
PERCENT OF SAMPLE 32%

NUMBER OF STUDENTS IN TOTAL SAMPLE 50

The instructors were concerned by what seemed to them to be a relatively high percentage of students who chose the

LGM section.[2] It was the hypothesis of the instructors at the time, that one design factor might have contributed to the selection of the LGM section by more of the students than either of the other alternatives. Traditional testing and grading practices were used in all classes, and the students may have felt more secure with traditional instruction when they were to be evaluated by traditional methods.

There were other perceived flaws in this first pilot version of the Choice Model. It seemed to the instructors that too much class time was consumed by the orientation process, and many students did not "appear" to begin serious study of course material until after their choices had been made. In addition, as the semester progressed the instructors grew increasingly frustrated by the provisions for coordination of content sequence and schedule, and by the requirement of uniformity in grading methods.

---

[2] There was some concern about overcrowding, since the LGM instructor would have had an unmanageably large class had enrollments reached the theoretical class capacity of 100 students in the three sections combined. In retrospect, however, the author recognizes that he personally was somewhat surprised that more students did not choose alternatives to the traditional method of instruction. Thus the concern of the instructors was due in part to the potential for overcrowding, and also in part to the unanticipated popularity of the traditional large group mode of instruction.

4.2.2 Second Pilot

Based upon this initial experience, the Choice Model was modified and offered again, with the same course and meeting times, during the Fall 1973 Semester. This time the students reported to three separate classrooms for the initial orientation. The same instructors, using the same respective instructional modes, each outlined their own individual class policies, schedules, testing and grading methods. For administrative simplicity the same text was again used in all classes. For the second and third class days, all students were strongly encouraged (but not required) to attend each of the other two classes, so that they would be familiar with all three alternative instructional environments before making a choice.

These changes were intended to address the problems experienced during testing of the original model design. By meeting in separate classrooms, it was anticipated that students would find the orientation process less intimidating. Providing three days for orientation instead of six days was intended to permit instructors and students to get into course content more quickly, while still allowing time for exposure of all students to all three of the IM, LGM, and SGM alternatives prior to making choices.

Changes were also made within each environment. The instructors were encouraged to independently design entire learning environments which were internally consistent with respect to their personal styles and modes of instruction,

rather than to "wrap" their instructional modes in externally consistent packages. It was hypothesized that students and faculty alike would feel more comfortable in nontraditional environments which were less traditionally structured.

At the end of the orientation phase, students were given a revised preference questionnaire. (See appendix D) The students were initially instructed to choose their preferred environments. Subsequently, they were instructed to rank their preferred instructor/style combinations without regard to the actual combinations available.[3] Preference groups were formed on the basis of initial choices, without regard to the subsequent preference rankings.

The data derived from the revised preference questionnaire are presented in table 3. The table is presented in three sections, one section corresponding to the rankings provided by each environmental preference group. The individual column headings of IM, LGM, and SGM identify the instructors who participated in the study. These individual

---

[3]On the original survey form students were instructed to rank order their preferences for the available instructional environments (combined instructor/method packages), as well as their independent preferences for instructor and method. On the revised survey form students were instructed to rank order their preferences for any of the nine hypothetically possible instructional environments which could be obtained by pairing any of the three instructors with any of the three instructional modes.

columns are grouped into sets of three corresponding to the three alternative modes of instruction.

Table 3 shows that for this second design of the Choice Model the distribution of choices was essentially similar to the distribution of choices for the first design. Sixty-three students participated in this second pilot study, as compared with fifty students in the original pilot.[4] A total 40% of the students in the second pilot chose the LGM environment, as compared with 30% each for the SGM and IM environments. The corresponding percentages from table 2 for the original pilot were 42%, 32%, and 26%.[5]

---

[4] The author has attributed the increased level of enrollment to normal differences between spring and fall enrollment patterns at the College, rather than to changes made to the Choice Model.

[5] The reader should note that many of the instructor/mode combinations indicated in this table of preference rankings were hypothetical combinations not actually available for student choice. The first LGM column in table 3 corresponds to the LGM instructor using the lecture style (a real option); the next LGM column corresponds to the LGM instructor using the small group mode (a hypothetical option); the last LGM column corresponds to the LGM instructor using the individual style of instruction (another hypothetical option.) The author reemphasizes that assignments to the actual instructional environments were based on specific choices from among the real options, which were specified separately from the preference rankings for real and hypothetical options.

TABLE 3

Fall 1973 Choice Questionnaire

Section A - IM Preference Group

RANK	INSTRUCTOR 1 W/LEC MODE			INSTRUCTOR 2 W/SG MODE			INSTRUCTOR 3 W/IND MODE			TOTAL
	LGM	IM	SGM	SGM	LGM	IM	IM	LGM	SGM	
1	1	18	4	1	0	4	4	1	0	
	5%	95%	21%	5%	0%	21%	21%	5%	0%	
2	3	1	3	4	2	6	5	3	5	
	16%	5%	16%	21%	11%	32%	26%	16%	26%	
3	2	0	3	4	2	6	5	2	2	
	11%	0%	16%	21%	11%	32%	26%	11%	11%	
4-9	1	0	2	3	2	0	0	1	2	
	5%	0%	11%	16%	11%	0%	0%	5%	11%	
NONE	12	0	7	7	13	3	5	12	10	
	63%	0%	37%	37%	68%	16%	26%	63%	53%	

NUMBER OF STUDENTS 19
PERCENT OF SAMPLE 30%

Section B - LGM Preference Group

RANK	INSTRUCTOR 1 W/LEC MODE			INSTRUCTOR 2 W/SG MODE			INSTRUCTOR 3 W/IND MODE			TOTAL
	LGM	IM	SGM	SGM	LGM	IM	IM	LGM	SGM	
1	23	3	2	0	2	0	0	0	0	
	92%	12%	8%	0%	8%	0%	0%	0%	0%	
2	0	1	0	6	3	2	3	4	2	
	0%	4%	0%	24%	12%	8%	12%	16%	8%	
3	2	2	1	3	3	2	4	2	1	
	8%	8%	4%	12%	12%	8%	16%	8%	4%	
4-5	0	0	1	0	0	0	0	1	0	
	0%	0%	4%	0%	0%	0%	0%	4%	0%	
NONE	0	19	21	16	17	21	18	18	22	
	0%	76%	84%	64%	68%	84%	72%	72%	88%	

NUMBER OF STUDENTS 25
PERCENT OF SAMPLE 40%

(CONTINUED)

Fall 1973 Choice Questionnaire

Section C - SGM Preference Group

RANK	INSTRUCTOR 1 W/LEC MODE LGM	IM	SGM	INSTRUCTOR 2 W/SG MODE SGM	LGM	IM	INSTRUCTOR 3 W/IND MODE IM	LGM	SGM	TOTAL
1	0	1	2	15	0	1	0	1	2	
	0%	5%	11%	79%	0%	5%	0%	5%	11%	
2	2	2	3	2	1	4	3	0	5	
	11%	11%	16%	11%	5%	21%	16%	0%	26%	
3	1	6	5	0	0	0	2	1	4	
	5%	32%	26%	0%	0%	0%	11%	5%	21%	
4-6	0	1	4	1	0	3	2	0	1	
	0%	5%	21%	5%	0%	16%	11%	0%	5%	
NONE	16	9	5	1	18	11	12	17	7	
	84%	47%	26%	5%	95%	58%	63%	89%	37%	

NUMBER OF STUDENTS 19
PERCENT OF SAMPLE 30%

NUMBER OF STUDENTS IN TOTAL SAMPLE 63

While the SGM and IM instructors expressed greater comfort with their increased "instructional freedom" under the revised system, the data in section A of table 3 suggest that the pedagogical distinctions between the LGM and IM classes may not have been made sufficiently clear to the students during the orientation phase. Although the IM section featured the individual style of instruction (self-pacing) as a particularly distinctive feature, 95% of the students in the IM preference group preferred the "lecture" style with the "IM" instructor. It is possible that many students thought they were in reality choosing between two lecture style sections, and one small group section. An alternative interpretation of these data however, is that

relatively few students in the total sample preferred the self-paced style of instruction, and that those who chose the IM environment based that choice primarily on the instructor rather than the style of instruction.

At the end of the semester, however, the IM instructor expressed personal misgivings about "individual" methods of instruction, and decided not to continue participating in the study. While it is unclear to what extent these misgivings were reflected in the student choices, the author recalls the words of Wallen and Travers with respect to comparative teaching methods research.[6]

> One can hardly expect a teacher to put full effort into the utilization of a teaching method which he does not consider sound or personally congenial. [1963: 467]

Another problem which occurred during this test of the second model design concerned the method used for student rotation between different classrooms during the orientation phase. Due to administrative oversight, the SGM classroom was isolated in a different building from the LGM and IM classrooms, and few students came for exposure to this environment on the on the second and third days of orientation. An undetermined number of students, perhaps as high as 50%, who originally attended the LGM classroom on the

---

[6] The author was particularly careful in later implementations of the Choice Model, to assure that all three participating instructors were personally and professionally comfortable with their respective modes of instruction.

first day, never left that class in order to experience the other learning environments on the other days.

4.3 DESIGN CHANGES

Before describing the third pilot study of the Choice model, it is necessary to briefly discuss two specific changes in the study which were made during the mid-1970's. One change dealt with the content and structure of the course being used for the study. The second change concerned alteration in format from one which emphasized the comparative aspects of the study to one which was primarily descriptive in nature.

4.3.1 Mini-Courses

At the same time that the Choice Model was first being designed and tested, the mathematics faculty at Prince George's Community College were preparing to change the length and organization of finite mathematics courses. Finite Mathematics I, the course taught in 1973 for the first two pilots of the Choice Model, dealt with the topics of functions, graphs, matricies, and linear programming. It was the first of a two-semester sequence of courses. During the mid-1970's, the Mathematics Department changed the original finite mathematics program from a sequence of two three-credit full semester courses, to a collection of several one-credit five-week mini-courses in the area of finite mathematics and applied calculus.

The author hypothesized that mini-courses might offer significant advantages over semester-long courses in the design and testing stage of the Choice Model. Both the first and the second pilot studies had resulted in class size imbalances favoring the traditional method. The instructors were then forced to wait for the next fifteen-week semester, before they could change the model design and test the revisions with another pilot study. It was also difficult to adjust the distribution of students between the environments after the orientation phase was over. Students seemed reluctant to change sections during the course, even when they were not experiencing particular success in their chosen mode.

By testing the Choice Model during a five-week session, it appeared that it would be easier to make adjustments during the semester by permitting new choices to be made every five weeks. Students could be given the opportunity to change their initial mode choices for the second mini-course, and instructors would have the opportunity to correct serious disparities in class size if necessary. Hence the author made the decision to postpone more pilots for several semesters, until the mini-courses were in place and interested instructors had gained experience using the LGM, SGM, and IM techniques in the new shorter course formats.

4.3.2 DESCRIPTIVE STUDY

In addition to the change from semester long courses to mini-courses, the major goal of the study itself was also changed after the first two pilot studies. The author originally approached the design of this study with the goal of investigating whether one could affect improvements in mathematics achievement through the mechanism of accommodating individual differences by offering students a choice among alternative learning environments. The author reached two major conclusions from the pilot studies, conclusions which led to a philosophical change of purpose. Rather than continuing to pursue the goals associated with a comparative statistical study, the author began instead to document and describe the evolution of the the Choice Model.

As a result of the first pilot study, the author concluded that the SGM and IM instructors in particular, needed significant latitude in order to design and offer not just alternative instructional modes, but complete and internally consistent learning environments. This seemed necessary in order that enough students would view the alternatives as attractive, in comparison with the more familiar environments of their previous experiences. As indicated earlier, the instructors reacted negatively to a tightly controlled study. They expressed the opinion that students seemed reluctant to choose nontraditional modes of instruction, when testing and grading procedures remained fixed in a traditional manner. All instructors felt con-

strained by their inability to adjust classroom activities, policies, and procedures as the course progressed.

The author also learned from the first two pilots that the task of finding a feasible way to structure the Choice Model was not trivial; on the contrary it was in fact quite challenging. As this lesson was becoming clear, the author gradually began to concentrate more on the development of the Model for offering students a choice between instructional environments, and less on the cognitive effects of learning with different instructional modes. This change was also influenced by the apparent fact that retention of the tight experimental controls which were necessary for a comparative study was proving to be counter-productive in the model-development process.

As a result of these early experiences and subsequent decisions, the design of the study was transformed from that of a comparative study, to measure changes in academic achievement, to a descriptive study of:

1. The Choice Model as a vehicle for individualization of college mathematics instruction.
2. Student characteristics as measured by self-report take-home instruments, and how these characteristics might relate to preferences for alternative learning environments.
3. Student characteristics as indicated by academic archive data, and how these characteristics might relate to environmental preferences.

The task of assessing the impact of the Choice Model upon student achievement and other student characteristics has in the main been left as an issue for future research studies.

4.3.3 Final Pilot

The study resumed with the third and final pilot version of the Choice Model during the Fall 1976 Semester, this time involving three mini-courses covering the content of Finite Mathematics II (MAT 110). The mini-courses were entitled:

1. Logic (MAT 11A)
2. Permutations and Combinations (MAT 11B)
3. Probability (MAT 11C)

The change in course content was necessary in order to assure sufficient enrollment for three sections at the same hour. Included in the change to mini-courses was a prerequisite change for these three courses from intermediate algebra to elementary algebra. The prerequisite for the mini-courses corresponding to Finite Mathematics I remained intermediate algebra. Most finite mathematics students began taking the lower prerequisite courses first, resulting in higher levels of enrollment in the MAT 11A-B-C mini-courses, and lower levels of enrollment in the mini-courses corresponding to Finite Mathematics I.

The same LGM and SGM instructors continued to teach in this third pilot of the Choice Model, using essentially the same instructional methods as before. A different IM

instructor joined the team, however, and used the Personalized System of Instruction (PSI) for the new IM option. New non-programmed textbooks were used for the mini-courses. All three instructors used the same texts, but in all other ways fashioned their own unique learning environments. More detailed descriptions of these three environments are provided later in this chapter.

A change in orientation procedure was also made for this third version of the Model, due in part to the influence of mini-courses. Since the choice of learning environment was to be made for a five-week course, the instructors could not reasonably dedicate an entire week (20% of the course) to orientation only. It was decided therefore, to reduce the period for orientation to the three alternative learning environments to the first two fifty-minute class periods.

The orientation phase was divided into four twenty-five minute segments. Three classrooms were again used for orientation, but this time the rooms were close together. Each student was assigned to one room for both days of orientation, and the instructors changed rooms instead of the students. The first orientation segment was for administrative organization, introduction of the mini-courses themselves, and explanation of the Choice Model. During the remaining three segments, each instructor spent twenty-five minutes in each of the three classrooms orienting all the students present to his/her specific learning environment.

4.3.3.1 Post-Orientation Preference

Yet another procedural modification was made, in order to give instructors greater control over the alternative section sizes. Rather than simply allowing students to appear in the classroom of their choice after the orientation phase was over, each student was given a post-orientation take-home packet (appendix E) to complete and return prior to the next class meeting. Each packet contained:

1. Three Learning Environment Evaluation Forms.
2. One Learning Environment Preference Questionnaire.

The students were instructed first to independently evaluate each of the learning environments to which they had been oriented, and to rate each on a separate scale from zero-to-ten, indicating how each environment compared with other high school and college learning environments from their previous experiences. Descriptive questions pertaining to different aspects of each environment were also asked on the evaluation forms.

Next the students were instructed to compare the three environments to each other, and to indicate on three different zero-to-ten scales their respective preferences for studying the first mini-course in each of the three environments. It was explained that three class rosters would be prepared from these preference questionnaires. The instructors expressed the desire to honor all individual preferences to the maximum extent possible, but reserved the right

to preserve a reasonable distribution of students between these rosters.

Table 4 summarizes the data collected in the post-orientation take-home packet. The format of table 4 is considerably different, however, from the formats used for tables 2 and 3. This is due in part to changes made in the preference reporting procedure, and in part due to the fact that not all students could be assigned to preference groups on the basis of their highest preference ratings. In order to achieve an acceptable distribution of students among the three preference groups, nine students who reported highest preference ratings for the IM environment were assigned to their second preference environments. More details pertaining to this issue are discussed following presentation of the post-orientation data itself.

Table 4 is divided into four sections, one section corresponding to each preference group, and the last section pertaining to the total sample. The columns in each section of the table are grouped. The first group of two columns identifies the preferred MODE and NUMber of students for whom the data in each respective row of the table are summarized. The middle three groups of two columns each pertain to the post-orientation preference ratings for each environment. Within each of these groups, the NUM column indicates how many of the students included in the respective row attended an orientation session in the environment corresponding to that column. The corresponding RTG column

indicates the mean zero-to-ten preference rating reported by those students. The last group of three columns presents the mean zero-to-ten evaluation ratings corresponding to the respective preference ratings in the same row.

The first three data rows of each section of table 4, reflect student data pertaining to each of the three respective environments. In each of the first three sections of table 4, the data rows pertain to subgroups of students within the respective preference group who reported a highest preference rating for the mode indicated. In the final section of table 4, the data rows pertain to the final assignments of students to preference groups.

The fourth row in each section of table 4 contains a summary for those students represented in the first three rows. The fifth row contains percentages corresponding to frequencies in the fourth row. The first percentage is based on the total sample of ninety-one students; subsequent percentages are based upon the size of the preference group for that section of the table.[7]

---

[7] In order to assist the reader further in interpreting the data in table 4, the author has included the following brief discussion of some of the information available from section B. There were thirty students assigned to the LGM preference group, twenty-eight of whom reported highest preference ratings for the LGM environment, and two of whom reported highest preference ratings for the IM environment. These thirty students comprised 33% of the sample. All thirty students attended an LGM orientation session; they reported a mean LGM preference rating of 9.2 and a mean LGM evaluation rating of 8.9. Twenty-nine of these students

(Footnote Continued)

Table 4

Fall 1976 Post-Orientation Questionnaire

Section A - IM Preference Group

HIGHEST PREFERENCE		PREFERENCE RATINGS						EVALUATION RATINGS		
		LGM		SGM		IM				
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM
IM	34	33	4.9	31	3.4	34	9.5	5.4	4.4	8.7
LGM	0	0		0		0				
SGM	0	0		0		0				
TOTAL	34	33	4.9	31	3.4	34	9.5	5.4	4.4	8.7
PERCENT	37%	97%		91%		100%				

Section B - LGM Preference Group

HIGHEST PREFERENCE		PREFERENCE RATINGS						EVALUATION RATINGS		
		LGM		SGM		IM				
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM
IM	2	2	5.0	1	1.5	2	8.0	6.0	1.5	9.5
LGM	28	28	9.5	28	4.9	27	4.7	9.1	5.3	5.3
SGM	0	0		0		0				
TOTAL	30	30	9.2	29	4.7	29	4.9	8.9	5.0	5.6
PERCENT	33%	100%		97%		97%4				

Section C - SGM Preference Group

HIGHEST PREFERENCE		PREFERENCE RATINGS						EVALUATION RATINGS		
		LGM		SGM		IM				
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM
IM	7	7	3.7	7	5.9	7	9.3	3.9	5.6	10.0
LGM	0	0		0		0				
SGM	20	19	5.3	20	9.4	18	5.3	5.2	8.8	5.7
TOTAL	27	26	4.9	27	8.4	25	6.3	4.8	8.0	6.9
PERCENT	30%	96%		100%		93%				

(CONTINUED)

(Footnote Continued)
attended an IM orientation session; they reported a mean IM preference rating of 4.9 and a mean IM evaluation rating of 5.6.

Fall 1976 Post-Orientation Questionnaire

Section D - Total Sample

PREFERENCE GROUP		PREFERENCE RATINGS						EVALUATION RATINGS		
		LGM		SGM		IM				
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM
IM	34	33	4.9	31	3.4	34	9.5	5.4	4.4	8.7
LGM	30	30	9.2	29	4.7	29	4.9	8.9	5.0	5.6
SGM	27	26	4.9	27	8.4	25	6.3	4.8	8.0	6.9
TOTAL	91	89	6.3	87	5.3	88	7.1	6.4	5.7	7.2
PERCENT	100%	98%		96%		97%				

Additional detailed discussion of the data in table 4 is not appropriate at this time. The author does make later reference to data from table 4 while discussing conclusions drawn from the third pilot. The table has been presented here for the primary purpose of permitting comparisons among overall distributions of preference and evaluation data for the three pilot versions of the Choice Model, and the final version of the Model which has been described later in this chapter. Data pertaining to the final version of the Choice Model are presented and discussed in chapters 5, 6, and 7.

4.3.3.2 Post-Instruction Evaluation

During the last week of the first mini-course all students were given a post-instruction take-home packet (appendix F.) This packet contained:

1. One Learning Environment Evaluation Form, for the course just ending.
2. One Learning Environment Preference Questionnaire, for selection of an environment for the second mini-course.

The post-instruction evaluation and preference forms were essentially similar the post-orientation forms. One of the purposes of the post-instruction questionnaire was to assess environmental preference changes before the start of the second mini-course. Another purpose was to assess the importance of the choice experience itself. For this purpose, one additional item was added to the post-instruction evaluation form. This was a zero-to-ten rating scale for student evaluation of the importance of being able to select a learning environment.

The data collected from these post-instruction questionnaires are presented in table 5. Most of the row and column headings in table 5 are identical those of table 4; the differing columns are described below. The first NUM column reflects the distribution of the new post-instruction preferences. The new evaluation column labeled CH contains average student ratings of the choice experience itself.

In order to facilitate comparisons between the data in tables 4 and 5, the first three sections of table 5 pertain to the same post-orientation preference groups which were presented in the corresponding sections of table 4. The rows in each section of table 5 summarize the data for students in the original preference groups, according to their highest post-instruction preference ratings, as indicated in the MODE column. The percentages given in each section of table 5 are based upon the number of students in the corresponding section of table 4.

Table 5

Fall 1976 Post-Instruction Questionnaire

Section A - IM Preference Group

HIGHEST PREFERENCE		NEW PREFERENCE RATINGS						EVALUATION RATINGS			
		LGM		SGM		IM					
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM	CH
IM	19	0	4.3	0	2.9	20	9.0			8.0	9.1
LGM	1	0	10.0	0	5.0	1	9.0			8.0	10.0
SGM	0										
TOTAL	20	0	4.6	0	3.0	20	9.0			8.0	9.1
PERCENT	59%										

Section B - LGM Preference Group

HIGHEST PREFERENCE		NEW PREFERENCE RATINGS						EVALUATION RATINGS			
		LGM		SGM		IM					
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM	CH
IM	1	1	8.0	0	5.0	0	10.0				
LGM	22	22	9.7	0	3.2	0	4.4	8.8			9.2
SGM	2	2	6.0	0	9.5	0	3.5	6.5			8.5
TOTAL	25	25	9.3	0	3.8	0	4.5	8.6			9.1
PERCENT	83%										

Section C - SGM Preference Group

HIGHEST PREFERENCE		NEW PREFERENCE RATINGS						EVALUATION RATINGS			
		LGM		SGM		IM					
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM	CH
IM	1	0	1.0	1	8.0	0	10.0		9.0		8.0
LGM	2	0	9.0	2	6.0	0	3.5		8.0		9.5
SGM	17	0	4.2	17	9.7	0	3.5		8.6		9.4
TOTAL	20	0	4.5	20	9.3	0	3.8		8.5		9.5
PERCENT	74%										

Section D - Total Sample

HIGHEST PREFERENCE		NEW PREFERENCE RATINGS						EVALUATION RATINGS			
		LGM		SGM		IM					
MODE	NUM	NUM	RTG	NUM	RTG	NUM	RTG	LGM	SGM	IM	CH
IM	20	0	4.6	0	3.0	20	9.0			8.0	9.1
LGM	25	25	9.3	0	3.8	0	4.5	8.6			9.1
SGM	20	0	4.5	20	9.3	0	3.8		8.5		9.5
TOTAL	65	25	6.4	20	5.2	20	5.7	8.6	8.5	8.0	9.2
PERCENT	71%										

Table 5 indicates that sixty-five students (71% of the original sample) completed post-instruction questionnaires. Completion rates by preference groups were 59% for IM students, 83% for LGM students, and 74% for SGM students. These questionnaires were distributed during the final exam, and were collected during the last class meeting when final exam grades were given to the students. This procedure yielded more returned questionnaires than might otherwise be expected.[8] Grade data have not been presented for students in the pilot studies; the reader is cautioned, however, not to assume that all of the students who completed post-instruction questionnaires also passed the course.

A total of seven students (10% of those reporting) indicated preference changes. Sections A shows that one IM student reported a highest post-instruction preference for the LGM environment. According to section B, one LGM student reported a preference for the IM environment after the first mini-course, and two LGM students reported SGM preferences. Similarly, section C shows that one SGM student reported a highest post-instruction preference for fro the IM environment, and two others reported preferences for the LGM environment. In the interest of clarity, it must be reemphasized that these questionnaires were

---

[8] The post-instruction packets were distributed at the beginning of the second mini-course for the final version of the Choice Model. The data presented in chapter 7 will show that 53% of the packets were returned for analysis.

collected before the start of the second mini-course, and do not reflect actual changes to the second environment.[9]

Section D of table 5 shows that all preference groups gave the choice experience high ratings. The overall mean rating was 9.2. The reader is reminded however, that these ratings were given by the 71% of the sample who took the final exam for the first mini-course. Data were not available for students who did not complete the course, and it is only fair to point out that their ratings of the choice experience might have differed significantly.

4.3.3.3 Conclusions

Several tentative conclusions were drawn from this third pilot study. First, the combined change in the IM environment to PSI format with a new instructor seemed to appeal to students, in a way which the earlier programmed instruction environment had not. For the first time, the students in a pilot sample selected the IM class (a nontraditional environment) as the most popular environment.

It was hypothesized that the PSI grading option, which has been described later in this chapter, was a significant factor in the IM popularity, and that some students may not

---

[9] Continuation in the second mini-course required successful completion of the first course. Some of the students who reported preference changes did not pass the first mini-course, and thus did not continue to participate in the study.

have realistically considered the other aspects of the IM environment before forming their preferences. It also appeared that students may not have been getting a sufficient orientation to the SGM environment. Only 22% of the original sample identified SGM as their preferred environment, and additional classroom orientation time was needed before many of the students in that environment began to function in their learning groups.

Pertaining to the rating system, in many individual cases the difference between a student's zero-to-ten preference and evaluation ratings of an environment were not significantly different, leading to the hypothesis that students were probably reporting essentially the same information on both scales in many cases. In addition, many of the ratings were extreme: 9 or 10 for the top preference (or evaluation) and 0 or 1 for the other two. It appeared that many students were more inclined to use the zero-to-ten rating in order to assure that their preferred choice of environment was honored, than to attempt an accurate assessment of the relative merits of each environment.

4.3.4 Final Adjustments

The author felt generally encouraged by the results of the third pilot version of the Choice Model, and decided to make one last set of adjustments, before testing the final version of the Choice Model during the Spring 1977 Semester. A major modification was needed in the orientation and selection process for this final version. The conclusions described above concerning the inadequacy of the orientation process were supported by the comments of several students from the third pilot sample who indicated in their evaluations that the twenty-five minute orientations to unfamiliar instructional modes (SGM or IM) were insufficient.

Since time was very crucial in the five-week mini-courses, it was not feasible to lengthen the orientation period. Instead, one of the author's reviewers suggested that video tapes of nontraditional classes "in action" might contribute positively to the effectiveness of the twenty-five minute orientation sessions. During the third mini-course of the Fall 1976 Semester pilot study, a video camera on a tripod was brought into each of the nontraditional classrooms for a full class period of video taping. The instructors later edited out brief portions of these video tapes to use in the orientation sessions for the final test of the Choice Model.

Additionally, the evaluation and preference sheets were modified and condensed for use in a revised post-orientation take-home packet. (See appendix G.) The comment portions

of the separate evaluation forms were combined on a single page to encompass all three environments. The separate zero-to-ten preference and evaluation ratings of each learning environment were replaced by an eighteen-item Likert scale questionnaire pertaining to all three environments. This questionnaire was designed to measure each students' relative attitudes towards each of the three environments.

Six items, three positive and three negative, were selected from the Hildenbrand [1976] twenty-item instrument to assess mathematics attitude in the small-group environment. Three versions of each of these six items were used, one pertaining to each environment. One version of each question was left in original form to address the SGM environment; the other two versions of each question were slightly reworded so as to address the LGM and IM environments respectively. The resulting eighteen items were then combined in random order to form a single questionnaire.

During analysis, however, the six items pertaining to each distinct environment were evaluated separately, yielding three separate scores, which were based upon the attitudes students reported on the questionnaire with respect to each environment. These scores, in conjunction with the written responses and comments, were used in the final version of the Choice Model to determine student "preferences", and subsequently to form class rosters for each environment.

The post-instruction evaluation and preference forms were modified and used in a similar manner for the final study. (See appendix H.) During the fall 1976 semester, the post-instruction take-home packet was distributed and collected at the end of the first mini-course. During the spring 1977 semester, there was not sufficient time to distribute and collect the post-instruction packet until the beginning of the second mini-course during that semester. As will be clear from the presentation of post-instruction data for the final study, contained in chapter 7, a lower rate of return of the post-instruction packets was experienced during the Spring 1977 semester as a direct result of this later collection time.

4.4 THE FINAL DESIGN

In this section of chapter 4, the author describes the final design of the Choice Model, as it was tested during the spring 1977 semester. Data pertaining to the pre-instruction data are presented and discussed in chapters 5 and 6. Post-instruction data are presented and discussed in chapter 7.

A major portion of this section is devoted to descriptions of the learning environments offered in the final version of the Choice Model. It is not the contention of the author that the LGM, SGM, and IM environments described here represent either the "ideal" three modes of mathematics instruction, or the "ideal" environments in which any of the

three respective instructional modes could be offered. The author does in fact believe that there is a clear consensus in the literature of individual differences and alternative instructional models to the effect that even the existence of such "ideals" has yet to be established.

The author contends that the three environments presented here are appropriate alternatives both for the student population served by the course of instruction, and for the respective instructors who designed them. In chapter 3 the author reviewed literature pertaining to the instructional modes themselves. That literature showed that each mode had already been subjected to what was then "state-of-the-art" comparative research in the area of higher education. The author was unable to find, however, any conclusive evidence in support of either the relative superiority or inferiority of any of the three modes.

In addition, as the author indicated in chapter 1, these three modes of instruction were selected for the study, in part because they were already in use at the College. Each of the instructors was already experienced in teaching the course content by her/his respective mode of instruction prior to using it in this study, and each had developed his/her instructional environment through actual classroom use and modification prior to offering it in this study. A basic goal of the Choice Model was to package existing alternative instructional modes, so that students

would have greater opportunity to study and learn in their preferred instructional environments.

While alternative instructional environments are at the heart of the Choice Model, other factors are also important to its design. For the purposes of this study, the Choice Model was adapted for use with five-week mini-courses. This section begins with a description of those mini-courses. The alternative environments are then described in the mini-course context. To conclude this section, the author describes the pre-instruction (or orientation) phase, the instruction phase, and the post-instruction phase of the Choice Model as it was employed in the mini-course program.

4.4.1 Course Structure And Content

The course with which this study of the Choice Model was last tested, was entitled Permutations and Combinations (MAT 11B). This five-week, one-credit mini-course was offered at the Prince George's Community College for undergraduate students desiring or required to study topics in the area of finite mathematics. This course was one of a package of nine different mini-courses in finite mathematics and applied calculus which were offered primarily for students preparing to transfer to a four-year college or

university in business administration or one of the social sciences.[10]

Three basic reasons prompted the selection of Permutations and Combinations as the course used in this study:[11]

1. It was an entry level freshman mathematics course with sufficient enrollment to permit the scheduling of a special "choice" section for up to one hundred students at the same hour.
2. As a mini-course, it offered the instructors greater flexibility to make adjustments to the Choice Model during the semester, should that become necessary in order to remedy undesirable situations. Of particular concern was the poten-

---

[10] This mini-course program has since been discontinued at the College. A complete postmortem of the mini-course program is not directly relevant to this study, since use the Choice Model is not dependent upon a five-week course format. A brief comment, however, is appropriate. The mini-course format at PGCC resulted in increased administrative overhead for the institution, including increased instructional management tasks for the teaching faculty. Due to a variety of factors, the program never achieved the level of flexibility envisioned. The author and other mathematics teaching faculty felt that without greater flexibility, the program did not offer enough benefits to offset its additional burdens. After several years of existence, therefore, the mini-course program was terminated, and the teaching of all finite mathematics courses returned to the traditional three-credit sixteen-week format.

[11] Two other mini-courses were offered in sequence during that semester, following Permutations and Combinations. Although the Choice Model was used with the same student sample for all three mini-courses, only data associated with the first course are addressed by this study.

tial for significant class imbalances if one or more of the initial environments proved to be basically unattractive to students.

3. The course structure was readily adaptable to alternative learning environments.

Special texts for all mini-courses were prepared for and adopted by the Mathematics Department. Principles of Counting [Pohl, 1977] was written especially for the MAT 11B mini-course, although not specifically for this study. The text content was divided into four modules, each of which began with a general statement of the learning objectives, and ends with an exercise set. Students could optionally purchase a programmed supplement for the text, also by Pohl [1973].

One of the issues pertaining to the adoption of mini-courses was the amount of class time which would be needed for testing, in order to assign grades once every five weeks, instead of once at the end of a fifteen-week semester. In response to this concern, the faculty in the Mathematics Department developed a set of three alternative mastery tests to measure student achievement of the stated objectives for each module in each mini-course. Appendix I contains a sample set of objectives and a sample mastery test.

Mastery testing was not restricted to just those participating in this study, nor to just IM students in particular. These tests were available for all mini-course

students to take in a college-wide testing facility, called the Mastery Learning Examination Center (MLEC), during the hours 8:00 am to 9:30 pm on Monday through Friday, and 9:00 am to 12:00 noon on Saturday. The mastery tests were graded by test proctors in the MLEC so that students could learn their scores immediately.

The graded tests were then returned to the appropriate instructors, so that the students could be given the opportunity to review their individual work. All mini-course instructors were free to use these mastery tests in whatever way they wished, as long as copies were not given back to the students for their retention. Each instructor in this study did incorporate these mastery tests into their student grading systems in different ways.

4.4.2 Instructional Environments: Mode And Style

The literature, which has been reviewed extensively in chapters 2 and 3, shows that an instructional environment is affected by many factors, including both the personal style of the instructor and the mode in which course content is presented and studied. Instructor styles and preferences influence many aspects of the environment, including methods of presentation, classroom organization and formality, student-instructor rapport, student assessment techniques, and classroom communication patterns.

In the descriptions which follow, the author has attempted to describe some of the primary "observable"

characteristics of the three alternative environments included in this study. These environments were fashioned by the individual instructors. No specific attempt has been made to describe characteristics of the instructors themselves, but descriptions of their instructional creations may provide the reader with some insight into their personal styles. Some descriptive and measured data pertaining to the instructors are provided in chapters 5, 6, and 7.

As the author has indicated in previous chapters, the alternative environments in the Choice Model have been categorized according to the size of the predominant group with or within which interaction occurs in the classroom:

1. Large Group Mode (LGM). The entire class is generally free to participate in and/or observe most classroom interactions. The author frequently refers to this as the traditional mode of instruction.
2. Small Group Mode (SGM). The class is subdivided into small groups of approximately five students; students primarily participate in and/or observe the interactions which occur within their group, and between their group members and the instructor.
3. Individual Mode (IM). Each student is permitted to interact independently with the instructor, as well as with others present in the physical environment. Although formalized group interac-

tion is not a primary component of this mode, a wide variety of informal and spontaneous group interaction is permitted.

The author concluded from the pilot studies that simply offering students an uninformed "free choice" between these three modes of content presentation did not provide a feasible instructional model. While he does not contend that the Model presented here is the only feasible way to offer students a choice between alternative instructional environments, the author does believe that the following two elements are important in achieving feasibility for this Choice Model:

1. Each instructor is given maximum freedom, consistent with existing time and content constraints, to fashion a complete instructional environment which both reflects and complements the instructional mode and the instructor's personal style.
2. The students are briefly exposed to each instructional environment, and then asked to carefully complete questionnaires which permit assessment of written comments by individual students, and measurement of individual student "preferences" pertaining to each of the three environments. Class rosters are then prepared, based upon the combined assessment of all student responses to these questionnaires.

4.4.2.1 Large Group Mode (LGM)

The LGM environment included in the final test of the Choice Model belonged to the general category of traditional lecture/discussion modes of classroom instruction. The class met in a standard mathematics classroom, containing individual tablet-arm chairs arranged in rows which faced the instructor and the chalkboard. The room capacity was approximately forty students. Students were encouraged to participate in class discussions by asking and answering questions, solving problems, and helping other students to solve problems. Although the instructor would occasionally assign individual or informal small-group problem-solving exercises during class time, these activities were supplemental to the majority of the classroom activities, which were conducted in the large group mode.

The instructor set the instructional pace, first by distributing to the students a tentative work schedule for the course, and then by presenting the course material, using the lecture/discussion mode, in close adherence with that schedule. The students were encouraged to keep up with the schedule on a daily basis, and were invited to seek individual help from the instructor both during class and during scheduled office hours.

The course content was presented in four modular units, in accordance with the text. Students were required to take one out-of-class ten-point mastery test in the MLEC, pertaining to each module. The lowest of these four mastery-

test scores was dropped from each student's grade computation at the end of the course. In addition, there was a thirty-point in-class test on each of the first three modules, and a sixty-point cumulative final examination at the end of the five-week mini-course. Student grades were based upon that percent of the total possible 180 points which were actually earned. Grades were assigned according to the traditional criteria.

1. A - 90% to 100%
2. B - 80% to 89%
3. C - 70% to 79%
4. D - 60% to 69%
5. F - 0% to 59%

4.4.2.2 Small Group Mode (SGM)

The SGM environment was fashioned after the Small-Group Discovery method described by Davidson [1971]. The class was divided into five groups of approximately five students each. Group composition was determined by the instructor, based primarily upon the following information pertinent to each student.

1. Home address.
2. Course schedule.
3. High School mathematics grades.

This information was collected on an in-class questionnaire during the third class period; the first meeting of the SGM student group.

While the literature describes many alternative grouping methods, the instructor chose the approach described below, on the basis of:

1. The need for a quick grouping technique for use in a five-week mini-course.
2. Previous experimentation with other grouping techniques in the nonresidential community college setting, in both mini- and traditional- length courses.
3. Student preferences.

Based upon previous grades, the instructor attempted to make assignments to groups which would provide for heterogeneity of mathematics achievement within each group. Simultaneously, in order to maximize opportunity for group members to continue their work together outside of the formal class meeting time, the instructor also considered schedule and residence information during the group assignment process. No class time was available in the mini-course for students to get acquainted after the orientation period and before group assignments were made, but if a student expressed a particular preference on the questionnaire, that preference was generally honored.

During the course, the SGM instructor distributed a sequence of small-group worksheets, each corresponding to a different course module in the text. When a group had progressed independently through the material on one worksheet, each group working at its own group rate, the next

worksheet was distributed to that group. Worksheet problems were designed to lead the students in their small-group examination of the module objectives provided in the text. While these worksheets were based upon the style of those used by Davidson in his discovery model, they were not strictly speaking intended as "discovery" vehicles. The students were encouraged to read and study the text, in which module objectives and instructional material pertinent to those objectives were presented. A sample worksheet is included in Appendix J.

A standard classroom, like that described for the LGM section, was used for the SGM class, but the room was arranged and used differently. There were chalkboards on three of the classroom walls. Each group was assigned its own "group space", adjacent to a section of chalkboard. Some groups arranged their chairs in a semi-circle facing their section of chalkboard, while other groups stood at the board instead of using chairs. The instructor encouraged all group members to work at the chalkboard, and to follow these guidelines from Davidson [1971]:

1. The students in each group work should together cooperatively to achieve a group solution to each problem.
2. Everyone must understand the solution to one problem before the group tackles a new one.
3. Everyone must listen carefully and try, whenever possible, to build upon the ideas of others.
4. There is no specified leader for the group.
5. Everyone should participate, and no one may dominate the group discussion.
6. Students should take turns writing solutions on the board.

The instructor occasionally used a brief five-to-ten minute portion of a fifty minute class, to introduce new material in the large group setting, or to clarify an issue which was causing general difficulty or confusion. But for the majority of their time in the SGM environment, students worked in their groups discussing course content and solving problems from the group worksheets. The instructor monitored the progress of all groups, intervening when necessary to help resolve problems in both the mathematics and group-functioning. The instructor encouraged groups having difficulty to meet more frequently, in addition to the normal class meeting times. Students, either individually or in groups, were also encouraged to come to the instructor outside of class time for additional assistance.

Student grades were based upon several factors, including graded homework, mastery tests, attendance, and a cumulative final examination. All tests and homework were graded on an individual student basis. Group work per se was not included in the grading formula. The major portion of the final grade (60%) was based upon mastery tests and homework. Four individual out-of-class tests, given in the MLEC, and two individual graded homework assignments were required of each student. Students could, after correcting their errors, receive permission to retake mastery tests and do additional homework assignments. No grades were dropped; each test and assignment was equally weighted in determining a coursework average.

Although different groups completed the worksheets at different rates, individual students were required to complete the first two module mastery tests and the first homework assignment by the end of the third class week. Completion of the remaining mastery tests and homework assignment was required by the end of the fifth class week, which was also the deadline for completion of all optional retesting of module mastery tests and all optional homework assignments.

Attendance contributed an additional 15% to the final grade. Unless specifically excused by the instructor, attendance was required of all students at all class sessions. The attendance grade was based upon the percent of all class sessions attended; an excused absence was counted as a class attended for this purpose.

The last 25% of the grade was based upon a comprehensive individual in-class final examination. Provision was made for adjusting final letter grade criteria based upon the distribution of total percentage scores within the 0% to 100% range. The distribution of grades presented below, however, shows that in fact all grades assigned at the end of the course fit within a traditional pattern:[12]

---

[12] Traditional pattern: A(90-100%), B(80-89%), C(70-79%), D(60-69%), and F(Below 60%).

1. A - 90% to 96%
2. B - 80% to 83%
3. C - 71% to 76%
4. D - 63% to 64%
5. F - 37% to 53%

4.4.2.3 Individual Mode (IM)

The IM environment was patterned after the Personalized System of Instruction (PSI), which includes the following features:

> (1) The go-at-your-own-pace feature, which permits a student to move through the course at a speed commensurate with his ability and other demands upon his time.
> (2) The unit-perfection requirement for advancement, which lets the student go ahead to new material only after demonstrating mastery of that which preceded.
> (3) The use of lectures and demonstrations as vehicles of motivation, rather than sources of critical information.
> (4) The use of proctors, which permits repeated testing, immediate scoring, almost unavoidable tutoring, and a marked enhancement of the personal-social aspect of the educational process. [Keller, 1968]

Class attendance in the IM environment was voluntary subsequent to the first class meeting. During class time, the instructor and a proctor[13] were both available to assist

---

[13] The term "proctor" is used in the PSI literature to describe the role of an assistant to the instructor. In the IM environment, the proctor was a paid student assistant. His functions included returning mastery tests to students for correction, reviewing those corrections, and providing various forms of tutoring assistance to individual students. Since individualized testing was conducted in a separate facility, the proctor in the IM environment was not directly involved in the test administration process.

students in the classroom. Students could study individually or in informal groups, either in the classroom or elsewhere. They could ask either the instructor or the proctor for individual assistance. Students could also request and receive impromptu lectures by the instructor on selected topics causing them difficulty.

A traditional classroom was also used for the IM section. Although the various classroom activities occurred simultaneously, in different sections of the room, there was limited formal organization of the classroom space. Students arranged their chairs in whatever way suited their individual purposes. There was a table at the front of the room where the proctor could work with individual students. The instructor had found in previous PSI classes, that some students would wait to seek help from the proctor until the instructor left the table. Hence, the instructor tended to move around the room, assisting students who asked for help, and leaving the tutor to function in his own separate space.

A student who chose the IM environment could earn his/her grade according to either of two plans. With Plan One, the student could earn a guaranteed grade of "C" by taking each of the four module mastery tests in the MLEC, and earning a score of at least 80% for each module. Students who initially missed the minimum 80% criteria were given up to two additional chances to meet an alternative minimum module mastery criteria, by retaking other forms of the test, after first correcting their errors and restudying

the module material. The alternative criteria was that a student was required to achieve a minimum 80% module average if retests were taken. Students following Plan One were required to complete testing on the first two modules by the end of the third week of classes, and on all modules by the end of the five-week mini-course.

Plan Two was available for students who preferred it, students wishing to earn an "A" or "B" grade, and students who could not satisfy the requirements of Plan One. With this alternate plan, the student was required to take an in-class mid-term exam during the third class week, and a comprehensive final in-class exam during the fifth week. The mid-term exam score was weighted as one-third, and the final exam score was weighted as two-thirds of the total percentage score used to determine the final grade. Under Plan Two, letter grades were assigned according to the traditional criteria:

1. A - 90% to 100%
2. B - 80% to 89%
3. C - 70% to 79%
4. D - 60% to 69%
5. F - 0% to 59%

Students were permitted to follow both plans, and receive the higher of the two grades earned.

4.4.3 Pre-Instruction Phase

Prior to the commencement of course instruction, the final implementation of the Choice Model provided for several activities which involved both the instructors and the students. First the instructors oriented groups of students to both the Model itself, and to the three alternative instructional environments. Then the students completed take-home questionnaires which were designed to assess their relative preferences for the three environments. Finally, the instructors assembled student rosters for each environment based upon the students' respective environmental preferences.

4.4.3.1 Orientation

As described earlier, the author experimented with several different approaches to the task of orienting students to the alternative instructional environments. Key features of the orientation procedure used for the final test of the Choice Model have been summarized below.

1. Three classrooms, all in close proximity, were scheduled for the same course, at the same meeting time, with one instructor assigned to each room.
2. The roster of all students participating in the study was divided into thirds alphabetically, and students were directed to the appropriate classroom as they arrived on the first class day.

3. During the first twenty-five minutes of the first class session, each instructor dealt with first day registration matters and then oriented students to the course, text, and general nature of the instructional choices, large group (LGM), small group (SGM), and individual (IM) modes, which they would be offered.

4. During the second twenty-five minutes of the first class session, the instructors each explained their own instructional environment to their group of students. Video tapes were used by the SGM and IM instructors to help convey to the students the nature of activities in these alternative classrooms. Students were also given handouts to further explain each environment (Appendix K.)

5. At the end of the first class session, students were instructed to purchase the text, begin studying the first module, and return to the same classroom for the second class meeting.

6. For the second class session, the instructors each reported to a different classroom, following a rotational pattern, to repeat their twenty-five minute introductions to their respective learning environments.

7. During the last twenty-five minute segment of the second class session, the instructors exchanged

classrooms once more to complete the orientation process with the last group of students.

4.4.3.2 Assessment of Preferences

At the end of the second class session during the final test of the Choice Model, each student in attendance was given a take-home packet (appendix G) containing various instruments for them to complete. One questionnaire solicited written comments concerning the three environments, previous student experiences with those environments, and student reactions to the orientation experience. A second Lickert scale questionnaire solicited quantified responses concerning the three alternative environments. The other questionnaires included in the packet were not used for the assessment of preferences, and are described later in this chapter. All students were instructed to complete the packets and return them to a central location by the following day, one day before the third class meeting.

Three learning environment preference scores were computed for each student from the Lickert scale questionnaire, one score corresponding to that student's preference for each of the three respective environments. Based upon the three preference scores individual student preferences for each of the three environments were tentatively ranked. Student comments on the other assessment questionnaire were also reviewed, and used to adjust the preference rankings appropriately.

The complete roster of all students participating in the study was then tentatively divided into three separate rosters, one for each learning environment. If there was little difference between a student's preference scores for two environments, and if the student's comments did not indicate a clear preference for one environment over the other, then that student's assignment to an environment roster was postponed until after those students with "clear and strong preferences" had been assigned to their preferred environments. Then the students with weak or split preferences were assigned to one of their two most preferred environments, in a manner which would create the best balance in roster sizes.

These tentative rosters for the three environments were posted outside each classroom at the beginning of the third class session, and the three instructors were available in the vicinity of each respective list to help students find the appropriate classrooms. Students who expressed dissatisfaction with the environment to which they had been tentatively assigned were permitted to change environments. Students who had missed all or part of the orientation process were directed to attend class in the environment(s) of their choice, and to meet with the instructors for individual conferences, before completing their take-home packets. Students who turned-in their take-home packets late were added to environment rosters on the basis of their

written (and in come cases verbal) comments; their Lickert scale preference questionnaires were scored later.

4.4.4 Instruction Phase

The instructional phase began with the third class session during the first mini-course. The instructional phase continued for the remainder of the semester, spanning three sequential mini-courses. Due to the hierarchical nature of the three courses however, students who were not successful during the first mini-course were not permitted to continue with the second course, but rather were encouraged to change their registrations and repeat the first course.[14]

A second set of take-home questionnaires was distributed at the start of the second mini-course. (See appendix H.) At least in part because non-successful students were not permitted to continue with the second course, the number of packets returned from this second distribution was approximately half the number of returns from the first distribution of take-home packets. The data derived from the second packet were used for post-instruction assessment of the first course, and have been included in this study on that basis. Other data from the second and third mini-courses have been excluded from this study.

---

[14] This was a basic feature of the mini-course program as opposed to a special feature of the Choice Model.

One of the instruments in the second take-home packet was used to assess the students' reactions both to the environments in which they had studied the first mini-course and to the Choice Model itself. The Lickert scale preference questionnaire was also included in the second packet to measure any changes in student preferences for the learning environments. In addition, this information was used to make necessary adjustments to the environment rosters for the second mini-course. The other instruments in the second take-home packet have been described below.

4.4.5 Post-Instruction Phase

Implementation of the Choice Model itself does not require a post-instruction phase. For the purposes of this study however, additional data were collected and analyzed in order to more fully describe both the students who participated in this final implementation of the Model and measurable outcomes of the two previous phases of the study. This analysis, which was conducted after completion of the instructional phase, involved data collected from two sources: Other questionnaires included in the two take-home packets, and data collected from the student's academic records at the College.

4.4.5.1 Additional Questionnaires

For the final study of the Choice Model, some additional instruments were included in the post-orientation and post-instruction take-home packets, in order to measure student characteristics for later descriptive purposes. These additional instruments were not analyzed until after completion of the instructional portion of the study, so as not to influence the instructional behaviors of the three teachers. The two sets of questionnaires used in the Spring 1977 study were distributed in take-home packets, in part because of the need to conserve instructional time in the mini-course format, but also because of the number of instruments included in each packet. Sample copies of the instruments included in each packet are contained in appendices G and H.

The first take-home packet, distributed during the pre-instruction phase at the end of the orientation process, contained the following materials.

1. Orientation Comment Form (Baldwin).
2. Learning Environment Preference Scale [Hildenbrand, 1976] (Modified by Baldwin).
3. Bledsoe Self-Concept Scale [Bledsoe and Garrison, 1962].

4. Personal Report of Communication Apprehension [McCroskey, 1975].

5. Fundamental Interpersonal Relations Orientation - Behavior [Schutz, 1958].

6. Mathematics Attitude Scale [Aiken and Dreger, 1961].

The complete second take-home packet (post-instruction) contained the following items.

1. Learning Environment Evaluation and Comment Form (Baldwin).

2. Learning Environment Preference Scale [Hildenbrand, 1976] (Modified by Baldwin).

3. Personal Report of Communication Apprehension [McCroskey, 1975].

4. Mathematics Attitude Scale [Aiken and Dreger, 1961].

5. Instructor Receptivity Scale [Falcione, 1976].

The author only considers data collected from the first two instruments in the first take-home packet to be essential for implementation of the Choice Model for a single course. Student responses to these questionnaires, one for written responses and the other for Likert scale responses, were initially used according to the procedure described above to establish relative preferences for the three environments. Data from these two questionnaires offered the instructors maximum opportunity to honor student preferences, while still enabling them to retain control over the

total distribution of students between the three environments. The first two instruments in the second take-home packet were necessary for continued use of the Choice Model with the same student sample in the second mini-course. These questionnaires would not be not required in applications of the Model to a single course and student sample.

In addition to the preference and evaluation questionnaires which have already been described, several other instruments indicated in the above lists were included in the two take-home packets. As has already been discussed, these additional instruments were an integral part of the study of the Choice Model, but the data derived from them were not used until after the instructional phase of the study was complete. These additional instruments and their respective functions in this study are briefly described below. More detailed information concerning them can be found in the literature chapters.

1. The Aiken and Dreger Mathematics Attitude Scale [1961] was included in both the post-orientation and post-instruction take-home packets to permit the study of initial attitudes towards mathematics in general, and to measure changes in mathematics attitude over the duration of the first mini-course. Of additional interest was whether any evidence of a possible relation between mathematics attitude and preference for learning environment would be detected.

2. Since the choice of learning environment involves relative preferences for differing social settings, the Bledsoe and Garrison Self-Concept Scale [1962] was included in the first take-home packet. Self-concept is recognized in the literature as an influencing factor in social behavior, and it was of interest to see if a possible relationship between self-concept and preference for learning environment could be detected.

3. Student-teacher and student-student patterns of interaction vary between the LGM, SGM, and IM environments. The FIRO-B [Schutz, 1966] instrument was included in the first packet in order to measure the interpersonal traits which students possessed at the time they expressed their preferences for the three environments, so that possible relations between these measured traits and environment preferences might be detected.

4. Requirements for verbal communication are inherently different in the three environments. Therefore the McCroskey Personal Report of Communications Apprehension (PRCA) [1978] was also included in the first packet. This permitted the author to look for any evidence of a relationship between communications apprehension and preference for the LGM, SGM, or IM environments.

5. Of further interest to the author were student perceptions of the instructors' openness to communication. By including the Falcione Teacher Receptivity [1976] instrument in the second packet, it was possible to look for differences in the measured student perceptions of instructor communication traits, and further to check for any relation between the students' own communications apprehension score and their perceptions of instructor communication openness.

4.4.5.2 Academic Records

Although academic data from student records maintained by the College were collected during the post-instruction phase of the study, some of those data have been classified as pre-instruction data because they came from those portions of the students' records which existed before the Spring 1977 semester. Pre-instruction data were collected for presentation in chapters 5 and 6 to describe the academic backgrounds of the students prior to participating in the final study. The pre-instruction data which were available from College records included:

1. High School overall average.
2. High School mathematics average.
3. Developmental Mathematics grade.
4. Previous enrollment in this course.
5. Algebra I achievement test score.

6. Mathematics interest index.
7. Number of semesters enrolled in college before this course.
8. College credits attempted before this course.
9. Quality points earned before this course.
10. Quality point average before this course.

Not all of these data were available for all students.

Post-instruction data were collected from College records in 1981, after the majority (but not all) of the students who participated in the 1977 study had completed their studies at Prince George's Community College. These data, which were collected for presentation in chapter 7, reveal not only the specific academic outcomes of the study, but also the general academic outcomes of each student's community college experience. The post-instruction data available for collection included:

1. Mini-course grades.
2. Total semesters of enrollment at this College.
3. Total college credits attempted.
4. Total quality points earned.
5. Quality point average.
6. Last semester of attendance.
7. Associates Degree earned.

4.5 ORIGINAL AND ADDITIONAL RESEARCH QUESTIONS

This chapter describes not only the Choice Model itself, but also the developmental process by which it evolved. The original research questions, presented in chapter 1 and repeated below, were also subjected to this evolutionary process. Model development described in this chapter, and post-instruction analyses of both measured and archive data presented in chapters 5, 6, and 7 led to the inclusion of additional research questions in the study. The validity of hypotheses which are themselves based upon prior analyses of data can not be established on the basis of those same data, and hence no such hypotheses have been presented in this study. The inclusion of additional research questions, however, serves to clarify the focus of the data analyses and description which is presented in the remaining chapters.

Original Questions:

1. To what extent did students value the opportunity to choose a learning environment?
2. When did students form their preferences for learning environments offered in the study, and what aspects of those environments were most significant to the students?
3. How were the students' preferences for the learning environments distributed?

4. How were the students' mathematics attitudes affected by the study?

5. How and to what extent were the students' preferences for the learning environments associated with individual traits, as measured by selected normed instruments?

6. How did the grade distributions for the total study group compare with the normal College grade distributions for the same course?

7. How and to what extent were the students' grades earned during the study associated with mathematics attitude and with previously earned high school grades?

Additional Questions Concerning the Pre-Instruction Phase:

8. How were sex of the student and age distributed with respect to environmental preference?

9. How and to what extent were the distributions of the students by sex and age related to sexes and ages of the instructors?

10. How did timing and sequence of the orientation experience affect the distribution of preferences?

11. How accurately did the Lickert scale preference instrument measure students' true environmental preferences?

12. How did self-reported mathematics attitude and sex of the student interact with environmental preference?

13. How did self-reported self-concept, self-ideal-concept, and sex of the student interact with environmental preference?

14. How did sex of the student and the FIRO-B interpersonal traits of expressed and withheld affection, control, and inclusion interact with environmental preference?

15. How did self-reported communication apprehension and sex of the student interact with environmental preference?

16. How did sex of the student and high school grades interact with environmental preference?

17. How did sex of the student and standardized measures of mathematics achievement and interest interact with environmental preference?

18. How did sex of the student and various indicators of previous college experience interact with environmental preference?

Additional Questions Concerning the Post-Instruction Phase:

19. How did sex of the student and course grades interact with environmental preference?

20. How were environmental preferences effected by the instructional phase of the study?

21. To what extent was communication apprehension effected by the instructional phase of the study?

22. How and to what extent were students' grades earned during the study associated with communication apprehension?

23. How and to what extent did student evaluations of their respective learning environments differ?

24. How and to what extent did student evaluations of their respective instructors' accessibility differ?

25. How and to what extent did sex of the student and environmental preference interact with student evaluations of the Choice Model?

26. How and to what extent did post-study academic archive data relate to the pre-study archive data, sex of the student, and environmental preferences.

The data collected in conjunction with the final spring 1977 semester implementation of the Choice Model are presented in the next three chapters. The bulk of the data, which were collected prior to the instructional phase, are presented and discussed in chapters 5 and 6. Additional data collected after the instructional phase are presented and discussed in chapter 7. Based upon these data, the author summarizes brief answers to the above research questions in chapter 8.

Chapter V

ORIENTATION AND PRE-INSTRUCTION PREFERENCE DATA

5.1 OVERVIEW

The subjects of this study were students who studied MATH 11BX, Permutations and Combinations, during the Spring 1977 semester at Prince George's Community College. This was a five-week mini-course, the first in a sequence of three such courses offered for the subjects during that semester. These students were first oriented to each of three alternative learning environments during the first week of class. After the orientation sessions were completed, each student was given a take-home packet containing environmental preference questionnaires, and other selected student characteristic questionnaires.

A total of sixty students attended at least some portion of the orientation phase. Five of these students never returned the questionnaires contained in the take-home packet, nor did they participate in the instructional phase of the study. The remaining sample of fifty-five students were assigned to one of three learning environments, based upon their environmental preferences. Eighteen students (33%) preferred the Large Group Mode (LGM), twenty-four (44%) preferred the Small Group Mode (SGM), and thirteen (24%) preferred the Individual Mode (IM.)

At the end of the instructional phase, a second take-home packet of questionnaires was distributed. These

questionnaires provided for reassessment of environmental preferences, evaluation of the learning environments, and remeasurement of certain student characteristics. Twenty-nine students (53%) of the original sample, returned the questionnaires contained in the second take-home packet.

Several years after the completion of the instructional phase of the study, additional data was collected from the academic records of all fifty-five students; data which had been kept by the College. These data included selected high school information, standardized test scores, academic records pertaining to the students' pre-study college experiences, and similar academic records pertaining to their total college experiences.

Due to the large amount of data collected during this study of the Choice Model, the author has divided the complete database into two major categories for descriptive purposes: Pre-instruction data and post-instruction data. The pre-instruction category includes data which were collected from the post-orientation take-home packet, before students were assigned to their preferred instructional environments, and academic archive data pertaining to the students educational backgrounds prior to enrollment in the course used for this study. The post-instruction category includes data gathered from the second take-home packet, course grades, and other academic archive data.

The pre-instruction database has been further divided into two subcategories; each subcategory is addressed in a

separate chapter. Chapter 5 pertains to the first portion of the pre-instruction database, which includes age and sex data for the participants in the study, data pertaining to the orientation process, and the environmental preference data. Chapter 6 deals with the variety of other measured and archived pre-instruction data pertaining to the students in the study sample. Chapter 7 addresses all of the post-instruction data, and includes selected comparisons between pre-instruction and post-instruction data.

Due in part to the vast variety of data which were collected for this study, and in part to the descriptive nature of the study itself, the author has chosen to consolidate the presentations, analyses, and discussions of related subsets of data within major sections of each chapter. Principal findings are then summarized at the ends of these major sections. In Chapter 8, the final chapter of this study, the author synthesizes the findings contained in chapters 5, 6, and 7, in order to provide general answers to the combined set of research questions which were presented at the end of chapter 4.

Most of the data addressed by chapters 5, 6, and 7 have been summarized in tables which are include in the respective chapters. The individual student data upon which these tables were based have been included in various appendices. Appendices L, M, and N contain the pre-instruction data for all fifty-five students in the sample. Appendices O, P, and T contain the post-instruction data for all students.

Appendices Q, R, and S contain comparative and evaluative data for a reduced sample of twenty-nine students who responded to both the post-orientation and post-instruction take-home packets. Sample packets, which were described in chapter 4, have been included in appendices G and H respectively.

The author begins this first data chapter, by presenting distributions of the students environmental preferences with regard to the sexes and ages of the students. The author found evidence during the analysis of various portions of the database, which appears to reflect differences in the distribution of female students in particular within the sample. Presentation of sex and age data first thus simplifies the discussion of possible sex differences as they occur in subsequent presentations and discussions. Data pertaining to the orientation phase and the actual determination of environmental preferences is addresses in the remaining sections of chapter 5.

5.2 SEX AND AGE

Age and sex data for both the students and the instructors are presented in this section. For comparison purposes, corresponding institutional data are also included here. Crosstabulation tables are provided to show how environmental preferences of students in the study were distributed with respect to sex and age. The individual

data upon which these tables were based can be found in appendix L.

The first data to be presented can be found in table 6, a crosstabulation of the sexes of the students with their preferred instructional environments. The initial discussion of table 6 concerns its format, however, more so than its contents. This is necessary because table 6 serves as the prototype for many of the other tables presented in this study.

5.2.1 Table Format

Many of the data tables in this study have been prepared with the FREQ procedure from the Statistical Analysis System (SAS) [1979: 215-220]. The FREQ procedure was used to produce two-way (and occasionally three-way) frequency and crosstabulation tables. Table 6 shows how student environmental preferences were distributed with respect to sex of the student. Since the formats of all the crosstabulation tables were prepared by the same statistical procedure, the following detailed description of the table 6 format is intended to serve as a model for interpretation of all the other crosstabulation tables in this chapter.[1]

---

[1] The cross tabulation table format prepared by SAS procedure FREQ is relatively compact and easy to follow, once the reader becomes accustomed to that format. The reader who is unfamiliar with this format, however, is advised to carefully study table 6 before continuing on to the study of other tables in the data chapters.

TABLE 6

Distribution of Sex by Preferred Environment

TABLE OF SEX BY ENVIRONMENT_1
SEX SEX OF STUDENT
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

<1>	FREQUENCY				
<2>	EXPECTED				
<3>	DEVIATION				
<4>	PERCENT	<W>	<X>	<Y>	<Z>
<5>	ROW PCT				
<6>	COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
<1>	FEMALE	3	13	3	19
<2>		4.5	8.3	6.2	
<3>	<A>	-1.5	4.7	-3.2	
<4>		5.45%	23.64%	5.45%	34.55%
<5>		15.79%	68.42%	15.79%	
<6>		23.08%	54.17%	16.67%	
<1>	MALE	10	11	15	36
<2>		8.5	15.7	11.8	
<3>	<B>	1.5	-4.7	3.2	
<4>		18.18%	20.00%	27.27%	65.45
<5>		27.78%	30.56%	41.67%	
<6>		76.92%	45.83%	83.33%	
<1>	TOTAL	13	24	18	55
<4>	<C>	23.64%	43.64%	32.73%	100.00%

The first two lines of the table heading identify the table number and title. The third line in the table heading identifies the variable names used by the FREQ procedure to prepare the crosstabulation table. In the case of table 6, the variables are SEX and ENVIRONMENT_1. The fourth and fifth lines of the heading give brief descriptions of these variables. The variable ENVIRONMENT_1 has been used to identify the respective learning environments to which each of the fifty-five students were assigned for study of the

first mini-course, based upon their individual measured post-orientation preferences.[2]

The table is arranged into rows and columns, according to the values of the variables being crosstabulated. The crosstabulation of each combination of variable values is represented in one cell of the table. Each cell contains six entries.[3] In this study the author uses the terms row and column respectively, to refer to the horizontal rows and vertical columns of cells within a table. To refer to an individual entry within a particular cell, he uses the specific name of that entry.

The values of the first variable in the crosstabulation table, identified in the third heading line, always appear in alpha-numeric order from top to bottom, to the left of each row in the table. These values serve as row labels for the table. In table 6 the values of the variable SEX are FEMALE and MALE. The last row label is always TOTAL. Each entry in the TOTAL row pertains to the column in which the

---

[2] ENVIRONMENT_1 has been used as the second (crosstabulation) variable in the majority of the tables presented in this study. In chapter 7, the variable ENVIRONMENT_2 is introduced to identify the respective learning environments which the students preferred for study of the second mini-course, but ENVIRONMENT_1 has still been used as the primary crosstabulation variable so that pre-instruction and post-instruction tables can more easily be compared.

[3] The discussion of the specific meanings of these cell entries has been included at a later point in this description of the table format.

entry appears. For the convenience of the reader in studying the table 6 format, the author has identified the rows with the additional special labels <A>, <B>, and <C> respectively. These special labels are not included in the other tables presented in this study.[4]

The values of the second variable in the crosstabulation table, identified in the third heading line, always appear in alpha-numeric order from left to right, as labels for the respective columns of the table. The values of ENVIRONMENT_1 are INDIVIDUAL, SMALL GROUP, and LARGE GROUP. The last column label is always TOTAL. Each entry in the TOTAL column pertains to the row in which it appears. The bottom two entries in the TOTAL column always pertain to the TOTAL row, and thus represent combined totals for all the data included in the table. For the convenience of the reader in studying the table 6 format, the author has identified the columns with the additional special labels <W>, <X>, <Y>, and <Z> respectively. These special labels

---

[4] Tables prepared by procedure FREQ are not restricted to exactly three rows. In general, there is one row for each value of the first variable, plus a TOTAL row. Some of the longer tables are continued on a second page. When this occurs, the reader will note that that the TOTAL row is identical on each page of the table, reflecting the totals in the respective columns for all entries on all pages of the entire table.

are not included in the other tables presented in this study.[5]

Corresponding to each ordered pair of variable values in a crosstabulation table is a cell, located at the intersection of the respective row and column, which contains six entries.[6] The key to these entries, a copy of which appears below, is the same for all crosstabulation tables and can always be found in the upper-left corner of each table.

<1> FREQUENCY
<2> EXPECTED
<3> DEVIATION
<4> PERCENT
<5> ROW PCT
<6> COL PCT

For the convenience of the reader in studying the format of table 6, the author has inserted the respective cell entry numbers <1>, <2>, <3>, <4>, <5>, and <6> in the left margin of table 6. These cell entry numbers are not inserted in the other tables presented in this study. The

---

[5] Tables prepared by procedure FREQ are not restricted to exactly four columns. In general, there may be one column for each value of the second variable, plus one additional TOTAL column. Although procedure FREQ is capable of continuing onto subsequent pages those tables which have too many columns to fit on one page, the use of this feature has been carefully avoided by the author. Thus all columns pertaining to any crosstabulation table presented in this study are shown on the same page. Tables are continued only when there are too many rows to fit on one page.

[6] The reader may have observed at this point that there are only two entries for each cell in the TOTAL row and in the TOTAL column. A separate explanation of these entries is presented later.

meanings of these six entries are explained below in reference to the first cell (row 1, column 1) of table 6.

<1> <A,W> FREQUENCY: 3

This is the number of students who are represented by this cell. This entry (3) means that there were three females who studied the first mini-course in the IM environment, in accordance with their measured environmental preferences.

<2> <A,W> EXPECTED: 4.5

This is the theoretically expected frequency according to the hypothesis of independence. In this case the hypothesis would state that preference for the IM environment is independent of the sex of the student. Thus this entry (4.5) means that in a group of fifty-five students of whom nineteen were female and thirteen were in the IM environmental preference group, 4.5 females were theoretically expected to prefer the IM environment under the hypothesis of independence.[7]

---

[7] This computation of expected value was made as follows:

- The probability of being female in this sample was 19/55 or 0.345.
- The probability of preferring the IM environment in this sample was 13/55 or 0.236.

Under the independence hypothesis, the expected probability of a female in this sample preferring the IM environment was the product (0.345)(0.236) or 0.082. This probability corresponds to an expectation that 8.2% of the fifty-five students in the sample (4.5) would be female students who preferred the IM environment.

<3> <A,W> DEVIATION: -1.5

This is the difference between the true frequency and the expected frequency (FREQUENCY minus EXPECTED) for the cell. A positive deviation means that the true frequency was higher than the expected frequency; a negative deviation means that the true frequency was lower than the expected frequency. The deviation in this cell means that -1.5 (fewer) females actually preferred the IM environment than would have been theoretically expected under the hypothesis of independence.

<4> <A,W> PERCENT: 5.45%

This is the percentage of the total sample represented by this cell. Thus the number of females in this cell (3) represented 5.45% of the number of students in the total sample (55.)

<5> <A,W> ROW PCT: 15.79%

This is the percentage of the row represented by this cell. Thus the number of females in this cell (3) represented 15.79% of the number of females in the total sample (19.)

<6> <A,W> COL PCT: 23.08%

This is the percentage of the column represented by this cell. Thus the number of females in this

cell (3) represented 23.08% of the number of students in the the IM environmental preference group (13.)

The remaining five cells <A,X>, <A,Y>, <B,W>, <B,X>, and <B,Y> can be interpreted in a manner identical to that described above for cell <A,W>.[8]

As noted earlier, each cell in the bottom TOTAL row <C> contains only two entries. These are the total FREQUENCY and total PERCENT entries for the corresponding columns. By way of illustration, cell <C,W> contains the following information.

<1> <C,W> FREQUENCY: 13

There were a total of thirteen students in the IM environmental preference group.

<4> <C,W> PERCENT: 23.64%

These thirteen students represented 23.64% of the fifty-five students in the sample.

Cells <C,X> and <C,Y> can be interpreted in a manner identical to that given above for cell <C,W>.

---

[8] It is important to note that the deviations from values expected under the hypothesis of independence have not been tested for significance in this study. Indeed, since this is primarily a descriptive study which explores many issues involving choice between alternative learning environments, no hypotheses have been proposed for testing. The author has included expected values and deviations in the data tables because of their value as descriptive statistics. While the proposal of hypotheses for testing by future studies, based upon the findings of this study, is appropriate, selective testing of *a posteriori* hypotheses based upon this data is not appropriate.

Similarly, each cell in the right TOTAL column <Z> contains only two entries. These are the total FREQUENCY and total PERCENT entries for the corresponding rows. By way of illustration, cell <A,Z> contains the following information.

<1> <A,Z> FREQUENCY: 19

There were a total of nineteen females in the sample.

<4> <A,Z> PERCENT: 34.55%

These nineteen females represented 34.55% of the fifty-five students in the sample.

Cell <B,Z> can be interpreted in a manner identical to that give above for cell <A,Z>.

The last format issue to be discussed pertains to cell <C,Z> which appears in the lower-right corner of the table. Located at the intersection of the two TOTAL columns, cell <C,Z> also contains two entries. These are the total FREQUENCY and total PERCENT entries for the entire sample. Cell <C,Z> contains the following information.

<1> <C,Z> FREQUENCY: 55

There were a total of fifty-five students in the sample.

<4> <A,Z> PERCENT: 100.00%

These fifty-five students represented 100.00% of the total sample.

5.2.2 Sexes of Students and Instructors

The total PGCC population of 11,830 students who enrolled in degree programs for the Spring 1977 semester was composed of 6,322 female students (53%) and 5,508 male students (47%.)[9] As was already revealed in table 6, of the fifty-five students in the sample who participated in the instructional phase of the study, nineteen (35%) were female and thirty-six (65%) were male. The author has thus observed that proportionally more males were enrolled in the study mini-course than one would expect on the basis of PGCC population statistics alone.

Although the reader may well conceive of other possible conjectures, the author proposes one particular conjecture concerning this disparity. The conjecture is based upon recent mathematics anxiety literature reviewed in chapter 3. More males than females may have tended to register for this mathematics mini-course, because of overall differences between the sexes in their respective levels of mathematics anxiety.

The literature reveals that mathematics anxiety in females has been shown to affect career and curriculum choices. Specifically, it has been shown that a disproportionate number of females avoid curricula with significant mathematics requirements. That tendency may have affected

---

[9]Source: PGCC Report No. 77-4: Enrollment Report, Spring 1976 and Spring 1977.

enrollments in the mathematics mini-course used in this study. Investigation of this conjecture is not directly relevant to this study, however, and is left instead as a recommendation for future study.

Table 6 reveals several disparities in the distribution of students among the three alternative environments.

1. More students (44%) were assigned to the SGM environmental preference group than to either of the other groups.[10]
2. More than the expected number of female students (68%) were assigned to the SGM preference group, and fewer than the expected number of females (16%) were assigned to the LGM environment.[11]

---

[10] The general method for assignments of students to environments under the Choice Model was described in chapter 4. Specific details concerning environmental orientation and measurement of student preferences are presented in subsequent sections of chapter 5. The reader should be aware at this point, however, that each student was assigned to that environment corresponding to her or his highest preference, as determined from evaluation of the preference forms in the post-orientation take-home packet. In essence, each student was assigned to the environmental preference group of his or her first choice.

[11] The deviation of 4.7 in the FEMALE-SGM cell is 57% higher than the expected frequency of 8.3. The deviation of -3.2 in the FEMALE-LGM cell is 52% higher than the expected frequency of 6.2. The reader is reminded that the expected frequency computation is based upon the percentages given in the TOTAL row and column. Thus the predominance of males in the sample and the relatively higher number of students assigned to the SGM group both affect the expected frequency computations.

3. More than the expected number of male students (42%) were assigned to the LGM preference group, and fewer than the expected number of males (31%) were assigned to the SGM group.[12]

Many conjectures are possible concerning distortions in the distribution of students by sex over environmental preference groups. To propose any particular hypothesis at this point would be premature. The "sex factor" was not anticipated by the author during the design phase of the study, nor was he conscious, during the instructional phase of the study, of any unusual distortion in the distribution by sex of students among the the three environments. Due to the absence of specific plans to study sex factors, little special attention was paid to this topic during the literature review, and none of the instruments used in the study were selected or developed with this factor in mind.

The author first became aware of a sex factor in the database for this study when he collected and began to analyze the archive data in 1981, four years after completion of the instructional phase. As a result of the preference patterns revealed in table 6, the author included sex as a factor for consideration in the additional research questions presented at the end of chapter 4. Whenever it

---

[12] The deviation of 3.2 in the MALE-LGM cell is 27% higher than the expected frequency of 11.8. The deviation of -4.7 in the MALE-SGM cell is 30% lower than the expected frequency of 15.7.

was feasible, during the analysis of the database for the study, the author also included consideration of a sex factor.

The IM and SGM[13] instructors in this study were male, and the LGM instructor was female. No evidence has been found on which to either confirm or reject a hypothesized relationship between the sexes of the instructors and the environmental preferences of the students. Nevertheless, the author believes that it is important to observe that the differing sexes of the instructors were among the characteristics which served to distinguish between the three alternative environments.

---

[13] The author of this study was also the SGM instructor during both the orientation and instruction phases of the study. In case it is not already clear to the reader, the author of this study is male. Although he has found no evidence which suggests a link between the sex of the SGM instructor and the preferences of a majority of the female students for the SGM environment, there is some evidence presented later in this chapter, which suggests that his dual roles of author and SGM instructor may have produced some unintended effects upon the distribution of student preferences. There is other evidence presented later which tends to suggest possible relationships between individual characteristics which appear to be associated with female students in the study and preferences for the SGM environment.

5.2.3 Ages of Students and Instructors

The second set of data included in this section of chapter 5, presented in tables 7 and 8, pertains to the ages of the students. The individual student data included in appendix L shows that the students participating in the study ranged in age from eighteen to forty-five years. For purposes of data presentation, student ages have been grouped into the following age ranges:

1. Under 20
2. 20 to 24
3. 25 to 30
4. 31 to 40
5. Over 40

The crosstabulation of student age ranges with environmental preference groups is presented in table 7.

The total age distribution for PGCC students enrolled in credit courses during Spring 1977 semester was available in slightly different age range categories from those used for table 7.[14]

AGE RANGE	NUMBER OF STUDENTS	PERCENTAGE
Under 21	3,884	28%
21 to 25	4,403	29%
26 TO 35	3,642	26%
Over 35	2,523	18%

---

[14] Source: PGCC Report No. 77-4: Enrollment Report, Spring 1976 and Spring 1977.

TABLE 7

Distribution of Age by Preferred Environment

TABLE OF AGE BY ENVIRONMENT_1
AGE AGE OF STUDENT
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
UNDER 20	4	9	8	21
	5.0	9.2	6.9	
	-1.0	-0.2	1.1	
	7.27%	16.36%	14.55%	38.18%
	19.05%	42.86%	38.10%	
	30.77%	37.50%	44.44%	
20 TO 24	7	12	8	27
	6.4	11.8	8.8	
	0.6	0.2	-0.8	
	12.73%	21.82%	14.55%	49.09%
	25.93%	44.44%	29.63%	
	53.85%	50.00%	44.44%	
25 TO 30	1	1	1	3
	0.7	1.3	1.0	
	0.3	-0.3	0.0	
	1.82%	1.82%	1.82%	5.45%
	33.33%	33.33%	33.33%	
	7.69%	4.17%	5.56%	
31 TO 40	0	1	1	2
	0.5	0.9	0.7	
	-0.5	0.1	0.3	
	0.00%	1.82%	1.82%	3.64%
	0.00%	50.00%	50.00%	
	0.00%	4.17%	5.56%	
OVER 40	1	1	0	2
	0.5	0.9	0.7	
	0.5	0.1	-0.7	
	1.82%	1.82%	0.00%	3.64%
	50.00%	50.00%	0.00%	
	7.69%	4.17%	0.00%	
TOTAL	13	24	18	55
	23.64%	43.64%	32.73%	100.00%

In spite of these age range differences, however, it is clear from the comparison of the TOTAL column in table 7 with general PGCC data given above that the sample of students included in this study was concentrated in the "younger" end of the College population age range. It is the author's conjecture that this difference is a reflection of a general enrollment trend; namely that proportionally more young PGCC students enroll in daytime courses.[15] Investigation of this conjecture is not directly relevant to this study, however, and is thus left as a recommendation for future study.

The primary purpose of table 7 is to show how student environmental preferences were distributed with respect to age range categories. All of the actual cell frequencies in table 7 are close to the expected frequencies under the independence hypothesis. Since the largest deviations from expected frequencies in any table 7 cells are -1.0 and 1.1, representing single students deviations in the under 20 IM and LGM cells respectively, the author has concluded that the distribution of student ages was generally independent of student preferences for the alternative environments.

For purposes comparison with the ages of the students, general age information for the instructors is also provided. The male instructor for the SGM environment, in the

---

[15] The course used in this study was offered at 10:00 A.M. on a Monday-Wednesday-Friday scheduling pattern.

31 to 40 age range at the time of the study, was the youngest of the three instructors. The male IM instructor and the female LGM instructor were both in the over 40 age range. Although it is possible that instructor age was a factor in the determination of environmental preferences by the students, the author has found no evidence of such in the data which was collected and analyzed.

Summary statistics for student ages by both sex and environmental preference have been computed from the data contained in appendix L. These statistics are presented in table 8. In a manner similar to that used for crosstabulation tables 6 and 7, the upper-left cell of table 8 contains the key to all the statistics in each individual cell of the table.

Just as table 6 is the prototype for crosstabulation tables in this study, table 8 is the prototype for summary statistical tables. For this reason, entry, row, and column numbers have been inserted by the author to aid the reader in studying the format of table 8. These aids have not been inserted in the other summary statistical tables included elsewhere in this study.

TABLE 8

Summary Statistics for Age
by Sex and Preferred Environment

<1> MEAN <2> STD DEV <3> MINIMUM <4> MAXIMUM <5> RANGE <6> FREQUENCY	<W> INDIVI- DUAL	<X> SMALL GROUP	<X> LARGE GROUP	<Z> TOTAL SAMPLE
<1> FEMALE	20.00	22.08	20.67	21.53
<2> STUDENTS	0.00	4.21	2.89	3.67
<3>	20	19	19	19
<4> <A>	20	33	24	33
<5>	0	14	5	14
<6>	3	13	3	19
<1> MALE	23.10	22.18	21.07	21.97
<2> STUDENTS	7.87	7.64	3.31	6.13
<3>	18	18	19	18
<4> <B>	44	45	31	45
<5>	26	27	12	27
<6>	10	11	15	36
<1> ALL	22.38	22.13	21.00	21.82
<2> STUDENTS	6.94	5.89	3.163	5.38
<3>	18	18	19	18
<4> <C>	44	45	31	45
<5>	26	27	12	27
<6>	13	24	18	55

As the reader can see upon inspection of table 8, its style is so similar to that of the crosstabulation tables, that lengthy and detailed explanations are unnecessary. One of the differences between the tables, however, is that all cells in the statistical summary tables contain values for all six statistics, whereas in the crosstabulation tables the TOTAL columns and rows only contain two statistics. Thus cell <C,Z> provides the following information concerning the total sample.

<1> <C,Z> MEAN: 21.82

The average age for all students in the sample.

<2> <C,Z> STD DEV: 5.38

The standard deviation of all sample students ages.

<3> <C,Z> MINIMUM: 18

The age of the youngest student in the sample.

<4> <C,Z> MAXIMUM: 45

The age of the oldest student in the sample.

<5> <C,Z> RANGE: 27

The difference between the ages of the oldest and the youngest student in the sample.

<6> <C,Z> FREQUENCY: 55

The number of students in the sample.

All other cells in table 8 can be interpreted in an identical manner.

Table 8 reveals that there was little difference between the all-female average age and the all-male average age. Likewise, there was little difference between the average ages for males and females in the SGM group. Some other relatively weak patterns with respect to average ages, sex and environmental preference group are summarized below.[16]

---

[16] The individual age data in appendix L, as well as data found in tables 7 and 8, reveal that the sample consisted of forty-eight students (87%) in the eighteen to (Footnote Continued)

1. The average age for females in the SGM group (22.0) was somewhat higher than in the combined average for females in non-SGM groups (20.3.)[17]
2. The average age for male IM students (23.1) was somewhat higher than the average age for LGM males (21.1.)
3. The average age for non-SGM males (21.9) was somewhat higher that the average age for non-SGM females (20.3.)

5.2.4 Summary

Data pertaining the sexes and ages of students and instructors have been presented and discussed in this section of chapter 5. The author observed that males outnumbered females in the sample by almost two-to-one. In

---

(Footnote Continued)
twenty-four age range, and only seven students (13%) in the twenty-five to to forty-five age range. The reader is hence advised to exercise caution when using these average age figures, due both to the skew of the age distribution and to small cell sizes. The presence of one high number in a small collection of lower numbers can have a disproportionate affect on the arithmetic mean of the collection.

[17] The combined average age for non-SGM females has been computed from the means and frequencies for the FEMALE cells in the IM and LGM columns respectively. The sum of ages for each cell is the product of the mean by the frequency. The combined average is thus the sum of those products, divided by the sum of the frequencies for the two cells. The combined non-SGM male average has been computed in a similar manner.

addition, he noted that contrary to the collegewide student population age distribution, the vast majority of the fifty-five students in the sample (87%) were under twenty-five years old. The author offered two possible conjectures regarding these sample imbalances.

1. Male predominance in the mathematics mini-course enrollment may have been a reflection of a generally (hypothesized) higher level of mathematics anxiety among the female student population at PGCC.
2. Young adult predominance in the sample may have been a reflection of a general (hypothesized) time-of-day pattern of course enrollment at PGCC.

Cell frequencies in the distribution of male students over environmental preference groups were closer to expected frequency values than were those for female students. Female students preferred the SGM environment approximately twice as frequently (68%) as they preferred either of the other two environments combined (32%.) Male students tended to prefer the LGM environment, but not so strongly as was the tendency for female students to prefer the SGM environment. Although no evidence of a relationship between the sexes of the of the instructors and the environmental preferences of the students was found, the author has noted that the IM and SGM instructors were both males, and that the LGM instructor was female.

Cell frequencies in the distribution of all students by age over environmental preference groups were close to expected values. Age statistics showed weak tendencies, however, for older females to prefer the SGM environment, and younger males to prefer the LGM environment. The author noted, however, that the arithmetic means presented in the study were subject to distortion, due both to the sample age and sex imbalances and to and small cell sizes. Although no evidence of a relationship between the ages of the instructors and the students environmental preferences has been found, the author has noted the male SGM instructor, in his mid-thirties, was the youngest of the three instructors. The other two instructors were both over forty.

5.3 STUDENT ORIENTATION AND DATA COLLECTION

In the preceding section the author provided an overview of the participants in the study, through an examination of the distributions of students and instructors by sex and age with respect to their respective IM, LGM, or SGM environmental preferences. Determination of these environmental preferences followed a three-step process, which the author refers to as the orientation phase of the Choice Model:

1. Students were exposed to each environment during discrete orientation sessions with the respective instructors.

2. Data relating to student preferences for each environment were collected. Data for measurement of selected student characteristics were also collected.

3. Preferences for each environment were assessed, and each student was assigned to an environment on the basis of that assessment.

In this section, the author describes the first two steps of the orientation phase, orientation and data collection. The third step of the orientation phase, assessment of preferences and assignment to environments, is discussed in the next section. Student characteristics, both those which were directly measured and those which were assessed unobtrusively through the examination of archive data are described in chapter 6.

5.3.1 Data Collection and Analysis

Much of the data presented in chapters 5 and 6 were collected directly from the students, using questionnaires distributed in take-home packets. Environmental preferences were determined from the students' responses to two questionnaires which were designed by the author for that purpose. These initial preference data are presented in this chapter. Data pertaining to other student characteristics measured by questionnaires in the first set of take-home packets are presented and discussed in chapter 6.

Student characteristics measured by questionnaires in a second take-home packet are discussed in chapter 7.

In this section of chapter 5, the author presents and discusses two related types of data: data pertaining to the initial measurement of environmental preferences, and data pertaining to the orientation process. The purpose of preference questionnaires was to provide the instructors with relative measures of individual preferences for all three environments. The purpose of student orientation was to introduce the students to each of the alternative learning environments before preferences were assessed. Earlier pilot studies, described in chapter 4, provided evidence that orientation to learning environments and measurement of relative preferences were techniques which could be helpful in avoiding undesirable (and potentially unmanageable) distortions in the distribution of students among the alternative environments.

In order to protect the anonymity of the students, without loosing control of the data, each take-home packet was assigned a control number. Each student was instructed to fill out an identification card attached to the front of each packet. For each packet, the identification card, packet envelope, and each sheet within the packet, were labeled with this identifying number. All the individual data contained in the appendices is identified by packet number.

The identification cards were used only when it was necessary to associate names with packet numbers. Specific examples of situations in which names were needed include:

1. Monitoring the distribution and return of take-home packets.
2. Preparing environment rosters, once environment assignments had been determined.
3. Adding archive data to the database, once it had been collected from the records office.

The first take-home packets were distributed by the instructors at the end of their last scheduled orientation sessions. Identification cards were collected by the instructors when the packets were distributed, in order to monitor packet returns. The students were instructed to return their completed packets to a specified central location by the next day, which was not a normal class meeting day. Preference data only were analyzed at that time, for the purpose of making environmental assignments for the first mini-course. The other questionnaires were not analyzed until after the semester was over, in order that the instructors' role-behaviors would not be affected by knowledge relating to the other measured student characteristics.

At the end of instructional phase for the first mini-course, the second take-home packets were distributed. These packets were distributed by name, so that each student would receive a packet labeled with the appropriate packet

number. Once again, only preference data from the second packets were analyzed at the beginning of the second mini-course. On the basis of those data, necessary adjustments in environment assignments for the second mini-course were made. No other measured or archive data were analyzed until after the end of the semester.

Three specific types of data are were collected which related to students' orientations to and preferences for each of the three environments:

1. Degree and timing of orientation to each environment during the pre-instruction phase of the study.
2. Self-reported preference scores for each environment.
3. Written preference comments pertaining to each environment.

The data pertaining to the degree and timing of orientation to each environment are discussed in this section of chapter 5. Preferences and comments are discussed in the following section.

5.3.2 Degree and Sequence of Orientation

The classroom portion of student orientation, as described in chapter 4, was subdivided into four segments during the first two class days. The total group of students participating in the study was initially divided alphabetically into three orientation classes, and one instructor was assigned to each class. Although the three classes were intended to be approximately equal in size, based upon the first day class roster, the tables below show the orientation class sizes ranged from a low of seven students (13% of the sample), to a high of nineteen students (35% of the sample.) For descriptive purposes these orientation classes are labeled as classes A, B, and C. Individual students' memberships in the respective orientation classes are identified in appendix L.

1. The IM instructor was assigned to orientation class A for the first class meeting.
2. The SGM instructor was assigned to orientation class B for the first class meeting.
3. The LGM instructor was assigned to orientation class C for the first class meeting.

The first half (part 1) of the first class meeting was devoted to general class organization and information functions. During the second half (part 2) of the first class meeting each instructor presented and explained her/his instructional environment to her/his respective orientation class. During each half of the second class

meeting (parts 1 and 2 respectively) each instructor made a similar presentation to each of the other orientation classes.

Orientation classes were instructed to return to the same classroom for the second class meeting. The instructors moved between classrooms in order to bring their respective environment orientation presentations to the students. The sequences of presentations to the orientation classes are indicated below.

1. Class A: IM ---> SGM ---> LGM
2. Class B: SGM ---> LGM ---> IM
3. Class C: LGM ---> IM ---> SGM

The Choice Model, as it was described in chapter 4 and as it was implemented for this study, did not completely equalize the orientation exposure of all students to all instructors. The respective orientation classes (A, B, and C) were together with their assigned first day instructors for a full class period, but were only with each of the other instructors for a half class period on the second day. In addition to this theoretically potential bias introduced by the overall structure of the orientation process, there was no feasible way in practice to assure that all students actually attended class on time during each of the first two days of the semester. It was therefore not even possible to assure that every student received some minimum degree of orientation to every environment.

Three variables, ORIENT_L, ORIENT_S, and ORIENT_I, have been used in this study to indicate the degree and timing of

each student's orientation to each of the respective LGM, SGM, and IM environments. The variable suffixes _L, _S, and _I correspond to the LGM, SGM, and IM environments respectively. Values for individual students can be found in appendix L.

Tables 9, 10, and 11 present crosstabulations of each of the variables ORIENT_I, ORIENT_S, and ORIENT_L with the variable ENVIRONMENT_1. The values of ENVIRONMENT_1 for individual students, also found in appendix L, identify their respective memberships in one of the three alternative environmental preference groups. The following labels are used in the tables to clearly represent the meanings of values of the three ORIENT_ variables.

0. NO ORIENTATION REPORTED
1. DAY 1 (PART 2)
2. DAY 2 (PART 1)
3. DAY 2 (PART 2)
4. DAY 3 (LATE)
5. DAY 4 (LATE)

The additional labels CLASS A, CLASS B, and CLASS C have been inserted in the appropriate rows of each table to indicate which orientation class is represented by that row.

5.3.2.1 Degree of Orientation Exposure

The degree of participation in various orientation activities, which has been represented by the ORIENT_I, ORIENT_S, and ORIENT_L variables, was determined primarily from the students' self-reports of attendance on one of the questionnaires included in the post-orientation take-home packet. In addition, the identification numbers assigned to

each take-home packet have been used to determine each student's membership in one of the three orientation classes. Since each instructor was given a different sequence of packet numbers to distribute, the location of each student when packets were distributed has been determined from those sequences.

Due to the time constraints of the orientation sessions, coupled with the fact that the instructors moved from class-to-class during this time, however, complete records of attendance for each student in each orientation session were not maintained. If a student failed to report attendance at a particular session, then a value of zero (NO ORIENTATION REPORTED) was assigned to the appropriate orientation variable. Analysis of orientation data has shown that non-oriented students represented a substantial portion of the sample.[18]

---

[18] While NO ORIENTATION REPORTED carries an apparent implication of nonattendance at the orientation session, it must be made clear to the reader that nonattendance is only an assumption. Some students in this category may have actually been present for orientation sessions which they did not report, perhaps in an effort to increase their chances for being assigned to their preferred environments. In other cases, students indicated that they felt that no orientation was needed due to personal experiences with specific environments or teachers. It is possible that some such students, who were only interested in one environment, only responded to questions about their preferred environment.

TABLE 9

Distribution of Individual Mode Orientation Exposure by Preferred Environment

TABLE OF ORIENT_I BY ENVIRONMENT_1
ORIENT_I INDIVIDUAL ORIENTATION
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO ORIENTATION REPORTED	4 4.5 -0.5 7.27% 21.05% 30.77%	10 8.3 1.7 18.18% 52.63% 41.67%	5 6.2 -1.2 9.09% 26.32% 27.78%	19 34.55%
DAY 1 (PART 2) CLASS A	0 1.7 -1.7 0.00% 0.00% 0.00%	2 3.1 -1.1 3.64% 28.57% 8.33%	5 2.3 2.7 9.09% 71.43% 27.78%	7 12.73%
DAY 2 (PART 1) CLASS C	6 2.8 3.2 10.91% 50.00% 46.15%	5 5.2 -0.2 9.09% 41.67% 20.83%	1 3.9 -2.9 1.82% 8.33% 5.56%	12 21.82%
DAY 2 (PART 2) CLASS B	3 4.0 -1.0 5.45% 17.65% 23.08%	7 7.4 -0.4 12.73% 41.18% 29.17%	7 5.6 1.4 12.73% 41.18% 38.89%	17 30.91%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Orientation exposure to the IM environment has been crosstabulated with environmental preference groups in table 9. The first row of this table indicates that approx-

imately 35% of the total sample reported no orientation to the IM environment. As the reader will see in tables 10 and 11, this was the highest "non-orientation" rate among the three environments.

There appears to have been a weak tendency for more than the expected number of students who had not reported orientation to the IM environment, to prefer the SGM environment over the LGM environment.[19] Premature conclusions should not be drawn with regard to either the cause or the significance of this tendency. This evidence in conjunction with further evidence in tables 10 and 11 which follow, however, has led the author conjecture three possible factors which might have effected the relationship between environmental preferences to degree of orientation exposure.

1. Since the author was the SGM instructor, and since he was in charge of the study, there may have been a tendency for newly enrolled and late-arriving students to go to the SGM classroom for information. Such a tendency may have resulted in an

---

[19] The positive deviation of 1.7 in the table 9 NO ORIENTATION REPORTED-SGM cell indicates that 20% more than the expected frequency of 8.3 "non-oriented" students preferred the SGM environment. The negative deviation of -1.2 in the NO ORIENTATION REPORTED-LGM cell indicates that 19% fewer than the expected frequency of 6.2 preferred the LGM environment.

unintentional procedural bias which favored the SGM environment.

2. It is also possible that once a student had already missed an orientation session, then existing preferences and previous experiences, either positive or negative, may have influenced the selection of which remaining orientation sessions were subsequently either attended or not attended.

3. Students who had missed a portion of the orientation program, and asked for guidance from the instructors, were generally told that they could attend all three environments before expressing their preferences. These students were encouraged, however, to attend whatever orientation sessions remained in the environments with which they were least likely to be familiar.

With regard to previous IM experiences, there were two other major instructional programs at PGCC which used IM-types of instruction in 1977. There is evidence to suggest that previous experiences in these programs influenced preferences for the IM environment, in manners consistent with the second degree of orientation conjecture. The developmental mathematics program at PGCC was then taught exclusively by the self-paced method, using programmed

textbooks.[20] The introductory psychology course was then offering and still does offer PSI as an instructional option.[21]

Before going on to table 10, the reader should observe the deviations in table 9 which will be discussed later in the context of orientation sequence. The second row shows that more than the expected number of students from CLASS A (who were oriented to the IM environment) preferred the LGM environment. Similarly, the second row shows that more than the expected number of students from CLASS C (who were oriented to the IM environment) preferred the IM environment, and that fewer than the expected numbers these students preferred the LGM environment.[22]

---

[20] Self-pacing is now an option rather than a requirement for most developmental mathematics students at PGCC. Individual student data from appendix N, which is discussed later in chapter 6, shows that ten of the fifty-five students in the sample (18%) had been previously enrolled in the developmental mathematics program. Three of these ten students (30%) did not report attendance at any IM orientation session, and all the ten students with previous developmental experience (100%) were subsequently assigned on the basis of their preferences to the non-IM environments.

[21] Although specific data pertaining to previous enrollments in PSI psychology have not been tabulated for this study, some students indicated in their written comments that this experience did influence their environmental preferences.

[22] In the CLASS A-LGM cell of table 9, the deviation of 2.7 indicates that the frequency in that cell is 117% higher than the expected frequency of 2.3. In the CLASS C-IM cell of table 9, the deviation of 3.2 indicates that the frequency in that cell is 114% higher than the expected

(Footnote Continued)

TABLE 10

Distribution of Small Group Mode Orientation Exposure by Preferred Environment

TABLE OF ORIENT_S BY ENVIRONMENT_1
ORIENT_S SMALL GROUP ORIENTATION
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO ORIENTATION REPORTED	2 2.8 -0.8 3.64% 16.67% 15.38%	5 5.2 -0.2 9.09% 41.67% 20.83%	5 3.9 1.1 9.09% 41.67% 27.78%	12 21.82%
DAY 1 (PART 2) CLASS B	4 4.0 -0.0 7.27% 23.53% 30.77%	9 7.4 1.6 16.36% 52.94% 37.50%	4 5.6 -1.6 7.27% 23.53% 22.22%	17 30.91%
DAY 2 (PART 1) CLASS A	1 2.4 -1.4 1.82% 10.00% 7.69%	2 4.4 -2.4 3.64% 20.00% 8.33%	7 3.3 3.7 12.73% 70.00% 38.89%	10 18.18%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

(CONTINUED)

(Footnote Continued)
frequency of 2.8. In the CLASS C-LGM cell of table 9, the deviation of -2.9 indicates that the frequency in that cell is 74% higher than the expected frequency of 3.9. Once again, however, small cell sizes cast some doubt on the reliability and significance of these statistics.

TABLE OF ORIENT_S BY ENVIRONMENT_1

ORIENT_S SMALL GROUP ORIENTATION

ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
DAY 2 (PART 2) CLASS C	6 2.8 3.2 10.91% 50.00% 46.15%	5 5.2 -0.2 9.09% 41.67% 20.83%	1 3.9 -2.9 1.82% 8.33% 5.56%	12 21.82%
DAY 3 (LATE)	0 0.5 -0.5 0.00% 0.00% 0.00%	1 0.9 0.1 1.82% 50.00% 4.17%	1 0.7 0.3 1.82% 50.00% 5.56%	2 3.64%
DAY 4 (LATE)	0 0.5 -0.5 0.00% 0.00% 0.00%	2 0.9 1.1 3.64% 100.00% 8.33%	0 0.7 -0.7 0.00% 0.00% 0.00%	2 3.64%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 10 crosstabulates SGM orientation exposure with membership in the environmental preference groups. The first row of table 10 indicates that approximately 22% of the total sample did not attend any SGM orientation session. This was the lowest "non-orientation" rate for the three environments. Table 10 also shows that the first day SGM environment orientation CLASS B was larger than either of

the other orientation classes on the first day.[23] In addition, table 10 shows that four students attended the SGM environment after the formal orientation period had ended. Three of the four late-oriented students indicated SGM to be their preferred environment, while the fourth student preferred the LGM environment. No late orientation in either of the IM or the LGM environments was reported by the students.

Taken together, these data provide evidence which tends to substantiate at least some portions of the degree of orientation conjectures, which the author presented earlier. The largest first day orientation class for the SGM environment; the highest orientation rate for the SGM environment; and the number of late orientations in the SGM environment are all consistent with the first conjecture concerning the author's dual role as experimenter and instructor. But given the likelihood that the SGM environment was the least familiar environment to the students, these data are generally consistent with the third conjecture also.

Before moving on to table 11, it is once again important for the reader to observe the cell deviations for the different orientation classes. The third row on the first page of table 10 indicates that more that the expected numbers of CLASS A students (who were oriented to the SGM

---

[23] The reader can verify this by comparing the DAY 1 (PART 2) rows in tables 9, 10, and 11.

environment) preferred the LGM environment. The first row on the second page of table 11 indicates that more than the expected numbers of CLASS C students (who were oriented to the SGM environment) preferred the IM environment, while fewer than expected preferred the LGM environment.[24] These trends are discussed in greater detail later with regard to orientation sequence.

Table 11 presents the crosstabulation of orientation exposure to the LGM environment with environmental preference groups. The first row of the table indicates that approximately 25% of the students in the study were not present at (or at least did not report presence at) any of the three LGM orientation sessions. As discussed earlier, the possibility exists that students who did not prefer an environment, may have failed to indicate on the take-home questionnaire that they had attended the orientation session for that environment.

---

[24] In the CLASS A-LGM cell of table 10, the deviation of 3.7 indicates that the frequency in that cell is 112% higher than the expected frequency of 3.3. The table 10 statistics for the CLASS C-IM cell and the CLASS C-LGM cell agree with those computed for table 9. Once again, small cell sizes cast some doubt on the reliability and significance of these statistics.

TABLE 11

Distribution of Large Group Mode Orientation Exposure by Preferred Environment

TABLE OF ORIENT_L BY ENVIRONMENT_1
ORIENT_L LARGE GROUP ORIENTATION
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO ORIENTATION REPORTED	3 3.3 -0.3 5.45% 21.43% 23.08%	8 6.1 1.9 14.55% 57.14% 33.33%	3 4.6 -1.6 5.45% 21.43% 16.67%	14 25.45%
DAY 1 (PART 2) CLASS C	6 2.6 3.4 10.91% 54.55% 46.15%	4 4.8 -0.8 7.27% 36.36% 16.67%	1 3.6 -2.6 1.82% 9.09% 5.56%	11 20.00%
DAY 2 (PART 1) CLASS B	3 4.5 -1.5 5.45% 15.79% 23.08%	9 8.3 0.7 16.36% 47.37% 37.50%	7 6.2 0.8 12.73% 36.84% 38.89%	19 34.55%
DAY 2 (PART 2) CLASS A	1 2.6 -1.6 1.82% 9.09% 7.69%	3 4.8 -1.8 5.45% 27.27% 12.50%	7 3.6 3.4 12.73% 63.64% 38.89%	11 20.00%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 11 reveals the weak tendency for "non-oriented" students to favor the SGM environment over the LGM environment; the same tendency was also noted in the discussion of

table 9.[25] In accordance with his third conjecture concerning degree of orientation, the author suspects that the traditional nature of the LGM environment may have contributed somewhat to the number of students who were not oriented to that environment.

Finally, concerning the deviations in other sections of table 11, the author notes that more than the expected number of students in CLASS C (who were oriented to the LGM environment) preferred the IM environment, and fewer than expected numbers preferred the LGM environment. In CLASS A, more than the expected number students preferred the LGM environment.[26] These observation, along with corresponding observations regarding tables 9 and 10, are discussed next.

The foregoing discussion has focused primarily on those students who did not attend all orientation sessions. The author has discussed evidence of possible relationships between the manner in which orientation was conducted,

---

[25] The deviation of 1.9 in the NO ORIENTATION REPORTED-SMG call is 31% higher than the expected frequency of 6.1. The deviation of -1.6 in the NO ORIENTATION REPORTED-LMG call is 35% higher than the expected frequency of 4.6.

[26] In the CLASS C-IM cell of table 11, the deviation of 3.4 indicates that the frequency in that cell is 131% higher than the expected frequency of 2.6. In the CLASS C-LGM cell of table 11, the deviation of -2.6 indicates that the frequency in that cell is 72% higher than the expected frequency of 3.6. In the CLASS A-LGM cell of table 11, the deviation of 3.4 indicates that the frequency in that cell is 94% higher than the expected frequency of 3.6. Once again, however, small cell sizes cast some doubt on the reliability and significance of these statistics.

non-orientation of some students to some environments, and student preferences for specific environments. He has conjectured three such relationships, and provided illustrations as to their plausibility.

It is the opinion of the author that in spite of its apparent shortcomings, student orientation to the alternative environments is an important aspect of the Choice Model. The discussion above is intended to provide greater insight into the complexities of the orientation phase, with particular emphasis on data pertaining to students who did not participate fully, which may ultimately lead to future enhancements of the model. The author has found no evidence, however, to suggest that the shortcomings noted in this study threaten the overall validity of the Choice Model.

5.3.2.2 Sequence of Orientation Exposure

The next issue for consideration is the sequence of orientation activities for those students who reported participation in the orientation phase of the study. The general concern is to examine to what extent variations in orientation sequence may have affected the preference formation process for different students. A specific sub-issue concerns whether or not there is any evidence that longer exposure to the first day instructor affected environmental preferences.

Some trends were previously observed with respect to the preferences of students in the different orientation classes. With regard to CLASS A, a review of orientation exposures depicted in tables 9, 10, and 11 reveals that:

1. The orientation sequence for CLASS A was IM, SGM, LGM respectively.
2. CLASS A was the smallest orientation class; it increased in size from seven on the first day to eleven by the end of the orientation phase.[27]
3. CLASS A tended to prefer the LGM environment.

A similar review of the CLASS B orientation exposure shows that :

1. The orientation sequence for CLASS B was SGM, LGM, IM.
2. CLASS B was the largest orientation class, fluctuating between seventeen and nineteen members for different orientation sessions.[28]
3. CLASS B tended to prefer the SGM and LGM environments over the IM environment.

---

[27] It is not safe to assume that all students in an orientation class on the first day, remained with that class on the second day, although that was the general trend. The orientation sequences for specific individuals can be determined from the data in appendix L.

[28] Since CLASS B started its orientation experience with the SGM instructor for the first day, the large size of that class may have been due in part to the dual instructor-experimenter role played by the author, which was addressed previously.

Finally, a review of the CLASS C orientation exposure reveals that:

1. The orientation sequence for CLASS C was LGM, IM, SGM.
2. CLASS C increased in size from eleven students on the first day, to twelve students on the second day.
3. CLASS C tended to prefer the IM and SGM environments over the LGM environment.

The author has found no clear evidence in these data to substantiate a conjecture that longer exposure to the first day instructor during the orientation process produced biases in the preferences of the students. Table 10 shows that a majority of the students in CLASS B who attended the SGM environment on the first day (53%) did prefer that environment. No comparable trends for the other first day classes, however, are evident.

There is a wealth of individual data available in the appendices, which allows the interested reader to study orientation trends much more completely and precisely. Some of these trends are described later in conjunction with the presentation of preference data. In general, however, the use of data in the appendices involves tracking of individual student records through the database. In this study the author provides guidelines for the reader who desires to study appendix data in greater detail, but he avoids

detailed descriptions of the tracking process, due to its technical nature.

In concluding the discussion of orientation data, the author provides an example of the additional detail which can be derived from the use of individual student orientation data records, which are available in appendix L. It may appear to the reader, from studying tables 9, 10, and 11, that approximately 25% of the sample did not attend class during the orientation phase. Table 9 indicates that nineteen students reported no orientation to the IM environment, but it can be determined from the individual data in appendix L that all but six of these students were oriented to at least one of the other environments. Likewise, six of the twelve students in table 10 who reported no SGM orientation exposure, did report orientation to at least one environment. Eight of the fourteen students in table 11 who reported no LGM orientation exposure, did report orientation to at least one of the other environments.

The data in appendix L shows that thirty students (55%) reported orientation exposure to all three environments, and that only six students (11%) from the total sample of fifty-five reported no orientation exposure to any of the environments prior to completing the preference questionnaires.[29] Furthermore, appendix L reveals that one of the

---

[29] The reader can verify in appendix L that students
(Footnote Continued)

six "truly non-oriented" students preferred the IM environment, two preferred the SGM environment, and three preferred the LGM environment. Additional details, such as sex, age, and preference scores for these six students can also be examined in appendix L.

5.3.3 Summary

In this section the author has described the first two steps in the orientation process, those being classroom orientation and data collection. He began by describing the structure of the orientation phase, and the manner in which data was collected and organized. The author then examined data pertaining to student participation in the classroom orientation sessions. This examination focused on two principal orientation issues.

First the author examined the data pertaining to students who did not report orientation exposure to specific environments. He explored possible relationships between reports of non-orientation to environments and the subsequent expressions of environmental preferences. The author identified possible shortcomings in the orientation process, so that future implementations of the Choice Model can

---

(Footnote Continued)
with packet numbers 25, 50, 66, 65, 3, and 49 reported no attendance at any of the orientation sessions prior to completing their take-home packets.

attempt to improve upon this important phase of the preference determination process.

The author presented three conjectures concerning possible relationships between orientation "abnormalities" and students' environmental preferences.

1. The author performed the dual roles of experimenter and SGM instructor. Some preferences may have been affected by this duality.
2. Some students may have selectively attended (or selectively reported attendance at) orientation sessions for only some and not all of the environments.
3. Instructors may have provided selective guidance to students who missed an orientation session, by advising them to attend orientation sessions in those environments with which they were least familiar.

The author determined on the basis of self-reports, that 89% of the sample of fifty-five students did receive orientation exposure to at least one of the environments before completing the environmental preference questionnaires. The data also revealed that 55% of the sample reported orientation exposure to all three environments. The reader has been encouraged to more fully investigate the orientation data found in appendix L.

The sample was initial divided alphabetically into three orientation classes. The Choice Model prescribed a

rotational system of orientation for these three classes, which in effect introduced differences in the sequence and duration of orientation exposure among the three classes. The author found no evidence to suggest, however, that these differences in sequence and duration of the orientation sessions introduced any systematic biases in the students' expressions of environmental preferences.

5.4 DETERMINATION OF ENVIRONMENTAL PREFERENCES

A great deal has already been observed concerning distributions with respect to environmental preferences. In this section, the author describes the preference questionnaires themselves, and the manner in which the questionnaires were evaluated. Distributions of Lickert scale preference scores and "quantified comment scores" are presented in this section as well. To provide the reader with an overview of the preference determination process, however, the author first discusses the general manner in which students' respective preferences for the IM, SGM, and LGM environments were assessed. He then describes the process by which students were assigned to learning environments for the first mini-course.

Two types of preference questionnaires were included in the first take-home packet.

1. Orientation Comment Form
2. Learning Environment Preference Scale

Copies of both forms are provided in appendix G. Assignments to environmental preference groups were based upon the

author's assessments of the preference data which were derived from these forms.

On the first questionnaire in the take-home packet, the Orientation Comment Form, each student was asked to provide short written comments with respect to their orientation and previous learning experiences in each environment, and with regard to their impressions of each learning environment. The primary goal of this questionnaire was to encourage each student to initially reflect on various aspects of each individual environment, without soliciting an explicit choice of a preferred environment. A secondary goal was to collect data which could be used to augment and clarify preferences which were measured by the second preference instrument. Some students did provide unsolicited comparative evaluations of environments, and others did express preferences for specific environments in their written comments.

For analysis purposes, the students' written comments were later "quantified" by the author, and mean response scores were computed. The quantifying process, and distributions of the resulting mean response scores are described later in this section. The mean response scores for individual students can be found in appendix L.

The second questionnaire, the Learning Environment Preference Scale, directed students to provide Lickert scale responses to a collection of statements pertaining to the IM, LGM, and SGM environments. These responses were then

used to calculate individual student preference scores for each of the three environments. The manner in which the scores were computed, and distributions of computed scores are presented later in this section. Individual preference scores for each students can also be found in appendix L.

5.4.1 Assignments to Preferred Environments

In order to determine the students' environmental preferences, IM, LGM, and IM preference scores were first computed from responses to the Lickert scale questionnaires. Each student was tentatively assigned to a "first choice" environment corresponding to her or his highest preference score. Written comments from the first preference questionnaire were then crosschecked for consistency with the preference scores. In some cases, a written comment was found which indicated a student's "true" first choice to be clearly different from his or her highest preference score. If so, then the student was tentatively reassigned to a different environment, based upon the written choice.

Packet numbers only were used by the author during this evaluation process, so that decisions would not be affected by personal knowledge of any other student characteristics. Once the evaluation of questionnaires was complete, then the student identification cards, completed by the students when they received the first take-home packets, were used to associate names with packet numbers. These names were in

turn used to prepare three preliminary environment rosters in accordance with the corrected list of "first choices."

The availability of preference scores in addition to written comments, provided the information necessary for determination of the relative strengths of first and second preferences. The students had been told during the orientation process that in the event too many students expressed the same first choice, some students would be assigned to an alternate environment on the basis of their second highest preference score. This procedure was not in fact needed during this particular semester, however, since honoring of first preferences did not result in the overcrowding of any environment.[30]

As students arrived for the third class meeting, they were directed to the appropriate classrooms in accordance with the preliminary environment rosters. At this time, any student who felt that her or his true first choice had not been correctly assessed, was given the opportunity to

---

[30] If the full class capacity of one hundred students had been achieved, and if a proportional distribution of "first choices" had occurred, then the final class sizes would have been approximately 24, 43, and 33 students for the IM, SGM, and LGM environments respectively. This projection is based upon the total percentage of students in the actual sample, given in the bottom row of each crosstabulation table, who were assigned to each environment. Some redistribution of students would then have become necessary. The author therefore considers the potential use of preference scores to achieve such a redistribution to be an important aspect of the Choice Model, even though that potential was not needed on this occasion.

request a change of environments. Since none of the environments were overcrowded, all such requests were honored, and the environment rosters were revised appropriately.

The individual data in appendix L shows that for forty-six students, representing 84% of the total sample of fifty-five students, assignments based upon preference scores were accepted by the students as valid indicators of their environmental preferences. Six more students (11%) were assigned on the basis of specific preferences which they expressed on their comment forms. Only three students (5%) requested environment changes after the assignment rosters were prepared.

There were several indications on the comment forms and in the data contained in appendix L, to suggest the possibility that some preferences were influenced by other students participating in orientation classes. Nine cases have been noted in which students made choices, either on the comment form or at class time, which were different from their highest preference scores.[31] These and other indicators, derived both from the data in the appendices and from students' individual comment forms, have led the author to conjecture that sufficient sociometric structure evolved

---

[31] Referring to appendix L, IM students with packet numbers 70, 73, 79, 17, and 77 expressed higher preference scores for other environments.

during the first to class days so that preferences were affected for some students.

There appears to have been a tendency for female students especially to choose the same environment which other females in their orientation class preferred.[32] Appendix L shows that all three CLASS A female students preferred the LGM environment, and all three CLASS B female students preferred the SGM environment. The females in CLASS C were divided, with half preferring the IM environment and the other half preferring the SGM environment. From the examination of other data, such as age (appendix L), high school background, and sessions of enrollment at PGCC (appendix N), the author has concluded it is unlikely that any significant number of these female students were acquainted with each other before coming to class. Hence he has conjectured that new student-to-student relationships began to form during the orientation phase, and that in some cases these new relationships influenced environmental choices.

---

[32] All three females in the IM group were from orientation CLASS C; only one reported her highest preference score for the IM environment. SGM students 75, and 13 express higher preference scores for other environments. LGM students 41 and 21 expressed higher preference scores for other environments. All three females in the LGM group were from orientation CLASS A; the IM preference score for one of these three was her lowest score.

The value of the variable ENVIRONMENT 1 for an individual student, used in the various crosstabulation tables contained in this chapter, identifies the final adjusted "first choice" roster on which the student's name appeared. In the various data appendices, the values of ENVIRONMENT 1 are always given in the first column, using the now familiar acronyms IM, SGM, and LGM. In the data tables, columns corresponding to these values are labeled INDIVIDUAL, SMALL GROUP, and LARGE GROUP respectively.

5.4.2 Environmental Preference Scores

Having provided the reader with an overview of the "choice" process, the author next discusses the Learning Environment Preference Scale (appendix G), from which preference scores were computed. This Lickert scale questionnaire contained a total of eighteen statements. Six statements pertained to each alternative learning environment.

5.4.2.1 Questionnaire Format

The principal wording of each set of six statements has been repeated for each environment in a basically unchanged format, except for the identification of the respective environment. In a few cases minor grammatical editing has been performed in conjunction with changes in environment identification. The six basic statements, with environment labels omitted, are provided below.

1. I think that I will enjoy working _____ to do mathematics.

2. For the majority of students, I think that the _____ approach is best.

3. I don't think that I would use the _____ method if I were a teacher.

4. I don't think that I will learn much mathematics by the _____ method.

5. I think that the _____ method is very inefficient for learning mathematics.

6. I think that the _____ method will help me to understand the theory behind the mathematics in this course.

The eighteen items in the Learning Environment Assessment Scale were arranged in random order. The directions on the questionnaire instructed the student to respond to each statement by circling the number corresponding to the degree to which that statement reflects her/his own feelings. The possible responses were:

1. strongly agree
2. agree
3. undecided
4. disagree
5. strongly disagree

5.4.2.2 **Scoring Procedure**

The responses of one student to each set of six statements which pertained to the same environment were processed in the following manner, in order to compute the corresponding environmental preference score for that student.

1. The original responses were assigned values on a 1 to 5 scale; each response value was then shifted to the -2 to +2 range by subtracting 3 from the original response value.
2. Since three of the six statements on the questionnaire were worded negatively and the other three were worded positively, the shifted response scores for the negative statements were multiplied by -1. In this way each resulting positive (or negative) numerical response score could then be interpreted directly as a positive (or negative) evaluation of the respective environment.
3. The arithmetic mean of the set of six transformed response scores pertaining to one environment was computed.
4. That mean was assigned to the corresponding variable PREF1_I, PREF1_S, or PREF1_L, as the student's preference score for that environment.[33]

---

[33] Corresponding values for the variables PREF2_I, PREF2_S, and PREF2_L were subsequently computed in the same way from an identical post-instruction questionnaire

(Footnote Continued)

The individual preference scores can be found in appendix L. These scores have been used within this and other appendices to order the students' data records. Data records are grouped first by environmental preference. Within each preference group, the records are subgrouped by sex. Within each subgroup, the records are arranged in increasing order by the values of the preference score which corresponds to the environmental group. Thus, for example, the first IM male student listed in appendix L has the lowest IM preference score (PREF1_I), and the last IM male has the highest IM preference score for that subgroup.

5.4.2.3 Distributions of Preference Scores

Tables 12, 13, and 14 present the respective crosstabulations of the IM, SGM, and LGM preference scores, with respect to environmental preference groups. Summary statistics for all three sets of preference scores, by environmental preference group, have also been calculated. All preference score statistics are presented in table 15. Mean preference scores for males and females have also been computed from the individual data in appendix L. These means are presented in the body of the text, but have not been tabulated separately.

TABLE 12

Distribution of Measured Individual Mode Preferences by Preferred Environment

TABLE OF PREF1_I BY ENVIRONMENT_1

PREF1_I INDIVIDUAL PREFERENCE SCORE (POST-ORIENTATION)

ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
NEGATIVE [-1.5,-0.5)	0 1.9 -1.9 0.00% 0.00% 0.00%	2 3.5 -1.5 3.64% 25.00% 8.33%	6 2.6 3.4 10.91% 75.00% 33.33%	8 14.55%
NEUTRAL [-0.5,+0.5)	1 6.4 -5.4 1.82% 3.70% 7.69%	17 11.8 5.2 30.91% 62.96% 70.83%	9 8.8 0.2 16.36% 33.33% 50.00%	27 49.09%
POSITIVE [+0.5,+1.5)	9 3.8 5.2 16.36% 56.25% 69.23%	5 7.0 -2.0 9.09% 31.25% 20.83%	2 5.2 -3.2 3.64% 12.50% 11.11%	16 29.09%
MOST POSITIVE [+1.5,+2.0]	3 0.7 2.3 5.45% 100.00% 23.08%	0 1.3 -1.3 0.00% 0.00% 0.00%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

For use in crosstabulation tables, preference scores have been categorized and assigned descriptive labels, one label corresponding to each of the following five data intervals.

1. [-2.00, -1.49) - MOST NEGATIVE[34]
2. [-1.50, -0.49) - NEGATIVE
3. [-0.50, +0.49) - NEUTRAL
4. [+0.50, +1.49) - POSITIVE
5. [+1.50, +2.00] - MOST POSITIVE

Table 12 reveals that the largest number of students in the total sample (49%) reported NEUTRAL preference scores for the IM environment. Table 15 shows a mean IM preference score of approximately 0.2 for the total sample. From the individual data in appendix L, the author has calculated that female and male students in the total sample had similar average IM preference scores.[35] The range of IM preference scores (table 15) was from -2.00 to 1.83.

As one might anticipate, due to the manner in which students were assigned to environmental preference groups,

---

[34] In this list, the data intervals are represented in terms of their endpoints on the number line. A square bracket [or] indicates that the interval includes the respective endpoint, and a parenthesis (or) indicates that the interval excludes the respective endpoint.

[35] Due to the number of different types of preference and mean response scores to be present, separate summary preference score statistics tables by sex have not been included in the study. Separate male and female mean scores for the SGM environmental preference group are provided, since those cell frequencies (13 and 11 respectively - table 6) are approximately equal. Separate male and female statistics are not provided for the IM and LGM groups, because of small female cell frequencies (3 each - table 6.)

the majority of IM students (92%) reported IM preference scores above the NEUTRAL range. The POSITIVE-IM cell shows a 137% deviation above the expected frequency[36] for IM students who reported IM preferences in the POSITIVE range. Table 15 shows that the lowest reported score for an IM student was 0.0. The mean IM preference score for IM students was approximately 1.1.

The majority of the SGM students (71%) reported NEUTRAL IM preference scores, and 21% more reported POSITIVE scores. The NEUTRAL-SGM cell shows a 44% deviation above the expected cell frequency. The mean IM preference score of approximately 0.1 for SGM students (table 15) appears to be consistent with the distribution of those scores for SGM students. Females and males in the SGM preference group reported mean IM preference scores of 0.0 and 0.3 respectively.

Table 12 shows that 50% of the LGM students reported IM preference scores in the NEUTRAL range, and 33% in the

---

[36] The use of the term "expected" here of course refers to the statistical expectation, not the author's anticipation, with regard to the independence hypothesis. The deviation of 5.2 in the POSITIVE-IM cell represents 137% of the expected frequency of 3.8. As an aid to the reader, while becoming accustomed to interpreting crosstabulation tables, the author has thus far provided the calculations of percent deviations from expected frequencies in footnotes. Due to the volume of data yet to be presented, however, the author does not continue this practice of footnoting percent deviations beyond this point. He refers to percent deviations when appropriate, but leaves verification of their calculation to the reader.

NEGATIVE range. The true frequency in the NEUTRAL LGM cell is close to the expected frequency. The NEGATIVE-LGM cell shows a 131% deviation above the expected frequency. Corresponding to this, the POSITIVE-LGM cell shows a 62% deviation below the expected frequency. The mean IM preference score of approximately -0.3 for LGM students appears to be consistent with the table 12 distribution for LGM students.

From these data, pertaining to IM preference scores derived from the Learning Environment Preference Scale, the author has concluded that:

1. The total sample tended to report high-neutral[37] scores; male and female scores tended to be similar.
2. IM students tended to report positive scores.
3. SGM students tended to report neutral scores; male scores tended to be somewhat higher that female scores.
4. LGM students tended to report low-neutral scores.

---

[37] By high-neutral, the author means that the arithmetic mean for the group was in the top third of the NEUTRAL $[-0.5, +0.5)$ range. Similarly, low-neutral means that the arithmetic mean was in the bottom third of the NEUTRAL range. The author will follow this convention throughout the study in describing the relationship between arithmetic means and distribution range levels.

TABLE 13

Distribution of Measured Small Group Mode Preferences by Preferred Environment

TABLE OF PREF1_S BY ENVIRONMENT_1

PREF1_S SMALL GROUP PREFERENCE SCORE (POST-ORIENTATION)

ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
NEGATIVE [-1.5,-0.5)	2 1.7 0.3 3.64% 28.57% 15.38%	0 3.1 -3.1 0.00% 0.00% 0.00%	5 2.3 2.7 9.09% 71.43% 27.78%	7 12.73%
NEUTRAL [-0.5,+0.5)	7 5.0 2.0 12.73% 33.33% 53.85%	4 9.2 -5.2 7.27% 19.05% 16.67%	10 6.9 3.1 18.18% 47.62% 55.56%	21 38.18%
POSITIVE [+0.5,+1.5)	4 5.4 -1.4 7.27% 17.39% 30.77%	17 10.0 7.0 30.91% 73.91% 70.83%	2 7.5 -5.5 3.64% 8.70% 11.11%	23 41.82%
MOST POSITIVE [+1.5,+2.0]	0 0.7 -0.7 0.00% 0.00% 0.00%	3 1.3 1.7 5.45% 100.00% 12.50%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 13 reveals that the majority of the students in the total sample (80%) reported POSITIVE or NEUTRAL preference scores for the SGM environment. Table 15 shows a mean SGM preference score of approximately 0.4 for the total sample. From the individual data in appendix L, the author has calculated that female and male students in the total sample reported mean SGM preference scores of 0.9 and 0.2 respectively.[38] The range of SGM preference scores (table 15) was from -2.00 to 1.83

The majority of IM students (53%) reported SGM preference scores in the NEUTRAL range, and 31% more reported scores in the POSITIVE range. The NEUTRAL-IM cell shows a 40% deviation above the expected cell frequency. The mean SGM preference score for IM students was approximately 0.2.

The majority of the SGM students (71%) reported POSITIVE SGM preference scores. The POSITIVE-SGM cell shows a 70% deviation above the expected cell frequency. Table 15 shows that the lowest reported score for an SGM student was 0.17. The mean SGM preference score of approximately 1.0 for SGM students (table 15) appears to be consistent with the distribution of those scores for SGM students. Females and males in the SGM preference group reported similar mean SGM preference scores.

---

[38] The reader is reminded that the majority of the female students (68% - table 6) were in the SGM environmental preference group, while only 31% of the male students were in the SGM group.

Table 13 shows that 55% of the LGM students reported SGM preference scores in the NEUTRAL range, and 28% in the NEGATIVE range. The NEUTRAL-LGM cell shows a 45% deviation above the expected frequency. The mean SGM preference score of approximately -0.3 for LGM students appears consistent with the table 13 distribution for LGM students.

From these data, pertaining to SGM preference scores derived from the Learning Environment Preference Scale, the author has concluded that:

1. The total sample tended to report high-neutral scores; male scores were lower than female scores.
2. IM students tended to report high-neutral scores.
3. SGM students tended to report positive scores; male scores tended to be somewhat higher that female scores.
4. LGM students tended to report low-neutral scores.

Table 14 reveals that the majority of the students in the total sample (51%) reported NEUTRAL preference scores for the LGM environment. Table 15 shows a mean LGM preference score of approximately 0.3 for the total sample. From the individual data in appendix L, the author has calculated that female and male students in the total sample reported mean LGM preference scores of 0.0 and 0.4 respectively. The range of LGM preference scores (table 15) was from -1.83 to 2.00.

TABLE 14

Distribution of Measured Large Group Mode Preferences by Preferred Environment

TABLE OF PREF1_L BY ENVIRONMENT_1

PREF1_L LARGE GROUP PREFERENCE SCORE (POST-ORIENTATION)

ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	1 0.2 0.8 1.82% 100.00% 7.69%	0 0.4 -0.4 0.00% 0.00% 0.00%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
NEGATIVE [-1.5,-0.5)	3 1.7 1.3 5.45% 42.86% 23.08%	4 3.1 0.9 7.27% 57.14% 16.67%	0 2.3 -2.3 0.00% 0.00% 0.00%	7 12.73%
NEUTRAL [-0.5,+0.5)	6 6.6 -0.6 10.91% 21.43% 46.15%	17 12.2 4.8 30.91% 60.71% 70.83%	5 9.2 -4.2 9.09% 17.86% 27.78%	28 50.91%
POSITIVE [+0.5,+1.5)	3 3.8 -0.8 5.45% 18.75% 23.08%	3 7.0 -4.0 5.45% 18.75% 12.50%	10 5.2 4.8 18.18% 62.50% 55.56%	16 29.09%
MOST POSITIVE [+1.5,+2.0]	0 0.7 -0.7 0.00% 0.00% 0.00%	0 1.3 -1.3 0.00% 0.00% 0.00%	3 1.0 2.0 5.45% 100.00% 16.67%	3 5.45%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

The largest single group of IM students (46%) reported LGM preference scores in the NEUTRAL range. The frequency distribution of LGM preference scores was close to that expected under the independence hypothesis. The mean LGM preference score for IM students was approximately -0.1.

The majority of the SGM students (71%) reported NEUTRAL LGM preference scores. The NEUTRAL-SGM cell shows a 39% deviation above the expected cell frequency. The mean LGM preference score of approximately -0.1 for SGM students (table 15) appears to be consistent with the distribution of those scores for SGM students. Females and males in the SGM preference group reported similar mean LGM preference scores.

Table 14 shows that 56% of the LGM students reported LGM preference scores in the POSITIVE range, and 28% in the NEUTRAL range. Table 15 shows that the lowest reported score for an LGM student was 0.17. The POSITIVE-LGM cell shows a 92% deviation above the expected frequency. The mean LGM preference score of approximately 1.0 for LGM students appears consistent with the table 14 distribution for LGM students.

From these data, pertaining to LGM preference scores derived from the Learning Environment Preference Scale, the author has concluded that:

1. The total sample tended to report high-neutral scores; male scores were higher than female scores.

2. IM students tended to report neutral scores.

3. SGM students tended to report neutral scores; male and female scores tended to be similar.

4. LGM students tended to report positive scores.

5.4.2.4 Summary Statistics for Preference Scores

Selected statistics pertaining to preference scores have already been discussed in conjunction with tables 12, 13, and 14. Each of those discussions focused on one set of preference scores at a time. The complete set of summary statistics for all three types of preference scores are presented in table 15, with reference to which the author can now summarize the combined findings.

1. The total sample reported high-neutral mean preference scores for all three environments; the highest mean was for SGM preference scores, and the lowest mean was for IM preference scores. Male means were higher than female means for IM and LGM preference scores; the female mean was higher than male mean for SGM preference scores.

2. The IM preference group reported positive IM scores, high-neutral SGM scores, and neutral LGM scores. Separate male and female means were not presented.

3. The SGM preference group reported neutral IM scores, positive SGM scores, and neutral LGM scores. Male SGM students reported somewhat

higher mean IM scores than did female SGM students; SGM male and female mean SGM and LGM preference scores were more similar.

4. The LGM preference group reported low-neutral IM scores, low-neutral SGM scores, and positive LGM scores. Separate male and female means were not presented.

TABLE 15

Summary Statistics for Preference Scores by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVIDUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
IM PREFERENCE SCORE (PREF1_I)	1.052 0.562 0.00 1.83 1.83 13	0.097 0.533 -0.83 1.33 2.16 24	-0.297 0.739 -2.00 0.83 2.83 18	0.194 0.790 -2.00 1.83 3.83 55
SGM PREFERENCE SCORE (PREF1_S)	0.219 0.724 -1.33 1.17 2.50 13	1.014 0.439 0.17 1.83 1.66 24	-0.277 0.735 -2.00 0.83 2.83 18	0.404 0.835 -2.00 1.83 3.83 55
LGM PREFERENCE SCORE (PREF1_L)	-0.050 0.904 -1.83 1.17 3.00 13	-0.069 0.533 -1.00 0.83 1.83 24	1.027 0.563 0.17 2.00 1.83 18	0.294 0.818 -1.83 2.00 3.83 55

5.4.3 Orientation Comments

As the author described earlier, two types of preference forms were collected in the post-orientation take-home packet. Scores computed from the Learning Environment Preference Scale were used to make preliminary assignments of students to environmental preference groups. Written comments on the Orientation Comment Form were then screened for consistency with these preliminary assignments. Distributions and summary statistics for preference scores with respect to the final environmental preference groups assignments were presented above.

5.4.3.1 Quantification of Environmental Comments

The author next presents an analysis of the written comments which students provided on the Orientation Comment Forms (appendix G.) The following four written responses concerning each learning environment were solicited from each student.

1. Please describe any previous experience that you have had with this method of instruction or with this instructor.
2. Please describe your impressions of the method of instruction.
3. Please describe your impressions of the instructor.
4. Please describe your impressions of the grading method.

There was also a space provided for one general comment. A total of thirteen written responses were requested.

Each written comment was subjectively evaluated, and then assigned a response score on a five-point scale from -2 (MOST NEGATIVE) to +2 (MOST POSITIVE). Comments which were either noncommittal or else identified both advantages and disadvantages were scored as NEUTRAL, while comments which conveyed some degree of preference or reservation were classified as either POSITIVE or NEGATIVE respectively. Those statements which indicated a strong preference or dislike, and those which used superlatives such as "very" were given the MOST POSITIVE or MOST NEGATIVE scores respectively.

In the list below, corresponding the the five possible response scores, are some examples of actual comments made by students participating in the study. All of these sample comments pertained to student impressions of the small group method, and are provided here to illustrate the scoring system. Responses to the other items were scored in a similar fashion.

1. MOST NEGATIVE (-2)
   a. "It usually ends up just goofing around and talking about everything except your work."
   b. "It stinks."
   c. "Dislike this method since there are tendencies for members to go too fast or "take over" the group."

2. NEGATIVE (-1)

   a. "Not suitable for me."

   b. "I wasn't terribly turned on by it."

   c. "I can't communicate with others in small groups."

3. NEUTRAL (0)

   a. "Not sure."

   b. "It seems OK but I don't think that it would be good for me."

   c. "OK if that is what you want."

4. POSITIVE (+1)

   a. "Feel somewhat positive toward this method."

   b. "Compared to large group it is more beneficial to the individual student because students are able to discuss problems with others in the group and also the instructor."

   c. "I'm not sure what this method entails but it seems as though there would be more chance for the individual to get help if needed."

5. MOST POSITIVE (+2)

   a. "Forces the student to get involved, would like very much to try it."

   b. "It seems very helpful."

   c. "There can never be any better way, especially to student of average nature."

5.4.3.2 Comparisons of Response Score and Preference Score Distributions

The four individual scores pertaining to the same environment were averaged,[39] and these averages were assigned the variable names RESPONSE_I, RESPONSE_S, and RESPONSE_L respectively. These variables have been cross-tabulated with ENVIRONMENT_1 in tables 16, 17, and 18. The values of the response averages have been categorized for tabulation, according to the same range criteria which were used to categorize preference scores. One additional category of NO RESPONSE has been added to identify students who provided no written responses to any of the questions pertaining to one environment.

Table 16 reveals that the largest number of students in the total sample (35%) wrote POSITIVE comments concerning the IM environment. Another 31% made NEUTRAL comments. There were no comments made by 27% of the sample concerning the IM environment. If one were to consider no comment to be a neutral response, then 58% of the total IM responses (27% + 29%) would be in the NEUTRAL range.[40] By way of

---

[39] When fewer that four responses were provided for an environment, averages were based only on those responses actually written. If no responses were written pertaining to one environment, then no average was computed.

[40] For the reminder of the discussion of written comments and their associated response scores, the author does combine NO RESPONSE frequencies with NEUTRAL frequencies in each column. He uses two terms, NEUTRAL

(Footnote Continued)

comparison, table 12 shows that preference scores, 29% reported POSITIVE and 49% reported NEUTRAL scores.

Table 16 also shows that the majority of IM students (54%) wrote POSITIVE IM comments. Another 23% made MOST POSITIVE comments about the IM environment. The corresponding percentages from table 12 are 69% POSITIVE, and 23% MOST POSITIVE preference scores.

Concerning SGM students, table 16 reveals that the majority (67%) gave NEUTRAL responses. POSITIVE comments concerning the IM environment were written by 33% of the SGM students. In table 12 there were NEUTRAL IM preference scores recorded for 71% of the SGM students, and POSITIVE scores recorded for 21% of the SGM group.

Table 16 shows that 72% of the LGM group gave NEUTRAL responses concerning the IM environment. Another 22% made POSITIVE comments. By comparison, 50% of the LGM students reported IM preference scores in the NEUTRAL range, 33% in the NEGATIVE range, and only 11% in the POSITIVE range.

(Footnote Continued)
comments and NEUTRAL responses, to distinguish between frequencies of actual written comments and the sum of frequencies described above. Distribution tables of response scores continue to distinguish, however, between the two categories of neutral response.

TABLE 16

Distribution of IM Mean Written Response Scores by Preferred Environment

TABLE OF RESPONSE_I BY ENVIRONMENT_1
RESPONSE_I MEAN INDIVIDUAL RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	2 3.5 -1.5 3.64% 13.33% 15.38%	9 6.5 2.5 16.36% 60.00% 37.50%	4 4.9 -0.9 7.27% 26.67% 22.22%	15 27.27%
NEGATIVE [-1.5,-0.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
NEUTRAL [-0.5,+0.5)	1 4.0 -3.0 1.82% 5.88% 7.69%	7 7.4 -0.4 12.73% 41.18% 29.17%	9 5.6 3.4 16.36% 52.94% 50.00%	17 30.91%
POSITIVE [+0.5,+1.5)	7 4.5 2.5 12.73% 36.84% 53.85%	8 8.3 -0.3 14.55% 42.11% 33.33%	4 6.2 -2.2 7.27% 21.05% 22.22%	19 34.55%
MOST POSITIVE [+1.5,+2.0]	3 0.7 2.3 5.45% 100.00% 23.08%	0 1.3 -1.3 0.00% 0.00% 0.00%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

From these data, pertaining to IM response scores derived from quantification of the Orientation Comment Form, the author has concluded that:

1. The distribution of response scores for the total sample tended to be consistent with the comparable distribution of preference scores, when missing comments were counted as neutral responses.
2. IM students tended to give positive responses, which were generally consistent in distribution with corresponding preference scores.
3. SGM students tended to give neutral responses, which were generally consistent in distribution with corresponding preference scores.
4. LGM students tended to give neutral responses; the distribution of response scores appeared to be shifted somewhat in the positive direction, in comparison to the comparable distribution of preference scores.

Table 17 reveals that the largest number of students in the total sample (40%) wrote POSITIVE comments concerning the SGM environment. Another 55% gave NEUTRAL responses. By way of comparison, table 13 showed that 42% reported POSITIVE preference scores, and 38% reported NEUTRAL scores.

TABLE 17

Distribution of SGM Mean Written Response Scores by Preferred Environment

TABLE OF RESPONSE_S BY ENVIRONMENT_1
RESPONSE_S MEAN SMALL GROUP RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	2	7	5	14
	3.3	6.1	4.6	
	-1.3	0.9	0.4	
	3.64%	12.73%	9.09%	25.45%
	14.29%	50.00%	35.71%	
	15.38%	29.17%	27.78%	
NEGATIVE [-1.5,-0.5)	1	0	2	3
	0.7	1.3	1.0	
	0.3	-1.3	1.0	
	1.82%	0.00%	3.64%	5.45%
	33.33%	0.00%	66.67%	
	7.69%	0.00%	11.11%	
NEUTRAL [-0.5,+0.5)	6	3	7	16
	3.8	7.0	5.2	
	2.2	-4.0	1.8	
	10.91%	5.45%	12.73%	29.09%
	37.50%	18.75%	43.75%	
	46.15%	12.50%	38.89%	
POSITIVE [+0.5,+1.5)	4	14	4	22
	5.2	9.6	7.2	
	-1.2	4.4	-3.2	
	7.27%	25.45%	7.27%	40.00%
	18.18%	63.64%	18.18%	
	30.77%	58.33%	22.22%	
TOTAL	13	24	18	55
	23.64%	43.64%	32.73%	100.00%

Table 17 also shows that the majority of IM students (62%) gave NEUTRAL SGM responses. Another 31% made POSITIVE comments about the SGM environment. The corresponding

percentages from table 13 are 54% NEUTRAL, and 31% POSITIVE preference scores.

Concerning SGM students, table 17 reveals that the majority (58%) wrote POSITIVE comments. NEUTRAL responses concerning the SGM environment were given by 42% of the SGM students. In table 13 the were NEUTRAL preference scores recorded for 17% of the SGM students, and POSITIVE scores recorded for 71% of the SGM group.

Table 17 shows that 67% of the LGM group gave NEUTRAL responses concerning the SGM environment. Another 22% made POSITIVE comments. By comparison with table 13, 56% of the LGM students reported SGM preference scores in the NEUTRAL range, 28% in the NEGATIVE range, and only 11% reported POSITIVE scores.

From these data, pertaining to SGM response scores derived from quantification of the Orientation Comment Form, the author has concluded that:

1. The distribution of response scores for the total sample tended to be consistent with the comparable distribution of preference scores, when missing comments were counted as neutral responses.
2. IM students tended to give neutral or positive responses, which were generally consistent in distribution with corresponding preference scores.
3. SGM students tended to give positive or neutral responses; the distribution of response scores appeared to be shifted somewhat towards neutral

(due to the number non-respondents), in comparison to the comparable distribution of more positive SGM preference scores.

4. LGM students tended to give neutral responses; the distribution of response scores appeared to be shifted somewhat in the positive direction, in comparison to the comparable distribution of preference scores.

Table 18 reveals that the largest number of students in the total sample (60%) gave NEUTRAL responses concerning the LGM environment. Another 29% made POSITIVE comments. By way of comparison, table 14 showed that 29% reported POSITIVE preference scores, and 51% reported NEUTRAL scores.

Table 18 also shows that the majority of IM students (77%) gave NEUTRAL LGM responses. Another 15% made POSITIVE comments about the LGM environment. The corresponding percentages from table 14 are 46% NEUTRAL, and 23% POSITIVE preference scores.

Concerning SGM students, table 18 reveals that the majority (79%) gave wrote NEUTRAL responses. POSITIVE comments concerning the LGM environment were given by 17% of the SGM students. In table 14 the were NEUTRAL preference scores recorded for 71% of the SGM students, and POSITIVE scores recorded for 13% of the SGM group.

TABLE 18

Distribution of LGM Mean Written Response Scores by Preferred Environment

TABLE OF RESPONSE_L BY ENVIRONMENT_1
RESPONSE_L MEAN LARGE GROUP RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	2 3.1 -1.1 3.64% 15.38% 15.38%	9 5.7 3.3 16.36% 69.23% 37.50%	2 4.3 -2.3 3.64% 15.38% 11.11%	13 23.64%
NEGATIVE [-1.5,-0.5)	1 0.5 0.5 1.82% 50.00% 7.69%	1 0.9 0.1 1.82% 50.00% 4.17%	0 0.7 -0.7 0.00% 0.00% 0.00%	2 3.64%
NEUTRAL [-0.5,+0.5)	8 4.7 3.3 14.55% 40.00% 61.54%	10 8.7 1.3 18.18% 50.00% 41.67%	2 6.5 -4.5 3.64% 10.00% 11.11%	20 36.36%
POSITIVE [+0.5,+1.5)	2 3.8 -1.8 3.64% 12.50% 15.38%	4 7.0 -3.0 7.27% 25.00% 16.67%	10 5.2 4.8 18.18% 62.50% 55.56%	16 29.09%
MOST POSITIVE [+1.5,+2.0]	0 0.9 -0.9 0.00% 0.00% 0.00%	0 1.7 -1.7 0.00% 0.00% 0.00%	4 1.3 2.7 7.27% 100.00% 22.22%	4 7.27%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 18 shows that 55% of the LGM group made positive comments concerning the LGM environment. Another 22% made MOST POSITIVE comments. By comparison with table 14, 56% of the LGM students reported LGM preference scores in the POSITIVE range, and 17% in the MOST POSITIVE range.

From these data, pertaining to LGM response scores derived from quantification of the Orientation Comment Form, the author has concluded that:

1. The distribution of response scores for the total sample tended to be consistent with the comparable distribution of preference scores, when missing comments were counted as neutral responses.
2. IM students tended to give neutral responses; the distribution of responses scores seemed to be more consolidated in the neutral range, with fewer extreme scores, than was true for the distribution of corresponding preference scores.
3. SGM students tended to give neutral responses, which were generally consistent with the comparable distribution of preference scores.
4. LGM students tended to give positive responses, which were generally consistent with the comparable distribution of preference scores.

5.4.3.3 Quantification of General Student Comments

As noted earlier, the written preference questionnaire also solicited a written general comment. These general written responses were evaluated according to the same criteria used for the environment comments. Samples of general comments from each of the categories are provided below.

1. MOST NEGATIVE (-2) [Only one comment.]

   "The questionnaire in the back of this pamphlet is the most ridiculous one I've ever seen in my life! For a math class?"

2. NEGATIVE (-1) [Only one comment.]

   "Some of the questions asked seem to be repetitious. I know it's not meant to be that way, but you can interpret them the same if not careful."

3. NEUTRAL (0)

   a. "I like the idea of taking all the tests and not worrying about failing. My concern (naturally) is my ability to grasp or master the subject. I've been away from math for 20 years - however I am a very hard worker."

   b. "Most of my responses are based only on limited background about the learning process and methods, and may vary accordingly as time goes on."

c. "Large group - I enjoy them. Small group - Will the rest of the group have enough patients if you are extremely slow to comprehend. Individual - No way, 9 out of 10 times a person won't strive as he should."

4. POSITIVE (+1) [Only one comment.]

"I was not here Mon. or Wed. to hear the orientations, yet I've always worked well and performed well in large classes."

5. MOST POSITIVE (+2)

a. "I would like to have [individual instruction] for strictly personal reasons with me. Because of my family it would be hard for me not to miss more than one day."

b. "I would prefer to be put in a large group math class."

c. "I think the small group method is best."

d. "An excellent selection of options."

5.4.3.4 Distribution of General and Total Response Scores

The response scores corresponding general comments were assigned the variable name of RESPONSE_G. General response scores were then crosstabulated with environmental preference groups. The resulting distribution of general response scores is presented in table 19.

TABLE 19

Distribution of Written General Response Scores by Preferred Environment

TABLE OF RESPONSE_G BY ENVIRONMENT_1
RESPONSE_G GENERAL RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	7 8.0 -1.0 12.73% 20.59% 53.85%	16 14.8 1.2 29.09% 47.06% 66.67%	11 11.1 -0.1 20.00% 32.35% 61.11%	34 61.82%
MOST NEGATIVE [-2.0,-1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
NEGATIVE [-1.5,-0.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	1 0.4 0.6 1.82% 100.00% 4.17%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

(CONTINUED)

TABLE OF RESPONSE_G BY ENVIRONMENT_1
RESPONSE_G GENERAL RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	2 1.2 0.8 3.64% 40.00% 15.38%	2 2.2 -0.2 3.64% 40.00% 8.33%	1 1.6 -0.6 1.82% 20.00% 5.56%	5 9.09%
POSITIVE [+0.5,+1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
MOST POSITIVE [+1.5,+2.0]	4 3.1 0.9 7.27% 30.77% 30.77%	5 5.7 -0.7 9.09% 38.46% 20.83%	4 4.3 -0.3 7.27% 30.77% 22.22%	13 23.64%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

As a summary measure for all written responses, the thirteen responses scores for each student were averaged.[41] These averages of all response scores were assigned to the RESPONSE_T variable. The distribution of these averages is

---

[41] When fewer than thirteen response scores were available, only the number of responses actually scored were averaged. Students who made no comments at all on the Orientation Comment Form, were counted in the NO RESPONSE category.

presented in table 20. The same data range criteria and labels were used for tables 19 and 20. Individual values for both the general and the total responses scores can be found in appendix L.

While 62% of the total sample made no general comment, the majority of the general comments which were written were in the MOST POSITIVE category. A review of the Orientation Comment Forms has revealed that the majority of these MOST POSITIVE comments were expressions of preference for a particular learning environment.

Table 20 reveals that the mean response scores were POSITIVE for 60% of the total sample. In each environmental group, the majority of the students had POSITIVE mean response scores. On a proportional basis, the IM group had the most POSITIVE comment forms (77%), and the SGM group had the fewest POSITIVE comment forms (46%.) The SGM group of students also had the most NEUTRAL mean response scores and the largest number of non-respondents.

TABLE 20

Distribution of Mean Total Written Response Scores by Preferred Environment

TABLE OF RESPONSE_T BY ENVIRONMENT_1
RESPONSE_T MEAN TOTAL RESPONSE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	1 1.4 -0.4 1.82% 16.67% 7.69%	4 2.6 1.4 7.27% 66.67% 16.67%	1 2.0 -1.0 1.82% 16.67% 5.56%	6 10.91%
NEGATIVE [-1.5,-0.5)	1 0.2 0.8 1.82% 100.00% 7.69%	0 0.4 -0.4 0.00% 0.00% 0.00%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
NEUTRAL [-0.5,+0.5)	1 3.5 -2.5 1.82% 6.67% 7.69%	9 6.5 2.5 16.36% 60.00% 37.50%	5 4.9 0.1 9.09% 33.33% 27.78%	15 27.27%
POSITIVE [+0.5,+1.5)	10 7.8 2.2 18.18% 30.30% 76.92%	11 14.4 -3.4 20.00% 33.33% 45.83%	12 10.8 1.2 21.82% 36.36% 66.67%	33 60.00%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

5.4.4 Summary

In this section, the author presented and discussed two questionnaires, distributed in the post-orientation take-home packet, from which environmental preferences were determined. Those two forms, the Learning Environment Preference Scale and the Orientation Comment Form, can be found in appendix G. Data derived from those questionnaires can be found in appendix L.

The author began this section by describing how information from both questionnaires was used in the process of assigning students to their preferred environments. The author reported that 84% of the students were accurately[42] assigned to environmental groups on the basis of preference scores substantiated by written comments. Another 11% of the students were accurately assigned on the basis of written comments which either modified or clarified assignments based on preference scores. The author expressed the opinion that the use of both types of questionnaires is an important feature of the Choice Model.

Only 5% of the students in the sample expressed verbal environmental preferences after assignments were made, which differed from those preferences which were determined from the questionnaires. Some of the written and verbal preferences appeared to inconsistent with corresponding preference

---

[42] Accuracy of placement was presumed if a student did not request assignment to a different environment.

scores for those students. The author conjectured that sufficient sociometric structure had been established in the orientation classes to affect the environmental preferences of some students. The trends upon which this conjecture was based were most evident for female students.

Preference scores were determined from student responses to the Learning Environment Preference Scale, a Lickert scale instrument. For comparative purposes, the author assigned response scores to written comments. He then presented and discussed distributions of both preference and response scores. Descriptive labels were used to identify five score ranges: most negative, negative, neutral, positive, and most positive. The author reported the following findings.

1. Mean preference scores for the total sample were in the high-neutral range. The mean SGM preference score was the highest, and the mean IM preference score was the lowest. Male mean IM and LGM preference scores were higher than female means; the female mean SGM score was higher than the male mean. The distributions of corresponding preference and response scores for the IM, SGM, and LGM environments were similar.
2. Mean preference scores for the IM preference group were as follows: positive for IM, high-neutral for SGM, and neutral for LGM. Due to the small number of IM females, male-female comparisons were

not presented. The distributions of corresponding preference and response scores for the IM and SGM environments were similar. The distribution of LGM response scores was more consolidated in the neutral range, than was the corresponding preference score distribution.

3. Mean preference scores for the SGM preference group were as follows: positive for SGM, and neutral for IM and LGM. SGM male and female mean SGM and LGM preference scores were similar; the male IM mean score was somewhat higher than the female mean. The distributions of corresponding preference and response scores for the IM and LGM environments were similar. The distribution of SGM response scores showed somewhat fewer positive and more neutral responses than did the corresponding preference score distribution.

4. Mean preference scores for the LGM preference group were as follows: positive for LGM, and low-neutral for IM and SGM. Due to the small number of LGM females, male-female comparisons were not presented. The distributions of corresponding preference and response scores for the LGM environment were similar. The distributions of IM and SGM response scores showed somewhat more neutral and fewer negative responses than did the corresponding preference score distributions.

In addition to environment comments, the Orientation Comment Form provided for one general comment. Approximately one third of the sample made general comments. The majority of the general comments were in the most positive category. Regarding overall responses to the comment form, 89% of the sample wrote at least one comment; 60% of the sample wrote generally positive comments.

Chapter VI

PRE-INSTRUCTION STUDENT DATA

6.1 OVERVIEW

In chapter 5 the author provided a general overview of how data for this study was collected, and how the presentation of that data has been organized. He then presented specific data dealing with the ages and sexes of the participants in the study. The bulk of chapter 5, however, was devoted to the presentation and discussion of data pertaining to the orientation process and measurement of environmental preferences. This data was classified as pre-instruction data.

The preference data presented in chapter 5 was collected from questionnaires included in post-orientation take-home packets. Additional questionnaires were included in those take-home packets to assess selected pre-instruction personal characteristics of the student subjects. In addition to data collected through the use of questionnaires, other pre-instruction academic data pertaining to these students were collected from the archives at Prince George's Community College. These other pre-instruction data, both from post-orientation questionnaires and from academic archives, are presented in chapter 6.

Additional data was also collected after the instructional phase of the study was complete. New preference and evaluation data was collected in a second set of take-home

packets. Selected students characteristics were again assessed using questionnaires. Post-study academic archive information was also collected for all student participants. The post-instruction data are presented and discussed in chapter 7.

6.2 POST-ORIENTATION STUDENT CHARACTERISTICS

In the previous chapter, the author presented data pertaining to environmental preferences which were collected on two questionnaires included in the post-orientation take-home packet. This first take-home packet (appendix G) also contained several other instruments, each designed to measure one of the following student characteristics:

1. Mathematics Attitude
2. Self-Concept
3. Interpersonal Relations Orientation
4. Communication Apprehension

In order to assure that the results of measuring student characteristics were not used to influence any aspect of the orientation or instructional portions of the study, these questionnaires were not analyzed until all instruction for the semester had been completed.

The data derived from these four post-orientation instruments are presented and discussed in this section of chapter 6. The same mathematics attitude and communication apprehension instruments were also included in the post-instruction take-home packet. Analyses of post-instruction

data, and comparisons with post-orientation data are presented in chapter 7.[1]

The author has provided student characteristic data in three forms. Individual student characteristics measured by instruments in the first take-home packet are available in appendix M.[2] Crosstabulations of these data with environmental preference groups, and summary statistics by sex and environmental preference group are presented in body of the text.

---

[1] Variable name suffixes have been used in this study to distinguish between post-orientation and post-instruction data. The suffix "_1" was used in this study to identify student characteristic variables which were assessed by questionnaires in the post-orientation take-home packet. The suffix "_2" was used to identify student characteristic variables which were assessed by questionnaires in the post-instruction take-home packet. Mathematics attitude scale scores (MAS) which were assessed by a questionnaire in the post-orientation take-home packet, for instance, have been assigned the variable name MAS_1. Corresponding MAS scores which were assessed by a questionnaire in the post-instruction take-home packet, have been assigned the variable name MAS_2. Other suffixes were used to label variables which pertain to other stages of the study. These other suffixes are discussed in more detail later in chapter 7.

[2] The order in which appendix M data is presented corresponds to that of appendix L. Individual records are grouped by sex within environmental preference groups. Records are arranged within each grouping in increasing order of the respective environmental preference score (appendix L.)

6.2.1 Post-Orientation Mathematics Attitude

Mathematics attitudes were assessed using the Aiken and Dreger [1961] Mathematics Attitude Scale (MAS). A copy of the MAS questionnaire is included in appendix G. MAS scores were computed from student responses to this twenty-item Lickert scale questionnaire, containing ten positive and ten negative statements concerning mathematics. The instructions told students to express on a five-point scale, the extent of agreement or disagreement between their personal feelings and those expressed in each statement. The five possible responses, together with the corresponding response values assigned by the author, are listed below.

1.	Strongly Disagree	-2.0
2.	Disagree	-1.0
3.	Undecided	0.0
4.	Agree	+1.0
5.	Strongly Agree	+2.0

During the scoring process, response values for negative statements were multiplied by -1, so that in each case a positive value would represent a positive attitude, and a negative value would represent a negative attitude. The twenty adjusted response values were then averaged, to yield a single MAS score. The variable name MAS_1 has been used to label MAS scores which was computed from the post-orientation take-home questionnaire. MAS_1 scores for individual students can be found in appendix M.

The distribution of the post-orientation MAS scores with respect to environmental preference is presented in

table 21. MAS scores have been categorized in that table and assigned descriptive labels, as described below.

1. [-2.00, -1.49) - MOST NEGATIVE[3]
2. [-1.50, -0.49) - NEGATIVE
3. [-0.50, +0.49) - NEUTRAL
4. [+0.50, +1.49) - POSITIVE
5. [+1.50, +2.00] - MOST POSITIVE

Summary statistics for MAS_1 scores are presented in table 22.

Table 21 reveals that the mathematics attitudes for the total sample were very evenly distributed, with approximately one-third of the students indicating positive, neutral, and negative attitudes respectively. The distributions of mathematics attitudes were similar for LGM and SGM students. LGM students tended to have somewhat lower MAS scores, however, than did SGM students. This is indicated by the fact that deviations in both NEGATIVE LGM cells are positive, while the deviations in the other cells are negative.

---

[3] In this list, the data intervals are represented in terms of their endpoints on the number line. A square bracket [] indicates that the interval includes that endpoint, and a parenthesis () indicates that the interval excludes that endpoint. As the reader has already observed, this notation was used in the previous section with respect to preference and response scores. This same type of notation has also been used to specify category ranges for other data in this study.

TABLE 21

Distribution of Measured Mathematics Attitude by Preferred Environment

TABLE OF MAS_1 BY ENVIRONMENT_1
MAS_1 MATH ATTITUDE (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
NEGATIVE [-1.5,-0.5)	1 4.3 -3.3 1.82% 5.56% 7.69%	9 7.9 1.1 16.36% 50.00% 37.50%	8 5.9 2.1 14.55% 44.44% 44.44%	18 32.73%
NEUTRAL [-0.5,+0.5)	5 4.3 0.7 9.09% 27.78% 38.46%	8 7.9 0.1 14.55% 44.44% 33.33%	5 5.9 -0.9 9.09% 27.78% 27.78%	18 32.73%
POSITIVE [+0.5,+1.5)	7 4.3 2.7 12.73% 38.89% 53.85%	7 7.9 -0.9 12.73% 38.89% 29.17%	4 5.9 -1.9 7.27% 22.22% 22.22%	18 32.73%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

It also appears from Table 21 that there was a tendency for proportionally more students with IM preferences to hold POSITIVE mathematics attitudes (54%), than was true for the

other preference groups. The actual frequency in the POSITIVE-IM cell was 63% higher that the expected frequency. Likewise, there was a tendency for proportionally fewer IM students to hold NEGATIVE attitudes (8%), than was true for either of the other preference groups. The actual frequency in the NEGATIVE-IM cell was 77% lower than the expected frequency.

TABLE 22

Summary Statistics for Mathematics Attitude by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.017 1.069 -0.95 1.15 2.10 3	0.046 0.884 -1.45 1.45 2.90 13	-0.250 0.872 -0.85 0.75 1.60 3	-0.011 0.863 -1.45 1.45 2.90 19
MALE STUDENTS	0.545 0.444 -0.40 1.15 1.55 10	-0.009 0.897 -1.35 1.05 2.40 11	-0.060 0.859 -1.80 1.20 3.00 15	0.124 0.804 -1.80 1.20 3.00 36
ALL STUDENTS	0.451 0.632 -0.95 1.15 2.10 13	0.021 0.871 -1.45 1.45 2.90 24	-0.092 0.838 -1.80 1.20 3.00 18	0.077 0.819 -1.80 1.45 3.25 55

The apparent tendency observed in Table 21 for more students with IM preferences to hold positive mathematics

attitudes and for fewer to hold negative attitudes is reflected in the ALL STUDENTS-IM cell of table 22. IM students reported the highest mean MAS score, with the lowest range and standard deviation of MAS scores. The observed tendency for greater than expected numbers of LGM students to hold negative mathematics attitudes is reflected in the statistics for the ALL STUDENTS-LGM cell.

Relationships among mathematics attitude, mathematics anxiety, and sex differences have been discussed previously in conjunction with the literature review contained in chapter 3. Table 22 permits the comparison of mathematics attitudes by sexes of the students. Consistent with expectations from the literature, the total female mean MAS score was somewhat lower than the total male mean score. Although statistical significance has not been tested, it does not appear to the author, however, that this difference would be found to be statistically significant.

When environmental preference group in addition to sex is considered in comparing mean MAS scores, larger differences are apparent. The highest mean mathematics attitude score (0.5) occurred in the MALE-IM cell. The lowest MAS mean occurred in the FEMALE-LGM cell, but due to its low frequency, the author has computed a combined female mean for the IM and LGM cells. The resulting mean MAS score for non-SGM females was -0.1.

Comparison of mean and minimum statistics for the male cells shows that males with the lowest MAS scores appeared

to avoid the IM environment, although males with high scores were found in all three preference groups. The individual data shows that only one IM male (10%) reported a mathematically negative MAS score. In contrast to this, four SGM males (36%) and seven LGM males (47%) reported negative MAS scores.

A similar comparison of female cells is somewhat less conclusive. The FEMALE-SGM cell had the highest mean and maximum female score, but it also had the lowest minimum female score. The individual data in appendix M shows that eight SGM females (62%) reported MAS scores which were mathematically positive, while two non-SGM females (33%) reported positive MAS scores.

In summary, the author has observed that the distribution of mathematics attitude scores for the total sample was evenly distributed between positive, neutral, and negative scores. When both sex and environmental preference were taken into account, however, the following trends appeared.

1. Proportionally more male students with the negative[4] MAS scores tended to prefer either the SGM or the LGM environment over the IM environment.

---

[4] In these conclusions, the terms negative and positive refer to the mathematical definitions of the terms, rather than to the descriptive labels of NEGATIVE and POSITIVE which the author uses to describe general categories of mathematics attitudes.

2. Proportionally more female students with positive MAS scores tended to prefer the SGM environment over either of the other environments.

6.2.2 Post-Orientation Self-Concept

Student self-concepts were assessed by the Bledsoe Self-Concept Scale. A copy of this a self-report instrument was included in the post-orientation take-home packet for each student. The questionnaire (appendix G) presented the students with a list of thirty self-descriptive words or phrases such as friendly, careful, lazy, smart, and loyal.

Two scores for each student were computed from her or his responses to the self-concept questionnaire. For Self-Concept Scale (SCS) assessment, each student was instructed to check one of three possible responses to indicate "if you are like the word says" nearly always, about half the time, or just now and then. For Self-Ideal-Concept Scale (SICS) assessment, each student was instructed to respond to the same set of thirty self-descriptive words, with the same three possible responses. This time each response was to indicate "if you would like to be like the word says."

In order that the SCS and SICS scores would have ranges comparable to the other scores discussed previously in this chapter, the author assigned the following response values to the three possible student responses.

1.	Just Now and Then	-2.0
2.	About Half the Time	0.0
3.	Nearly Always	+2.0

Twenty-five of the descriptive words held positive connotations pertaining to each student's self-concept, and the other five held negative connotations. Responses to the negative words were multiplied by -1 so that in all cases a score of +2.0 would correspond to a positive self-concept. The thirty individual adjusted response scores for each scale were then averaged to yield the respective SCS and SICS scores. These self-concept and self-ideal-concept scores have been assigned variable names SCS_1 and SICS_1 respectively. Individual student values for each of these variables are provided in appendix M.

6.2.2.1 Self-Concept

The distribution of the post-orientation SCS scores with respect to environmental preference groups is presented in table 23. Scores were categorized for those tables and assigned the following descriptive labels.

1. [-2.00, -1.49) - LOWEST
2. [-1.50, -0.49) - LOWER
3. [-0.50, +0.49) - NEUTRAL
4. [+0.50, +1.49) - HIGHER
5. [+1.50, +2.00] - HIGHEST

Summary statistics for SCS scores, by sex and environmental preference group, are provided in table 24.

TABLE 23

Distribution of Self-Concept
by Preferred Environment

TABLE OF SCS_1 BY ENVIRONMENT_1
SCS_1 SELF CONCEPT (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	3 1.9 1.1 5.45% 37.50% 23.08%	1 3.5 -2.5 1.82% 12.50% 4.17%	4 2.6 1.4 7.27% 50.00% 22.22%	8 14.55%
HIGHER [+0.5,+1.5)	6 8.0 -2.0 10.91% 17.65% 46.15%	17 14.8 2.2 30.91% 50.00% 70.83%	11 11.1 -0.1 20.00% 32.35% 61.11%	34 61.82%
HIGHEST [+1.5,+2.0]	4 3.1 0.9 7.27% 30.77% 30.77%	6 5.7 0.3 10.91% 46.15% 25.00%	3 4.3 -1.3 5.45% 23.08% 16.67%	13 23.64%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

The most obvious feature of table 23 is that no students reported self-concepts below the NEUTRAL level. The majority of the sample (62%) reported self concepts in the HIGHER category, and 24% more reported SCS scores in the HIGHEST category. In addition, the NEUTRAL and HIGHER cells show that proportionally more SGM students reported HIGHER

self-concept scores than did students in the other environmental preference groups, and proportionally fewer SGM students reported NEUTRAL self-concept scores than did students in the other groups.

TABLE 24

Summary Statistics for Self-Concept
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	1.063 0.643 0.33 1.53 1.20 3	1.225 0.326 0.73 1.67 0.94 13	0.777 0.216 0.53 0.93 0.40 3	1.129 0.387 0.33 1.67 1.34 19
MALE STUDENTS	1.086 0.588 0.33 2.00 1.67 10	1.054 0.476 0.33 1.80 1.47 11	0.987 0.536 0.07 1.80 1.73 15	1.035 0.520 0.07 2.00 1.93 36
ALL STUDENTS	1.081 0.573 0.33 2.00 1.67 13	1.147 0.402 0.33 1.80 1.47 24	0.952 0.498 0.07 1.80 1.73 18	1.067 0.477 0.07 2.00 1.93 55

The ALL STUDENTS row of table 24 shows that SGM students reported the highest mean SCS score, while the LGM students reported the lowest mean score. The author has noted, however, that the differences between these means is not large. Likewise, while the mean SCS score for females

was higher than that for males, the difference was not large. Within the SGM preference group, the difference between male and female means was greater, but it was still not a large difference.

Table 24 shows that there were no negative SCS scores reported by the students in the sample. The lowest SCS score (0.07) was reported by a IM male student. The lowest female score (0.33) occurred in the IM group. The minimum and maximum statistics for female cells suggest that females with high self-concept scores tended to prefer the IM and SGM environments.[5] No comparable trend for male students was evident.

6.2.2.2 Self-Ideal-Concept

The distribution of self-ideal-concept scores (SICS) is presented in table 25. Summary statistics for SICS scores are presented in table 26. Finally, SCS and SICS scores are crosstabulated in table 27.

Table 25 shows that majority of the students in the sample (80%) reported scores in the HIGHEST category. The cell deviations show that the distribution of SICS scores with respect to preference groups was generally close to expected values. The only NEUTRAL SICS scores were in the LGM preference group, which also had fewer than expected

---

[5]Stronger conclusions concerning female self-concept trends are not appropriate due to small cell sizes.

scores in the HIGHEST category. The predominance of scores in the HIGHEST category suggests that upper-end saturation of the instrument may have occurred.

TABLE 25

Distribution of Self-Ideal-Concept by Preferred Environment

TABLE OF SICS_1 BY ENVIRONMENT_1
SICS_1 SELF-IDEAL-CONCEPT (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	0 0.5 -0.5 0.00% 0.00% 0.00%	0 0.9 -0.9 0.00% 0.00% 0.00%	2 0.7 1.3 3.64% 100.00% 11.11%	2 3.64%
HIGHER [+0.5,+1.5)	2 2.1 -0.1 3.64% 22.22% 15.38%	4 3.9 0.1 7.27% 44.44% 16.67%	3 2.9 0.1 5.45% 33.33% 16.67%	9 16.36%
HIGHEST [+1.5,+2.0]	11 10.4 0.6 20.00% 25.00% 84.62%	20 19.2 0.8 36.36% 45.45% 83.33%	13 14.4 -1.4 23.64% 29.55% 72.22%	44 80.00%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Comparisons of the mean SICS scores given in table 26 show that students in all cells reported very similar mean

self-ideal-concept scores. There were no negative SICS scores; the lowest male SICS score of 0.33 occurred in the LGM group, and the lowest female score of 0.73 occurred in the SGM group. The individual student data in appendix M reveal that all females in the IM and LGM environmental preference groups reported self-ideal-concepts in the HIGHEST category.

TABLE 26

Summary Statistics for Self-Ideal-Concept by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	1.753 0.204 1.53 1.93 0.40 3	1.652 0.340 0.73 2.00 1.27 13	1.820 0.101 1.73 1.93 0.20 3	1.694 0.295 0.73 2.00 1.27 19
MALE STUDENTS	1.634 0.408 0.60 2.00 1.40 10	1.626 0.399 0.73 2.00 1.27 11	1.553 0.526 0.33 2.00 1.67 15	1.598 0.448 0.33 2.00 1.67 36
ALL STUDENTS	1.662 0.367 0.60 2.00 1.40 13	1.640 0.360 0.73 2.00 1.27 24	1.598 0.489 0.33 2.00 1.67 18	1.631 0.401 0.33 2.00 1.67 55

6.2.2.3 Comparison of Self-Concept and Self-Ideal-Concept Reports

Table 27 provides a more detailed distribution of self-ideal-concept (SICS) scores with respect to environmental preference, by controlling for self-concept (SCS) scores. Table 27 presents distribution in three respective segments, for students with NEUTRAL category SCS scores, HIGHER SCS scores, and HIGHEST SCS scores.

TABLE 27

Distribution of Self-Ideal-Concept
by Preferred Environment and Self-Concept

TABLE OF SICS_1 BY ENVIRONMENT_1

SECTION 1 - CONTROLLING FOR SCS_1=NEUTRAL
SICS_1 SELF-IDEAL-CONCEPT (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	0 0.8 -0.8 0.00% 0.00% 0.00%	0 0.3 -0.3 0.00% 0.00% 0.00%	2 1.0 1.0 25.00% 100.00% 50.00%	2 25.00%
HIGHEST [+1.5,+2.0]	3 2.3 0.8 37.50% 50.00% 100.00%	1 0.8 0.3 12.50% 16.67% 100.00%	2 3.0 -1.0 25.00% 33.33% 50.00%	6 75.00%
TOTAL	3 37.50%	1 12.50%	4 50.00%	8 100.00%

The first section of table 27 reflects the distribution of SICS scores for the eight students who had NEUTRAL category SCS scores. Two students (25%) also reported NEUTRAL SICS scores; these were both LGM male students. The other six students with neutral self-concepts, all reported self-ideal-concepts in the HIGHEST category. The reader can consult the individual data in appendix M if additional information pertaining to these eight students is desired.

TABLE OF SICS_1 BY ENVIRONMENT_1

SECTION 2 - CONTROLLING FOR SCS_1=HIGHER
SICS_1 SELF-IDEAL-CONCEPT (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
HIGHER [+0.5,+1.5)	2 1.6 0.4 5.88% 22.22% 33.33%	4 4.5 -0.5 11.76% 44.44% 23.53%	3 2.9 0.1 8.82% 33.33% 27.27%	9 26.47%
HIGHEST [+1.5,+2.0]	4 4.4 -0.4 11.76% 16.00% 66.67%	13 12.5 0.5 38.24% 52.00% 76.47%	8 8.1 -0.1 23.53% 32.00% 72.73%	25 73.53%
TOTAL	6 17.65%	17 50.00%	11 32.35%	34 100.00%

TABLE OF SICS_1 BY ENVIRONMENT_1

SECTION 3 - CONTROLLING FOR SCS_1=HIGHEST
SICS_1 SELF-IDEAL-CONCEPT (POST-ORIENTATION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
HIGHEST [+1.5,+2.0]	4 4.0 0.0 30.77% 30.77% 100.00%	6 6.0 0.0 46.15% 46.15% 100.00%	3 3.0 0.0 23.08% 23.08% 100.00%	13 100.00%
TOTAL	4 30.77%	6 46.15%	3 23.08%	13 100.00%

The second section of table 27 presents the distribution of self-ideal-concept (SICS) scores for students whose self-concept (SCS) scores were in the HIGHER range. The reader will recall from the discussion of table 23 that the majority of the sample (62%) reported SCS scores in the HIGHER range. The majority of these thirty-four students reported SICS SCORES in the highest range. The cell deviations indicate that the actual frequency distribution for these SICS scores agreed closely with the expected distribution. The individual student data in appendix M reveals

that with one exception[6] no student reported a lower SICS score than SCS score.

The last section of table 27 shows that all of the thirteen students who reported the highest self-concepts, also reported self-ideal-concepts in the highest range possible. Furthermore, a comparison of total column percents from tables 25 and 27, indicates that the distribution of these students over the environments closely agreed with the proportional distribution of all students over the three environments.

To summarize the findings with respect to self-concept and self-ideal-concept reports, the discussion has revealed that:

1. No students reported scores in the negative range; the majority reported SCS scores in the HIGHER range.
2. All but one student reported SICS scores which were equal to or higher than their SCS scores; the majority reported SICS scores in the HIGHEST range, perhaps indicating instrument saturation.

---

[6] This was student number 47, an international female student of age twenty-three. It would appear from an inspection of her questionnaire, that she did not fully understand the directions for completing the form. Since no assumptions of intent were appropriate during the data entry process, her SICS score was lower than her SCS score. It appears to the author, however, that she intended to report a higher self-ideal-concept, rather than a lower one.

3. Female students with high SCS scores appeared to prefer the SGM and IM environments.

4. Female SGM students reported a higher mean SCS score than did their male counter-parts.

6.2.3 Interpersonal Relations

The third student characteristic assessment instrument included in the post-orientation take-home packet was FIRO-B, which is an acronym for Fundamental Interpersonal Relations Orientation - Behavior. This is an instrument developed by William C. Schutz [1966.] The six interpersonal traits measured by FIRO-B and their associated variable names for use in this study are listed below.

1.	Expressed Affection	(EA_1)
2.	Withheld Affection	(WA_1)
3.	Expressed Control	(EC_1)
4.	Withheld Control	(WC_1)
5.	Expressed Inclusion	(EI_1)
6.	Withheld Inclusion	(WI_1)

The FIRO-B instrument (appendix G) contains fifty-four statements which are subdivided into four parts. The four parts are identified in table 28 below. The variable names in the second column of table 28 show that the first two parts of the instrument pertain to assessment of expressed inclusion, expressed affection, and withheld control. Similarly, the second two parts of the FIRO-B instrument pertain to assessment of expressed control, withheld inclusion, and withheld affection.

The third column of table 28 presents the current values of six counters, one corresponding to each different

variable name in the second column. A study of these counters reveals that there are nine statements corresponding to each of the six variables. The fourth column indicates whether or not the corresponding statement is worded in a positive context. The last column contains the significant response criterion levels for each statement. All the information in table 28 is relevant to the scoring procedure for FIRO-B which is explained next.

TABLE 28

Key to FIRO-B Statements and Responses

Statement	Variable	Counter	Positive?	Level
Part 1				
1	EI	1	YES	3
2	WC	1	YES	4
3	EI	2	YES	4
4	EA	1	YES	3
5	EI	3	YES	2
6	WC	2	YES	2
7	EI	4	YES	2
8	EA	2	YES	1
9	EI	5	YES	1
10	WC	3	YES	2
11	EI	6	YES	2
12	EA	3	YES	2
13	EI	7	YES	1
14	WC	4	YES	1
15	EI	8	YES	2
16	EI	9	YES	2
Part 2				
17	EA	4	YES	2
18	WC	5	YES	2
19	EA	5	NO	3
20	WC	6	YES	3
21	EA	6	YES	2
22	WC	7	YES	4
23	EA	7	YES	3
24	WC	8	YES	3
25	EA	8	NO	2
26	WC	9	YES	2
27	EA	9	YES	2

(CONTINUED)

Key to FIRO-B Statements and Responses

Statement	Variable	Counter	Positive?	Level
Part 3				
28	WI	1	YES	4
29	WA	1	YES	4
30	EC	1	YES	3
31	WI	2	YES	3
32	WA	2	YES	3
33	EC	2	YES	3
34	WI	3	YES	4
35	WA	3	NO	3
36	EC	3	YES	3
37	WI	4	YES	2
38	WA	4	YES	2
39	WI	5	YES	1
40	WA	5	NO	2
41	EC	4	YES	3
Part 4				
42	WI	6	YES	2
43	WA	6	YES	2
44	EC	5	YES	3
45	WI	7	YES	2
46	WA	7	NO	2
47	EC	6	YES	2
48	WI	8	YES	2
49	WA	8	YES	2
50	EC	7	YES	2
51	WI	9	YES	1
52	WA	9	NO	2
53	EC	8	YES	2
54	EC	9	YES	2

The instructions on the instrument direct each student to select one of six possible responses to each statement, to indicate "which of the following answers best applies to you." Different sets of responses are presented for different parts of the questionnaire. The responses for the first part (items 1 - 16) and fourth part (items 41 - 54) are the same.

1. Usually
2. Often
3. Sometimes

4. Occasionally
5. Rarely
6. Never

The responses to the second and third parts (items 17 - 27 and and 28 - 40 respectively) are also the same.

1. Most People
2. Many People
3. Some People
4. A few People
5. One or Two People
6. Nobody

The procedure which this author used to compute the six FIRO-B scores from individual responses to the fifty-four statements is described below.

1. As shown in table 28, the nine statements corresponding to each variable have been mixed to form the set of fifty-four statements. The corresponding sets of nine responses to these statements were regrouped for scoring purposes.
2. Responses to the negatively worded statements were subtracted from 7[7], so that for all statements an adjusted response score of 1 would correspond to an affirmative response to a positively worded statement.

---

[7] Subtracting 7 was necessary because the possible response values were 1 through 6. By way of example, item 19 is a negatively worded statement pertaining to expressed affection, so a response of 1 to this statement would be adjusted by the described procedure to a response of 6, and a response of 6 would be adjusted to a response of 1.

3. The Level column in table 28 gives the highest adjusted response score which is considered to represent an affirmative response to that statement; low response numbers represent affirmative responses. If an adjusted response to a statement was less than or equal to the level given in the table, then that response was given a point value of 1. Otherwise the adjusted response was given a point value of 0.

4. The points awarded for affirmative responses pertaining to the same interpersonal variable were then added to yield the raw score for that variable. Thus a raw score of 0 means that none of that student's responses to the nine statements pertaining to that variable were evaluated as affirmative responses. Similarly, a raw score of 9 means that all of that student's responses were affirmative.

5. In order to achieve the same range of FIRO-B scores as were used for the other measured variables in this study, one final transformation was performed. The constant 4.5 was subtracted from each raw score and the difference was divided by 2.25. This yielded a final set of adjusted scores ranging from -2.0 for a raw score of 0, up to 2.0 for a raw score of 9. Individual student FIRO-B

scores for each of these six variables can be found in appendix M.

FIRO-B variable scores were categorized in crosstabulation tables and assigned descriptive labels. In tables for expressed affection, control, and inclusion, the categories have been given the following labels for the respective score ranges. Corresponding ranges of raw scores (point values) appear after each label.

1.	[-2.00, -1.49) -	LEAST	- [0, 1]
2.	[-1.50, -0.49) -	LESS	- [2, 3]
3.	[-0.50, +0.49) -	NEUTRAL	- [4, 5]
4.	[+0.50, +1.49) -	MORE	- [6, 7]
5.	[+1.50, +2.00] -	MOST	- [8, 9]

A high numerical score corresponds high expressing behavior with respect to the measured variable.

In tables for withheld affection, control, and inclusion, the category labels have been reversed in polarity for the same respective score ranges. Corresponding ranges of raw scores (point values) appear after each label.

1.	[-2.00, -1.49) -	MOST	- [0, 1]
2.	[-1.50, -0.49) -	MORE	- [2, 3]
3.	[-0.50, +0.49) -	NEUTRAL	- [4, 5]
4.	[+0.50, +1.49) -	LESS	- [6, 7]
5.	[+1.50, +2.00] -	LEAST	- [8, 9]

A high numerical score corresponds to low withholding behavior with respect to the measured variable.

6.2.3.1 Expressed Affection

The crosstabulation of expressed affection scores (EA_1) with respect to environmental preference groups is presented in table 29. Summary statistics for EA_1 with respect to sex and environmental preference group are presented in table 30. Presentation and discussion of a corresponding pair of crosstabulation and statistical summary tables for withheld affection scores (WA_1) follows this presentation and discussion of expressed affection scores.

The total column in table 29 reveals that the majority of the sample reported expressed affection scores in the LEAST, LESS, and NEUTRAL categories. There were only three students (5%), all from the SGM preference group who reported scores in the MORE category. Another group of eight students (15%) reported EA scores in the MOST category.[8]

---

[8] The individual data in appendix M indicates that all three students in the MORE category were SGM females, and that all students in the MOST category were males.

TABLE 29

Distribution of FIRO-B Expressed Affection
by Preferred Environment

TABLE OF EA_1 BY GROUP_1
EA_1 EXPRESSED AFFECTION (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LEAST [-2.0,-1.5)	2 2.8 -0.8 3.64% 16.67% 15.38%	5 5.2 -0.2 9.09% 41.67% 20.83%	5 3.9 1.1 9.09% 41.67% 27.78%	12 21.82%
LESS [-1.5,-0.5)	5 4.7 0.3 9.09% 25.00% 38.46%	10 8.7 1.3 18.18% 50.00% 41.67%	5 6.5 -1.5 9.09% 25.00% 27.78%	20 36.36%
NEUTRAL [-0.5,+0.5)	5 2.8 2.2 9.09% 41.67% 38.46%	2 5.2 -3.2 3.64% 16.67% 8.33%	5 3.9 1.1 9.09% 41.67% 27.78%	12 21.82%
MORE [+0.5,+1.5)	0 0.7 -0.7 0.00% 0.00% 0.00%	3 1.3 1.7 5.45% 100.00% 12.50%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
MOST [+1.5,+2.0]	1 1.9 -0.9 1.82% 12.50% 7.69%	4 3.5 0.5 7.27% 50.00% 16.67%	3 2.6 0.4 5.45% 37.50% 16.67%	8 14.55%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

In the IM preference group, scores were concentrated in the LESS and NEUTRAL categories, with somewhat fewer than expected numbers of students reporting scores in the LEAST, MORE, and MOST categories. The distribution of SGM students suggests the existence of two subgroups, one concentrated in the LESS category, and the other concentrated in the MORE and MOST categories. The majority of the students in the LGM preference group reported expressed affection scores in the lower three categories.

TABLE 30

Summary Statistics for Expressed Affection
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.223 0.445 -0.67 0.22 0.89 3	-0.565 0.997 -2.00 1.11 3.11 13	-0.077 0.514 -0.67 0.22 0.89 3	-0.434 0.869 -2.00 1.11 3.11 19
MALE STUDENTS	-0.402 0.967 -1.56 1.56 3.12 10	-0.020 1.558 -1.56 2.00 3.56 11	-0.489 1.374 -2.00 2.00 4.00 15	-0.322 1.316 -2.00 2.00 4.00 36
ALL STUDENTS	-0.361 0.860 -1.56 1.56 3.12 13	-0.315 1.285 -2.00 2.00 4.00 24	-0.421 1.269 -2.00 2.00 4.00 18	-0.361 1.173 -2.00 2.00 4.00 55

The ALL STUDENTS row and TOTAL SAMPLE column of table 30 show that overall mean expressed affection scores were similar for the three preference groups and for the two sexes. Within the female row however, the SGM female cell has a lower mean than do either of the non-SGM female cells. In the male row, the opposite is true; the SGM male cell has a higher mean than do either of the non-SGM male cells.

The minimum, maximum, and range statistics show that male students reporting both high and low scores were present in all preference groups. The distribution in table 29, combined with individual data from appendix M, shows the existence of two subgroups of males; those in the MOST category and those in the NEUTRAL or lower categories. It can be verified by the reader that the mean EA score for the eight males in the MOST category was 1.835, while the mean for all males with EA scores of NEUTRAL or lower was -.938. The means by preference group for males with scores in NEUTRAL or lower categories were -0.620, -1.110, and -1.075 for the IM, SGM, and LGM groups respectively. Individual data in appendix M shows that of the males with NEUTRAL or lower EA scores, those with the higher scores tended to prefer the IM environment.

The minimum, maximum, and range statistics show that none of the IM and LGM females reported EA scores above the NEUTRAL range; the highest female score occurred in the SGM preference group. It was previously noted that three SGM females reported EA scores in the MORE category. It can be

verified from the data in appendix M that the mean EA score for the three female SGM students in the MORE category was 0.963, and the mean score for the ten remaining SGM females was -1.024. The mean score for all females, excluding the three in the MORE category, was -0.696. The individual data further reveals that non-SGM female EA scores were all between these high and low mean scores SGM female subgroups. From this appears clear that females with the lowest EA scores tended to prefer the SGM environment.

In summary, there is evidence to suggest that two male subgroups and two female subgroups of students existed in the sample. These subgroups were distinguishable with respect to level of reported expressed affection score. The author refers to these subgroups as the "higher" and "lower" subgroups for each sex.

1. Males in the higher subgroup tended to prefer the SGM and LGM environments.
2. Of the males within the lower subgroup, those with the higher scores tended to prefer the IM environment.
3. All females in the higher subgroup (only three) preferred the SGM environment.
4. Of the females in the lower subgroup, those with the lowest scores also tended to prefer the SGM environment.
5. Within the lower male and female groups, SGM males and females tended to have similar scores.

6. Within the lower male and female groups, non-SGM females tended to have higher scores than did non-SGM males.

7. Between the higher male and female groups, males reported consistently higher scores than did females.

6.2.3.2 Withheld Affection

Withheld affection data derived from the FIRO-B instrument is presented next, in order to permit the reader to more easily compare expressed and withheld affection findings. The distribution of WA scores with respect to environmental preference groups is presented in table 31. Summary statistics by sex and preference group are then presented in table 32. Individual withheld affection scores can be found in appendix M.[9]

---

[9] The reader is reminded that the descriptive labels for "withheld" traits are reversed from those for "expressed" traits. Thus the lowest WA score indicates that corresponds to the greatest tendency to withhold affection. Categories of withheld affection in table 31 are presented in increasing order with respect to WA score.

TABLE 31

Distribution of FIRO-B Withheld Affection by Preferred Environment

TABLE OF WA_1 BY GROUP_1
WA_1 WITHHELD AFFECTION (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

WA_1	INDIVIDUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST [-2.0,-1.5)	3 4.0 -1.0 5.45% 17.65% 23.08%	6 7.4 -1.4 10.91% 35.29% 25.00%	8 5.6 2.4 14.55% 47.06% 44.44%	17 30.91%
MORE [-1.5,-0.5)	2 1.2 0.8 3.64% 40.00% 15.38%	3 2.2 0.8 5.45% 60.00% 12.50%	0 1.6 -1.6 0.00% 0.00% 0.00%	5 9.09%
NEUTRAL [-0.5,+0.5)	3 2.6 0.4 5.45% 27.27% 23.08%	4 4.8 -0.8 7.27% 36.36% 16.67%	4 3.6 0.4 7.27% 36.36% 22.22%	11 20.00%
LESS [+0.5,+1.5)	4 2.8 1.2 7.27% 33.33% 30.77%	5 5.2 -0.2 9.09% 41.67% 20.83%	3 3.9 -0.9 5.45% 25.00% 16.67%	12 21.82%
LEAST [+1.5,+2.0]	1 2.4 -1.4 1.82% 10.00% 7.69%	6 4.4 1.6 10.91% 60.00% 25.00%	3 3.3 -0.3 5.45% 30.00% 16.67%	10 18.18%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 31 shows that the largest single group of students in the sample (31%) reported WA scores in the MOST category. The majority of the sample scores (60%), however, were evenly distributed between the NEUTRAL, LESS, and LEAST categories. Only 9% of the scores fell in the MORE category. When the MORE and MOST categories are combined, the distribution of scores with respect to preference groups corresponds closely with expected values.

TABLE 32

Summary Statistics for Withheld Affection
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	0.223 0.445 -0.22 0.67 0.89 3	-0.257 1.400 -2.00 2.00 4.00 13	0.370 0.678 -0.22 1.11 1.33 3	-0.082 1.205 -2.00 2.00 4.00 19
MALE STUDENTS	-0.355 1.438 -2.00 2.00 4.00 10	0.505 1.325 -1.56 2.00 3.56 11	-0.607 1.522 -2.00 1.56 3.56 15	-0.197 1.481 -2.00 2.00 4.00 36
ALL STUDENTS	-0.222 1.283 -2.00 2.00 4.00 13	0.093 1.391 -2.00 2.00 4.00 24	-0.444 1.450 -2.00 1.56 3.56 18	-0.157 1.381 -2.00 2.00 4.00 55

From inspection of the ALL STUDENTS row in table 32, it is apparent that SGM students reported the highest mean WA score, which reflects lowest average level affection withholding behavior. The LGM environmental preference group reported the lowest mean WA score, indicating the highest average level of withholding behavior. The IM group reported a mean which was approximately midway between the SGM and LGM group means.

The difference between the means for males and females in the TOTAL SAMPLE column is smaller than the differences between preference group means. When differences within preference groups by sex are considered, stronger patterns are revealed. In the non-SGM preference groups, the mean WA scores indicate that females tended to report a lower average level of withholding affection behavior than did males. In the SGM group, however, the pattern was reversed. Female SGM students tended to report a higher average level of affection withholding behavior than did SGM males. It can be verified from the individual data in appendix M that all non-SGM females (100%) reported scores in the NEUTRAL or LESS categories in table 31, while 46% of the SGM females reported WA scores in the MORE or MOST categories.

Similarly, when differences within sexes by preference group are considered, stronger patterns evolve than those reflected in the ALL STUDENTS row. Non-SGM females reported an overall lower average level of affection withholding behavior than did SGM females. Non-SGM males, however,

reported a higher overall average level of withholding behavior. It can be verified from inspection of the individual WA score data in appendix M that 67% of the SGM males reported scores in the LESS or LEAST categories. Conversely, 52% of the non-SGM males reported WA scores in the MORE or MOST categories.

In summary, there is evidence of a sex factor in the distribution of withheld affection scores with respect to environmental preference groups.

1. Female students who reported the most affection withholding behavior consistently preferred the SGM environment.
2. While there were male students in all three environments who reported WA scores at both ends of the spectrum, there was a tendency for those males who reported the least withholding behavior to prefer the SGM environment, and those who reported the most withholding behavior to prefer the non-SGM environments.

6.2.3.3 Summary of Expressed and Withheld Affection Findings

Detailed analysis of interactions between EA and WA scores is beyond the scope of this study, and is thus left to the reader. Without getting into those details, it is difficult to precisely describe the combined findings with regard to both expressed and withheld affection. Some

general findings, however, can still be reported.

1. Included in the IM preference group were the following principal subgroups:
   a) Males with midrange expressed affection scores.
   b) Females with midrange expressed affection scores.
   c) Males who tended to withhold affection.
   d) Females with midrange withheld affection scores.
2. Included in the SGM preference group were the following principal subgroups:
   a) Males with strong tendencies to express affection.
   b) Females with somewhat weaker tendencies to express affection.
   c) Males who tended not to express affection.
   d) Females who tended not to express affection.
   e) Males who did not tend to withhold affection.
   f) Females who did tend to withhold affection.
3. Included in the LGM preference group were the following principal subgroups:
   a) Males with strong tendencies to express affection.
   b) Males who tended not to express affection scores.

c) Females with midrange expressed affection scores.

d) Males who tended to withhold affection.

e) Females with midrange withheld affection scores.

6.2.3.4 Expressed Control

The FIRO-B expressed control (EC) scores reported by students in the sample are discussed next. The distribution of EA scores with respect to environmental preference groups is presented in table 33. Accompanying that distribution is table 34, which presents summary statistics for the EA scores by sex and preference group. Withheld control scores are presented after that.

Table 33 shows that most of the students in the sample (95%) reported expressed control scores in the lower three categories. The deviation in the LEAST-SGM cell shows that 38% more than the expected number of SGM students reported EC scores in this category. Conversely, 38% fewer than the expected number of LGM students reported LEAST EC scores.

TABLE 33

Distribution of FIRO-B Expressed Control by Preferred Environment

TABLE OF EC_1 BY GROUP_1
EC_1 EXPRESSED CONTROL (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LEAST [-2.0,-1.5)	4 4.7 -0.7 7.27% 20.00% 30.77%	12 8.7 3.3 21.82% 60.00% 50.00%	4 6.5 -2.5 7.27% 20.00% 22.22%	20 36.36%
LESS [-1.5,-0.5)	4 5.0 -1.0 7.27% 19.05% 30.77%	9 9.2 -0.2 16.36% 42.86% 37.50%	8 6.9 1.1 14.55% 38.10% 44.44%	21 38.18%
NEUTRAL [-0.5,+0.5)	3 2.6 0.4 5.45% 27.27% 23.08%	3 4.8 -1.8 5.45% 27.27% 12.50%	5 3.6 1.4 9.09% 45.45% 27.78%	11 20.00%
MORE [+0.5,+1.5)	1 0.2 0.8 1.82% 100.00% 7.69%	0 0.4 -0.4 0.00% 0.00% 0.00%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
MOST [+1.5,+2.0]	1 0.5 0.5 1.82% 50.00% 7.69%	0 0.9 -0.9 0.00% 0.00% 0.00%	1 0.7 0.3 1.82% 50.00% 5.56%	2 3.64%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 34 indicates that the mean EC scores for males in each preference group were higher than the corresponding female mean scores. This table also shows that male and female SGM students reported lower mean EC scores than did their non-SGM counter-parts. Minimum statistics show that both males and females with low EC scores were found in each preference group. Maximum statistics show that only males in the non-SGM groups reported the three scores above the NEUTRAL category which are reflected in table 33.

TABLE 34

Summary Statistics for Expressed Control by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.813 0.514 -1.11 -0.22 0.89 3	-1.352 0.669 -2.00 0.22 2.22 13	-0.963 0.926 -2.00 -0.22 1.78 3	-1.206 0.688 -2.00 0.22 2.22 19
MALE STUDENTS	-0.535 1.310 -2.00 2.00 4.00 10	-1.072 0.755 -2.00 0.22 2.22 11	-0.726 0.872 -2.00 1.56 3.56 15	-0.779 0.977 -2.00 2.00 4.00 36
ALL STUDENTS	-0.599 1.160 -2.00 2.00 4.00 13	-1.224 0.708 -2.00 0.22 2.22 24	-0.766 0.858 -2.00 1.56 3.56 18	-0.926 0.905 -2.00 2.00 4.00 55

Separate male and female distributions of expressed control scores can be derived from the individual data contained in appendix M. These distributions show that the lower male SGM mean was due in the main to the three non-SGM males who reported high EC scores. Otherwise, distributions of expressed control scores for the three male groups were basically similar to that of the total sample.

There were, however, no high female EC scores reported. The lower SGM female mean was due to the fact that 62% of the SGM females reported expressed control scores in the LEAST category. By comparison, only one non-SGM female (17%) reported an EC score in the LEAST category.

In summary, it appears that although few students reported strong expressed control behaviors, those who did were exclusively males, and none of them preferred the SGM environment. The majority of the males reported low levels of expressed control, with only minor differences between preference groups. Females with the lowest reported levels of expressed control tended to prefer the SGM environment.

6.2.3.5 Withheld Control

Corresponding to the interpersonal relations trait of expressing control (EC) is the related trait of withholding control (WC.) The distribution of WC scores reported by the students in the sample, with respect to environmental preference groups, is presented in table 35. Summary

statistics for these FIRO-B withheld control scores are presented in table 36 by sex and preference group. Individual data are presented in appendix M.

The distribution of withheld control scores in table 35 looks somewhat similar to that presented in table 33 for expressed control scores. Once again, 95% of the sample reported scores in the MOST, MORE, and NEUTRAL categories, with only 5% reporting scores in the LESS and LEAST categories.[10] It was also true the only three students who reported these high scores, which correspond to lesser degrees of withholding, were from the non-SGM environments. The individual data in appendix M shows, however, that only one student reported both high EC and WC scores.

The deviations in the MOST row of table 35 reveal that 53% more than the expected number of LGM students reported scores in this category. The IM and SGM cells, however, show smaller than expected frequencies. The deviations in the MORE row show that 49% fewer than the expected number of LGM students reported scores in this category, while more than expected frequencies occurred in the IM and SGM cells.

---

[10] The reader will note that once again the sequence of category labels has been reversed for withheld behavior scores.

TABLE 35

Distribution of FIRO-B Withheld Control by Preferred Environment

TABLE OF WC_1 BY GROUP_1
WC_1 WITHHELD CONTROL (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST [-2.0,-1.5)	4 4.3 -0.3 7.27% 22.22% 30.77%	5 7.9 -2.9 9.09% 27.78% 20.83%	9 5.9 3.1 16.36% 50.00% 50.00%	18 32.73%
MORE [-1.5,-0.5)	7 5.7 1.3 12.73% 29.17% 53.85%	13 10.5 2.5 23.64% 54.17% 54.17%	4 7.9 -3.9 7.27% 16.67% 22.22%	24 43.64%
NEUTRAL [-0.5,+0.5)	0 2.4 -2.4 0.00% 0.00% 0.00%	6 4.4 1.6 10.91% 60.00% 25.00%	4 3.3 0.7 7.27% 40.00% 22.22%	10 18.18%
LESS [+0.5,+1.5)	2 0.5 1.5 3.64% 100.00% 15.38%	0 0.9 -0.9 0.00% 0.00% 0.00%	0 0.7 -0.7 0.00% 0.00% 0.00%	2 3.64%
LEAST [+1.5,+2.0]	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

TABLE 36

Summary Statistics for Withheld Control
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.817 0.254 -1.11 -0.67 0.44 3	-0.941 0.561 -2.00 -0.22 1.78 13	-0.370 0.260 -0.67 -0.22 0.45 3	-0.831 0.519 -2.00 -0.22 1.78 19
MALE STUDENTS	-0.802 0.963 -1.56 1.11 2.67 10	-0.909 0.503 -1.56 -0.22 1.34 11	-1.025 1.026 -2.00 2.00 4.00 15	-0.928 0.860 -2.00 2.00 4.00 36
ALL STUDENTS	-0.805 0.840 -1.56 1.11 2.67 13	-0.926 0.524 -2.00 -0.22 1.78 24	-0.916 0.968 -2.00 2.00 4.00 18	-0.894 0.756 -2.00 2.00 4.00 55

According to table 36, the total male and female mean withheld control scores were very similar, although males overall reported a slightly lower mean score, corresponding to a slightly higher average level of control withholding behavior. The ALL STUDENTS row shows that the mean scores for preference groups were also similar, with the IM mean being somewhat higher than the means for the other two preference groups. The corresponding male and female means within preference groups, however, reveal more variation

than do the means between groups and the means between sexes.

Although the male and female means for the IM groups are similar, the corresponding ranges and standard deviations are quite different. Separate distributions of scores for IM males and females can be derived from the data in appendix M. These show that all three IM females (100%) and four IM males (40%) reported scores in the MORE category. The IM students shown in the MOST and LEAST cells of table 35 were all males.

All the statistics given for the SGM female and SGM male cells in table 36 are similar, although the female mean score is somewhat lower than the male mean. The minimum statistics show that no SGM student, male or female, reported a positive WC score. Thus, even those SGM students who were counted in the NEUTRAL cell of table 35 reported low-neutral scores. The distributions of male and female WC scores over the SGM cells were both very similar to the overall distribution of SGM of student scores shown in table 35.

The differences between statistics for the male and female LGM cells of table 36 are great. The individual data in appendix M show that all three female LGM students (100%) and five male LGM students (33%) reported scores in the NEUTRAL and MORE cells shown in table 35. All nine of the LGM students counted in the MOST cell were male, representing 60% of all LGM males, and at the other extreme the only

student to report a withheld control score in the LEAST category was also an LGM male.

In summary, the WC score data seem to indicate that while most students reported that they tended to behave in ways which withheld control from others, those who reported that they were the least inclined to withhold control tended to be males who preferred the IM or LGM environments. On the other hand, it appears that students who reported that they are most resistant to control by others also tended to be males, and they too were most likely to prefer the IM or LGM environments. Although most female students tended to report midrange WC scores, and it appears that those females who reported the most resistance of control by others tended to prefer the SGM environment.

The distributions of male and female SGM student WC scores were similar. SGM student scores were concentrated in the MORE cell, with some scatter in the NEUTRAL and MOST cells. The distributions of male and female non-SGM student withheld control scores were dissimilar. Non-SGM female scores were restricted to the NEUTRAL and MORE cells. The majority of non-SGM male WC scores (52%) were concentrated in the MOST withholding cell; the distribution was skewed, however, with some scores reported in all of the lesser withholding cells.

6.2.3.6 Summary of Expressed and Withheld Control Findings

The majority of students in the sample reported generally low tendencies behave in ways which expressed control, and correspondingly high tendencies to behave in ways which withheld control. A minority of male students from the IM and LGM preference groups, however, reported high levels of expressed control behaviors. In addition, an overlapping but not identical minority of IM and LGM males reported low levels on withheld control behaviors.

Within the IM preference group, 40% of the males reported EC scores in the LEAST category, with smaller numbers of males reporting higher levels of expressed control behavior. In addition, 80% of the IM males reported WC scores in the MORE and MOST categories. All three IM females reported generally low-midrange EC and WC scores. The IM females reported tendencies to express somewhat more control and to withhold somewhat less control than did the majority of the IM males.

Both male and female SGM students tended to report low-midrange EC and WC scores. The majority of SGM students of both sexes reported withheld control scores in the MORE range, and no SGM students reported WC scores in the LESS or LEAST ranges. The SGM males reported expressed control scores which were concentrated in the LESS range, while the majority of SGM females reported EC scores in the LEAST

range. No SGM students reported expressed control scores in the MORE or MOST ranges.

With exception of one LGM male student, all LGM students reported expressed control scores in the NEUTRAL, LESS, or LEAST ranges. LGM male EC scores tended to be concentrated in the LESS range, while the three female scores were distributed equally among the three lower cells. LGM female withheld control scores were in the NEUTRAL and MORE cells, while the majority of male LGM students reported WC scores in the MOST category.

6.2.3.7 Expressed Inclusion

The final pair of FIRO-B scores to be discussed deal with the interpersonal trait of inclusion. The distribution of expressed inclusion (EI) scores with respect to environmental preference groups is presented in table 37. Corresponding summary statistics by sex and preference groups are presented in table 38. Individual EI scores are included in appendix M.

The TOTAL column in table 37 shows that the majority of the sample (78%) reported expressed inclusion scores in the middle ranges of LESS, NEUTRAL, and MORE, with the largest concentration of 35% occurring in the LESS category. The deviations in LESS cells show, however, that 61% more than the expected number of LGM students reported EI scores in this range, while -40% fewer than the expected number of SGM students reported EI scores in the LESS range. The

deviations in the MORE and MOST rows of table 37 show that 25% and 92% more than the expected number of SGM students reported EI scores in those respective ranges.

The ALL STUDENTS row of table 38 shows that SGM students reported a higher mean EI score than did students in the IM and LGM groups. The means in the TOTAL SAMPLE column of table 38 show that female students reported a somewhat higher average level of expressed inclusion behavior than did the male students. It is important to note however that since the majority of the female students were also in the SGM group, these sample trends should not be assumed to be independent of each other.

The minimum, maximum, and range statistics in the individual cells of table 38 indicate a relatively large degree of variation within each cell. Within the IM preference group, the individual data does not reveal any consistent differences in the distributions of expressed inclusion scores on the basis of sex. The author attributes the difference between the IM male and female means to the small female cell size. The majority of the IM students (69%) reported EI scores in the NEUTRAL and LESS ranges.

TABLE 37

Distribution of FIRO-B Expressed Inclusion by Preferred Environment

TABLE OF EI_1 BY GROUP_1
EI_1 EXPRESSED INCLUSION (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LEAST [-2.0,-1.5)	2 1.4 0.6 3.64% 33.33% 15.38%	2 2.6 -0.6 3.64% 33.33% 8.33%	2 2.0 0.0 3.64% 33.33% 11.11%	6 10.91%
LESS [-1.5,-0.5)	4 4.5 -0.5 7.27% 21.05% 30.77%	5 8.3 -3.3 9.09% 26.32% 20.83%	10 6.2 3.8 18.18% 52.63% 55.56%	19 34.55%
NEUTRAL [-0.5,+0.5)	5 3.1 1.9 9.09% 38.46% 38.46%	6 5.7 0.3 10.91% 46.15% 25.00%	2 4.3 -2.3 3.64% 15.38% 11.11%	13 23.64%
MORE [+0.5,+1.5)	2 2.6 -0.6 3.64% 18.18% 15.38%	6 4.8 1.2 10.91% 54.55% 25.00%	3 3.6 -0.6 5.45% 27.27% 16.67%	11 20.00%
MOST [+1.5,+2.0]	0 1.4 -1.4 0.00% 0.00% 0.00%	5 2.6 2.4 9.09% 83.33% 20.83%	1 2.0 -1.0 1.82% 16.67% 5.56%	6 10.91%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

TABLE 38

Summary Statistics for Expressed Inclusion
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.520 1.123 -1.56 0.67 2.23 3	0.154 1.041 -1.56 1.56 3.12 13	-0.073 1.432 -1.11 1.56 2.67 3	0.012 1.074 -1.56 1.56 3.12 19
MALE STUDENTS	-0.268 0.875 -2.00 1.11 3.11 10	0.345 1.211 -1.56 2.00 3.56 11	-0.519 0.868 -1.56 1.11 2.67 15	-0.186 1.028 -2.00 2.00 4.00 36
ALL STUDENTS	-0.326 0.892 -2.00 1.11 3.11 13	0.241 1.102 -1.56 2.00 3.56 24	-0.445 0.944 -1.56 1.56 3.12 18	-0.117 1.038 -2.00 2.00 4.00 55

The individual EI score data in appendix M, show that the SGM male and female distributions of expressed inclusion scores were quite similar. The difference between SGM female and male mean EI scores can be attributed to slight differences in concentration of scores; 54% of the SGM males reported scores in the MORE and MOST categories as compared to 38% of the SGM females, and 54% of the SGM females reported EI scores in the NEUTRAL and LESS ranges as compared to 36% of the SGM males.

The higher LGM female mean EI score is due to one of those three students (33%) reporting expressed inclusion behavior in the MOST category. The other two females (67%) reported EI scores in the LESS range. The majority of the LGM males (53%) reported EI scores in the LESS range, with a second smaller node of 20% in the MORE category.

In summary, the observed differences in distributions of expressed inclusion scores appears to have been a more closely related to environmental preference group memberships than to the sexes of the students. The distribution of EI scores in the IM preference group was concentrated in the NEUTRAL and LESS ranges. The SGM student expressed inclusion scores were fairly evenly distributed among the four upper categories. The LGM expressed inclusion scores were concentrated in the LESS category. Thus, students of both sexes who reported greater inclination to express inclusion tended to prefer the SGM environment. Conversely, students of both sexes who reported lesser inclination to express inclusion tended to prefer the non-SGM environments.

6.2.3.8 Withheld Inclusion

The final set of FIRO-B data to be presented pertains to the interpersonal trait of withholding inclusion. The distribution of WI scores with respect to environmental preference groups is presented in table 39. Corresponding summary statistics are presented in table 40. Individual withheld inclusion data have been included in appendix M.

TABLE 39

Distribution of FIRO-B Withheld Inclusion by Preferred Environment

TABLE OF WI_1 BY GROUP_1
WI_1 WITHHELD INCLUSION (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST [-2.0,-1.5)	8 6.9 1.1 14.55% 27.59% 61.54%	9 12.7 -3.7 16.36% 31.03% 37.50%	12 9.5 2.5 21.82% 41.38% 66.67%	29 52.73%
MORE [-1.5,-0.5)	1 1.2 -0.2 1.82% 20.00% 7.69%	2 2.2 -0.2 3.64% 40.00% 8.33%	2 1.6 0.4 3.64% 40.00% 11.11%	5 9.09%
NEUTRAL [-0.5,+0.5)	0 0.7 -0.7 0.00% 0.00% 0.00%	3 1.3 1.7 5.45% 100.00% 12.50%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
LESS [+0.5,+1.5)	3 1.9 1.1 5.45% 37.50% 23.08%	3 3.5 -0.5 5.45% 37.50% 12.50%	2 2.6 -0.6 3.64% 25.00% 11.11%	8 14.55%
LEAST [+1.5,+2.0]	1 2.4 -1.4 1.82% 10.00% 7.69%	7 4.4 2.6 12.73% 70.00% 29.17%	2 3.3 -1.3 3.64% 20.00% 11.11%	10 18.18%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Perhaps the most striking feature of table 39 is the polarization of data in the extreme categories. A total of 53% of the students reported WI scores in the MOST category, while the next largest concentration was 18% in the LEAST range. The deviations show that more than the expected numbers of non-SGM students reported the most inclination to withhold inclusion. Conversely, more than the expected number SGM students reported the least inclination to withhold inclusion.

TABLE 40

Summary Statistics for Withheld Inclusion
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	-0.667 1.335 -2.00 0.67 2.67 3	-0.941 1.435 -2.00 2.00 4.00 13	0.813 1.360 -0.67 2.00 2.67 3	-0.621 1.481 -2.00 2.00 4.00 19
MALE STUDENTS	-0.934 1.557 -2.00 2.00 4.00 10	0.950 1.215 -1.56 2.00 3.56 11	-1.738 1.232 -2.00 2.00 4.00 15	-0.544 1.642 -2.00 2.00 4.00 36
ALL STUDENTS	-0.873 1.459 -2.00 2.00 4.00 13	-0.075 1.626 -2.00 2.00 4.00 24	-1.013 1.475 -2.00 2.00 4.00 18	-0.570 1.575 -2.00 2.00 4.00 55

The means in the ALL STUDENTS row of table 40 show that SGM students reported a higher average WI score than did students in the non-SGM groups, indicating less inclination to withhold inclusion. The means in the TOTAL SAMPLE column appear to reflect general similarity between the WI score reports for males and females. The standard deviation and range statistics, however, indicate a high degree of variability.

The individual data in appendix M show similar trends for withheld inclusion reporting by students in the IM and LGM preference groups. Between sex and within sex differences for the non-SGM students are inconclusive.[11] In each non-SGM preference group, a scattering of male and female students reported low inclusion withholding tendencies. The majority students in the IM and LGM groups, as reflected table 39, reported WI scores in the MOST category. The individual data shows that twenty male students reported WI scores in the MOST category. All but one of these males (95%) were in the non-SGM preference groups.

Comparison of mean withheld inclusion scores between male cells in table 40 reveals that SGM males tended to

---

[11] The difference in means for male and female LGM students may indicate that female students who prefer the LGM environment tend to report less withholding behavior, but the female sample size is too small to rely on this data to support that conclusion. Likewise, the appearance from the cell means that females who least withhold inclusion prefer the LGM group is also not reliable due to small cell size.

report higher scores, indicating lesser tendencies to withhold inclusion. The individual data show that eight males from the total sample reported WI scores in the LEAST category, and that 75% of these males were in the SGM preference group. Comparison of mean withheld inclusion scores between female cells in table 40 suggests that SGM females tended to report lower scores, indicating greater tendencies to withhold inclusion. The individual data show that nine females from the total sample reported WI scores in the MOST category, and that 89% of these females were in the SGM preference group. Finally, comparison of female and male means within the SGM preference group shows that males tended to report lesser levels of inclusion withholding behavior than did the females. The individual data shows that 55% of the SGM males reported WI scores in the LEAST range, while 62% of the SGM females reported WI scores in the MOST category.

In summary, the FIRO-B withheld inclusion data reported by the sample reveals some of the strongest evidence so far relating to interactions between the sexes and environmental preferences of the students. The male portion of the population tended to report polarized WI scores. The majority of those males reporting low levels of withholding behavior (high scores) preferred the SGM environment, while the majority of males reporting high levels of withholding behavior (low scores) preferred the non-SGM environments. Female scores were polarized to a lesser degree than were

male scores, with no clear preference pattern for those females reporting low levels of inclusion withholding behavior. The majority of females who reported high levels of withholding behavior, however, preferred the SGM environment.

6.2.3.9 Summary of Expressed and Withheld Inclusion Findings

In the IM preference group, the author reported that EI scores were concentrated in the NEUTRAL and LESS ranges, indicating low to moderate tendencies to express inclusion. WI scores for the IM group were heavily concentrated in the MOST category, indicating a strong tendency to withhold inclusion. The EI and WI scores reported by the three IM females were scattered, so the trends noted here pertained primarily to male students.

Expressed Inclusion scores reported by SGM males and females were distributed over the upper four categories. SGM students of both sexes reported average tendencies to behave in ways which moderately expressed inclusion. The majority of SGM males reported low levels of inclusion withholding behavior, while the majority of SGM females reported high levels of inclusion withholding behavior.

Students in the LGM preference group reported lesser levels of expressed inclusion behavior than did students in either of the other preference groups. The majority of LGM students of both sexes reported EI scores in the LESS range.

Male LGM students predominantly reported inclusion withholding behavior in the MOST range. The three female LGM scores were scattered, but tended to reflect lesser levels of withholding behavior.

6.2.4 Communication Apprehension

Thus far, the author has presented and discussed data relating mathematics attitudes, self-concepts, and interpersonal traits to the sexes and environmental preferences of the students in the sample. These student characteristics were all assessed by self-report instruments contained in a take-home packet which was distributed at the end of the orientation phase of this study. The Personal Report of Communication Apprehension (PRCA) [McCroskey, 1975] is final student characteristic instrument to be discussed. This instrument was also included in the post-orientation take-home packet.

The PRCA (appendix G) is a Lickert scale questionnaire composed of twenty-five statements concerning feelings about communication with other people. Fourteen of the statements described negative feelings about communication, and eleven statements described positive feelings. Students were provided with five alternative responses to each statement. The instructions on the questionnaire asked the student to "indicate the degree to which each statement applies to you by marking whether you:"

1. Strongly Agree
2. Agree
3. Are Undecided
4. Disagree
5. Strongly Disagree

The number preceding each response represents the raw score attributed to that response. Raw scores were evaluated in the following manner.

1. The response scale was first shifted to the -2.0 to +2.0 range by subtracting 3 from each raw response score.
2. Shifted response scores for negative statements were multiplied by -1, in order to reverse the polarity of these responses.[12]
3. The twenty-five adjusted response scores were then averaged, and that average was assigned to the variable PRCA_1.

This scoring system was used for purposes of consistency with the scoring methods used on the other student characteristic instruments administered in both the post-orientation and post-instruction take-home packets. McCroskey described an alternative scoring procedure, which is arithmetically simpler for students use in the classroom. The McCroskey formula is also presented here, so that readers who are familiar with the range of scores resulting

---

[12]As a result, an adjusted response of 2.0 to any statement indicates high apprehension, and an adjusted response of -2.0 represents low apprehension.

from that formula can more easily interpret the alternative scores presented here.

1. Raw scores for the negatively worded items are added together. The possible range for the negative total is 14 to 70.
2. Raw scores for the positively worded items are added together. The possible range for the separate positive total is 11 to 55.
3. The positive item total is added to 84, and the negative item total is subtracted from that sum. The possible final PRCA score range is from 25 for the lowest apprehension to 125 for the highest apprehension.[13]

The communication apprehension scores (PRCA) have been crosstabulated with respect to environmental preference groups in table 41. For this purpose, PRCA scores have been categorized and assigned descriptive labels. Those labels, along the the corresponding ranges of scores derived from the two scoring procedures, are given below. The range of

---

[13] The mathematical effect of adding 84 before subtracting the negative total is the equivalent of subtracting a raw response score from 6 for each negatively worded item, thereby reversing the polarity on a 1 to 5 scale. There were fourteen negatively worded items; the product of 6 and 14 is 84. In order to convert a McCroskey score to the -2.0 to 2.0 range used by the author, the reader can divide by 25 and subtract 3 from the result. In order to compute a McCroskey score from the score given by the author, the reader can add 3 and then multiply by 25.

scores used by the author precedes each label, and the corresponding McCroskey scores follow each label.

1. [-2.00, -1.49) - LOWEST - [25, 37]
2. [-1.50, -0.49) - LOWER - [38, 62]
3. [-0.50, +0.49) - NEUTRAL - [63, 87]
4. [+0.50, +1.49) - HIGHER - [88, 112]
5. [+1.50, +2.00] - HIGHEST - [113, 125]

Summary statistics for the PRCA_1 variable, by environmental preference and sex, are presented in table 42. McCroskey formula scores, however, are not included in this table. Individual communication apprehension scores in the -2.0 to 2.0 range are presented in appendix M.

The distribution of PRCA scores in table 41 shows that no students reported communication apprehension levels in the HIGHEST score category. Only one student reported a score in the LOWEST category. The majority of the sample students (62%) reported PRCA scores in the NEUTRAL range, with another 27% reporting scores in the LOWER category. Cell deviations show that 22% more than the expected number of SGM students reported NEUTRAL PRCA scores. In addition, 150% more than the expected number of LGM students reported scores in the HIGHER category.

TABLE 41

Distribution of Communication Apprehension by Preferred Environment

TABLE OF CA_1 BY GROUP_1

CA_1 COMMUNICATIONS APPREHENSION (POST-ORIENTATION)
GROUP_1 1ST ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LOWEST [-2.0,-1.5)	0 0.2 -0.2 0.00% 0.00% 0.00%	1 0.4 0.6 1.82% 100.00% 4.17%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
LOWER [-1.5,-0.5)	5 3.5 1.5 9.09% 33.33% 38.46%	5 6.5 -1.5 9.09% 33.33% 20.83%	5 4.9 0.1 9.09% 33.33% 27.78%	15 27.27%
NEUTRAL [-0.5,+0.5)	7 8.0 -1.0 12.73% 20.59% 53.85%	18 14.8 3.2 32.73% 52.94% 75.00%	9 11.1 -2.1 16.36% 26.47% 50.00%	34 61.82%
HIGHER [+0.5,+1.5)	1 1.2 -0.2 1.82% 20.00% 7.69%	0 2.2 -2.2 0.00% 0.00% 0.00%	4 1.6 2.4 7.27% 80.00% 22.22%	5 9.09%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

The PRCA mean scores in the TOTAL SAMPLE column of table 42 show that female students reported a slightly higher average level of communication apprehension than did

male students. Likewise, the means in the ALL STUDENTS row indicate that LGM students reported a higher average level of apprehension than did students in the IM and SGM preference groups. Comparisons of male and female mean PRCA scores within preference groups show that non-SGM females reported somewhat higher levels of communication apprehension than did non-SGM males.

TABLE 42

Summary Statistics for Communication Apprehension by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVIDUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	0.200 0.454 -0.12 0.72 0.84 3	-0.316 0.332 -0.92 0.28 1.20 13	0.080 0.760 -0.68 0.84 1.52 3	-0.172 0.457 -0.92 0.84 1.76 19
MALE STUDENTS	-0.517 0.384 -1.16 -0.16 1.00 10	-0.340 0.482 -1.52 0.08 1.60 11	-0.041 0.553 -0.80 0.88 1.68 15	-0.265 0.518 -1.52 0.88 2.40 36
ALL STUDENTS	-0.352 0.494 -1.16 0.72 1.88 13	-0.327 0.398 -1.52 0.28 1.80 24	-0.021 0.567 -0.80 0.88 1.68 18	-0.233 0.495 -1.52 0.88 2.40 55

Individual data for the non-SGM females show that five of these females (83%) reported communication apprehension

scores in the NEUTRAL or HIGHER categories. By comparison, 77% of the SGM females reported scores in the NEUTRAL category. Two of the five students in the sample who reported higher apprehension scores were non-SGM females. Only four females (21%) reported PRCA scores in the LOWER range. Three of these females (75%) were from the SGM preference group.[14] No female reported a communication apprehension score in the LOWEST range.

The individual data for male students shows that 50% of the IM males reported PRCA scores in the NEUTRAL range. By comparison, 73% of the LGM males reported scores in the NEUTRAL or HIGHER categories, and 73% of the SGM males reported NEUTRAL scores. All three of the male students who reported HIGHER PRCA scores were from the LGM preference group. Scores were reported in the LOWER-LOWEST range by 50% of the IM males, 27% of the LGM males, and 27% of the SGM males. The only student to report a score in the LOWEST range was an SGM male.

In summary, distributions of communication apprehension scores for all separate preference groups were concentrated in the NEUTRAL range. The IM and SGM distributions were skewed in the direction of lower apprehension scores, while the LGM distribution was generally centered on the NEUTRAL category. The four of the five students who reported

---

[14] As 68% of all females in the sample were in the SGM preference group, this statistic is inconclusive.

communication apprehension scores in the HIGHER range (80%) preferred the LGM environment; the other preferred the IM environment.

There were no strong indicators of sex factors with regard to the distribution of PRCA scores. There was a weak indication that higher apprehensive males preferred the LGM environment. There was also a weak indicator that lower apprehensive females preferred the SGM environment.

6.2.5 Summary of Student Characteristics

In this section, the author has presented and discussed data pertaining to a variety of student characteristics which were assessed through the use of written self-reports distributed in a post-orientation take-home packet. The following instruments were so distributed to all students. Also indicated are the multiple traits, as appropriate, assessed by each instrument. Sample copies of all of these instruments have been included in appendix G.

1. Aiken and Dreger Mathematics Attitude Scale -MAS
2. Bledsoe Self-Concept Scale
   a) Self-Concept Scale -SCS
   b) Self-Ideal-Concept Scale -SICS
3. Schutz Fundamental Interpersonal Relations Orientation - Behavior (FIRO-B)
   a) Expressed Affection -EA
   b) Withheld Affection -WA
   c) Expressed Control -EC
   d) Withheld Control -WC
   e) Expressed Inclusion -EI
   f) Withheld Inclusion -WI
4. McCroskey Personal Report of Communication Apprehension -PRCA

The author has described each instrument, as well as the scoring procedures used to derive scores corresponding

to each trait. For purposes of uniformity, all scores were expressed in the range from -2.0 to +2.0. Individual scores for all students have been included in appendix M. For purposes of presenting distributions of these trait scores with respect to environmental preference groups, all scores were grouped in the following ranges.

1. [-2.0, -1.5)
2. [-1.5, -0.5)
3. [-0.5, +0.5)
4. [+0.5, +1.5)
5. [+1.5, +2.0]

For each trait, an appropriate descriptive label was assigned to each range of scores.

Summary statistics were also presented in tabular form for all trait scores. These statistics were provided for the total sample, single-sex groups, mixed-sex environmental preference groups, and single-sex preference subgroups. Statistics included:

1. Mean score
2. Standard deviation of scores
3. Minimum score
4. Maximum score
5. Range of scores
6. Cell frequency

The author has reported various observations concerning apparent relationships between trait score distributions and statistics, sexes of the students, and environmental preference groups. None of these observed relationships has been tested for statistical significance. Neither have possible interactions between student traits been analyzed. The reader should be aware that since all student traits were measured with self-report instruments, the scores cannot be

assumed to represent true and accurate assessments of the traits themselves. In all cases, therefore, the author's comments pertain to the reported scores as opposed to verified student traits. With these qualifications in mind, the author has summarized his principal findings and observations pertaining to all ten measured traits. The summary is organized according to the alternative learning environments.

1. Individual Mode (IM) Environment

   a) This group included ten males and three females.[15]

   b) Male students with negative mathematics attitudes and female students with positive attitudes tended to prefer the other environments.

   c) Females with high self-concept scores tended to prefer this environment (or the SGM environment) over the LGM environment. No discernible male trend regarding self-concept scores was observed.

   d) Male subgroups included those with moderate tendencies of express affection and those with stronger tendencies to withhold affec-

---

[15] The reader should keep these relatively small numbers in mind, especially the number of females, when reviewing student characteristics for the IM preference group.

tion.[16] Females reported generally moderate tendencies to express affection and moderate tendencies to withhold affection.

e) Male subgroups included those with low tendencies to express control, those with higher tendencies to express control, and those with high tendencies to withhold control. All females reported moderate to low tendencies to both express and withhold control.

f) Male subgroups included those with moderate to low tendencies to express inclusion and high tendencies to withhold inclusion. No trends concerning female inclusion tendencies were observed.

g) Males tended report moderate to low communication apprehension. Females reported moderate or higher apprehension.

2. Small Group Mode (SGM) Environment

a) This group included thirteen females[17] and eleven males.

---

[16] Where the author describes same-sex subgroups with different trait characteristics, it cannot be assumed that the subgroups are distinct. In this case, the author makes no assertion as to possible overlap of the two male subgroups.

[17] The reader should be aware that only 6 females 32% (Footnote Continued)

b) Males with negative mathematics attitudes tended to prefer this environment (or the LGM environment) over the IM environment. Females with positive attitudes tended to prefer this environment.

c) Females with high self-concepts tended to prefer this environment (or the IM environment) over the LGM environment. No male preference trends were observed, but SGM females tended to have higher self-concepts than did SGM males.

d) Male subgroups included those with strong tendencies to express affection, those who with tendencies not to express affection, and those who did not tend to withhold affection. Female subgroups included those with moderate tendencies to express affection, those who tended not to express affection, and who did tend to withhold affection.

e) Males reported moderately low tendencies to express control, while females reported even lower levels of expressed control behavior.

(Footnote Continued)
were not included in the SGM group; those six were divided between the other two groups. In some cases it is difficult to discriminate between trends among females that are preference linked, and those which are more general female trends regardless of preference.

Both sexes reported moderately high tendencies to withhold control.

f) Both sexes reported moderate to high tendencies to express inclusion. While males reported low tendencies to withhold inclusion, females reported high tendencies to withhold inclusion.

g) Both sexes reported moderate to low levels of communication apprehension. Students with higher levels of apprehension tended not to prefer this environment.

3. Large Group Mode (LGM) Environment

a) Included in this group were fifteen males and three females.

b) Males with negative mathematics attitudes tended to prefer this environment (or the SGM environment) over the IM environment. Females with positive attitudes tended to prefer the SGM environment over this one.

c) No male trends were observed. Females with high self-concepts tended to prefer the other environments.

d) Male subgroups included those with strong tendencies to express affection, those who tended not to express affection, and who did tend to withhold affection. The females

reported moderate tendencies both to express and withhold affection.

e) Males reported moderately low tendencies to express control, and high tendencies to withhold control. The females reported moderate to low tendencies to express control and moderate tendencies to withhold control.

f) Both sexes reported generally low tendencies to express inclusion. Males reported high tendencies to withhold inclusion. By comparison, the females reported generally lower tendencies to withhold inclusion. to

g) Both sexes reported generally moderate levels of communication apprehension. The majority of students in the sample with higher apprehension, however, preferred this environment.

6.3 PRE-INSTRUCTION ACADEMIC ARCHIVE DATA

While the data presented in the previous section was self-reported by the students on questionnaires included in the post-orientation take-home packet, the data presented in this section was unobtrusively collected by the author from the students' academic records at Prince George's Community College. Three principal types of documents were reviewed by the author: High school transcripts, standardized placement test reports, and college transcripts. The data

compiled from these three archive sources are presented in the three respective subsections which follow.

The variable suffix _1 has been used to indicate data which was collected in the first take-home packet at the end of the orientation phase of the study. The suffix _0 has been appended to all archive data variables presented in this section, to denote the fact that all of this data pertains to pre-study-enrollment academic data for the students in the sample. Post-instruction measured data and post-study archive data are presented in chapter 7.

6.3.1 High School Data

Two primary sets of high school data were selected for tabulation in this study: average overall high school grades (HSAG_0), and average overall high school mathematics grades (HSAMG_0.) Distributions of these average grades with respect to environmental preference are presented in tables 43 and 44. Since not all students had high school transcripts on file, average grades were not available for some students. Specific data for individual students, including high school name, location, and last date of attendance, can be found in appendix N. Due to wide variations in high schools attended, the author determined that letter grades approximating overall levels of performance were sufficient; the greater precision which could have been obtained from computing grade point averages was not deemed appropriate in these circumstances.

Table 43 shows that the majority of the students in the sample (56%) did "C" level work in their high school courses. The next largest group of students (20%) did "B" level work. High school data was not available for 18% of the students in the sample. Some of these had completed graduate equivalency degree (GED) programs, and others had not provided high school transcripts for inclusion in their college records.

Cell frequencies for the SGM environmental preference group (Table 43) were close to expected values. On the other hand, all but three of the IM students (85%) had "C" average grades from high school. The deviation in the C-IM cell shows this to be 51% higher than the expected number of IM students to have "C" average grades. The corresponding deviation for the LGM group shows that 31% fewer than the expected number of students had "C" average high school grades. The deviation in the B-LGM cell shows that 67% more than the expected number of LGM students had "B" averages. The only "A" student preferred the LGM environment, and the only "D" students preferred the SGM environment.

TABLE 43

Distribution of High School Average Grade
by Preferred Environment

TABLE OF HSAG_0 BY ENVIRONMENT_1
HSAG_0 HIGH SCHOOL AVERAGE GRADE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NOT AVAILABLE	1	5	4	10
	2.4	4.4	3.3	
	-1.4	0.6	0.7	
	1.82%	9.09%	7.27%	18.18%
	10.00%	50.00%	40.00%	
	7.69%	20.83%	22.22%	
A	0	0	1	1
	0.2	0.4	0.3	
	-0.2	-0.4	0.7	
	0.00%	0.00%	1.82%	1.82%
	0.00%	0.00%	100.00%	
	0.00%	0.00%	5.56%	
B	1	4	6	11
	2.6	4.8	3.6	
	-1.6	-0.8	2.4	
	1.82%	7.27%	10.91%	20.00%
	9.09%	36.36%	54.55%	
	7.69%	16.67%	33.33%	
C	11	13	7	31
	7.3	13.5	10.1	
	3.7	-0.5	-3.1	
	20.00%	23.64%	12.73%	56.36%
	35.48%	41.94%	22.58%	
	84.62%	54.17%	38.89%	
D	0	2	0	2
	0.5	0.9	0.7	
	-0.5	1.1	-0.7	
	0.00%	3.64%	0.00%	3.64%
	0.00%	100.00%	0.00%	
	0.00%	8.33%	0.00%	
TOTAL	13	24	18	55
	23.64%	43.64%	32.73%	100.00%

TABLE 44

Distribution of High School Average Math Grade by Preferred Environment

TABLE OF HSAMG_0 BY ENVIRONMENT_1
HSAMG_0 HIGH SCHOOL AVERAGE MATH GRADE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NOT AVAILABLE	1 2.6 -1.6 1.82% 9.09% 7.69%	6 4.8 1.2 10.91% 54.55% 25.00%	4 3.6 0.4 7.27% 36.36% 22.22%	11 20.00%
A	0 0.2 -0.2 0.00% 0.00% 0.00%	0 0.4 -0.4 0.00% 0.00% 0.00%	1 0.3 0.7 1.82% 100.00% 5.56%	1 1.82%
B	2 1.2 0.8 3.64% 40.00% 15.38%	2 2.2 -0.2 3.64% 40.00% 8.33%	1 1.6 -0.6 1.82% 20.00% 5.56%	5 9.09%
C	10 7.8 2.2 18.18% 30.30% 76.92%	13 14.4 -1.4 23.64% 39.39% 54.17%	10 10.8 -0.8 18.18% 30.30% 55.56%	33 60.00%
D	0 1.2 -1.2 0.00% 0.00% 0.00%	3 2.2 0.8 5.45% 60.00% 12.50%	2 1.6 0.4 3.64% 40.00% 11.11%	5 9.09%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 44, which presents the distribution of average high school mathematics grades, shows that the majority of the sample (60%) had "C" average mathematics grades in high school. Only one student had an "A" average in high school mathematics. Table 44 shows that in comparison to the distribution of overall average grades, there were fewer "B" level mathematics students and more "D" level mathematics students. The distributions of average high school mathematics grades for students in all three environmental preference groups were generally close to those which would be expected in accordance with the hypothesis of independence. The author has observed, however, that proportionally more students in the IM preference group had "B" and "C" level average mathematics grades.

In conclusion, there appeared to be a trend for more than the expected number of students sampled with high overall high school grades (A or B) to prefer the LGM environment, and more than the expected number with average grades (C) to prefer the IM environment. No clear high mathematics grade trend was apparent, however, there was a tendency for students with low mathematics grades (D) to prefer the SGM or LGM environments. Students with average mathematics grades showed a weak preference for the IM environment.

6.3.2 Placement Test Data

The second source of pre-instruction archive data was that of placement test scores. Prince Georges Community College has used the Comparative Guidance and Placement (CGP) Program of the College Entrance Examination Board since the early 1970's. The CGP Program is composed of a battery of standardized achievement tests and other instruments which are administered to students at the time they apply to the College.[18]

Although several different levels of mathematics achievement tests are used in the CGP Program, only the Elementary Algebra scores (CGPEA_0) have been included in this study, since the prerequisite for the first mini-course included in the study was elementary algebra. Some students in the sample had also completed a voluntary take-home portion of the CGP which measures various academic and career interests. Their self-reported CGP Mathematics Interest scores (CGPMI_0) have also been included in this study.

---

[18] Only the CGP achievement tests in English, mathematics, and reading are still in use at PGCC today.

6.3.2.1 Elementary Algebra Achievement

The CGP mathematics achievement test is a thirty-five item instrument with a twenty minute time limit. CGP achievement scores are similar to standard scores, only their respective distributions have been shifted either up or down during the norming process. The amount and direction of shift for each distribution has been determined by the College Entrance Examination Board so that the comparable numerical scores received on different tests represent comparable levels of mathematics difficulty. Thus while a standard score of 50 represents the estimate of the population mean, a CGP mathematics achievement score of 50 does not generally represent the population mean.[19] As is true of standard scores, a range of ten points on one side of the estimated population mean for a CGP mathematics achievement test score does approximate to one standard deviation.

The distribution of CGP Elementary Algebra scores with respect to environmental preference is presented in table 45. Summary statistics for the CGPEA_0 variable, by environmental preference and sex, are presented in table 46. For purposes of crosstabulation, these algebra scores have

---

[19] National norm data provided by the College entrance Examination Board [1979: 21-22] indicated the following mean scores on the CGP Elementary Algebra achievement test are: 48.98 for 1470 first year algebra students, and 58.56 for 1495 more advanced high school algebra students. The weighted average for these two samples yields a mean score of 53.81.

been categorized and assigned descriptive labels; one label corresponding to each of the following five data intervals.

1. [66, 74] - VERY HIGH
2. [58, 65] - HIGH
3. [50, 57] - MODERATE
4. [42, 49] - LOW
5. [28, 41] - VERY LOW

Individual CGP Elementary Algebra and Mathematics Interest scores are presented in appendix N. Both CGP scores were available for 65% of the sample. Neither score was available for 21% of the sample. There were four students (7%) for whom only the achievement score was available, and three more (5%) for whom only the interest score was available.

Table 45 shows that elementary algebra scores for a majority of the students (64%) were distributed over the LOW, MODERATE, and HIGH ranges. An additional 27% of the sample had no CGP scores. The cell deviations from expected values indicate that the distribution of algebra scores was generally consistent with the hypothesis of independence.

TABLE 45

Distribution of CGP Elementary Algebra Score by Preferred Environment

TABLE OF CGPEA_0 BY ENVIRONMENT_1
CGPEA_0 CGP ELEMENTARY ALGEBRA SCORE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
VERY HIGH [66, 74]	1 0.5 0.5 1.82% 50.00% 7.69%	0 0.9 -0.9 0.00% 0.00% 0.00%	1 0.7 0.3 1.82% 50.00% 5.56%	2 3.64%
HIGH [58, 65]	2 2.6 -0.6 3.64% 18.18% 15.38%	4 4.8 -0.8 7.27% 36.36% 16.67%	5 3.6 1.4 9.09% 45.45% 27.78%	11 20.00%
MODERATE [50, 57]	3 3.5 -0.5 5.45% 20.00% 23.08%	7 6.5 0.5 12.73% 46.67% 29.17%	5 4.9 0.1 9.09% 33.33% 27.78%	15 27.27%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

(CONTINUED)

TABLE OF CGPEA_0 BY ENVIRONMENT_1
CGPEA_0 CGP ELEMENTARY ALGEBRA SCORE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LOW [42, 49]	4 2.1 1.9 7.27% 44.44% 30.77%	3 3.9 -0.9 5.45% 33.33% 12.50%	2 2.9 -0.9 3.64% 22.22% 11.11%	9 16.36%
VERY LOW [28, 41]	0 0.7 -0.7 0.00% 0.00% 0.00%	2 1.3 0.7 3.64% 66.67% 8.33%	1 1.0 0.0 1.82% 33.33% 5.56%	3 5.45%
NOT TESTED	3 3.5 -0.5 5.45% 20.00% 23.08%	8 6.5 1.5 14.55% 53.33% 33.33%	4 4.9 -0.9 7.27% 26.67% 22.22%	15 27.27%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

The ALL STUDENTS row of table 46 shows that the mean achievement score for students in the SGM preference group was lower than those for students in the other two groups. The TOTAL SAMPLE column shows that the mean score for males was higher than that for females. Female cell means were generally similar for all preference groups. Males in the SGM group, however, had lower minimum, mean, and maximum scores than did males in the IM and LGM groups.

TABLE 46

Summary Statistics for CGP Elementary Algebra Score by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	50.000 9.644 43 61 18 3	49.375 8.484 37 58 21 8	49.000 12.000 37 61 24 3	49.429 8.680 37 61 24 14
MALE STUDENTS	55.143 8.295 43 67 24 7	52.750 6.159 43 59 16 8	55.727 8.138 45 69 24 11	54.654 7.440 43 69 26 26
ALL STUDENTS	53.600 8.527 43 67 24 10	51.063 7.371 37 59 22 16	54.286 9.017 37 69 32 14	52.825 8.183 37 69 32 40

The minimum scores in table 46 show that both male and female students with scores in the lower ranges were found in all environmental preference groups. The lowest scores, however, occurred among females in the SGM and LGM groups. The maximum scores show that the males and females with the higher scores tended to prefer the IM and LGM environments.

6.3.2.2 Mathematics Interest

Comparative student interests are measured by the CGP using an untimed take-home instrument containing descriptions of 176 activities related to eleven fields of study. Sixteen of the activities pertain to the field of mathematics. Students are instructed to report whether they "like" or "dislike" each activity. Mathematics interest scores, representing the difference between the number of likes and dislikes.[20]

The distribution of CGP Mathematics Interest scores with respect to environmental preference is presented in table 47. Summary statistics for the CGPMI_0 variable, by environmental preference and sex, are presented in table 48. For purposes of crosstabulation, these interest scores were categorized and assigned descriptive labels; one label corresponding to each of the following five data intervals.

1. [25, 32] - VERY HIGH
2. [17, 24] - HIGH
3. [9, 16] - LOW
4. [0, 8] - VERY LOW

---

[20] The computation formula is 16 + "likes" - "dislikes." The scores range from 0 to 32. A score of 16 indicates an equal number of likes and dislikes. No other scaling is performed.

TABLE 47

Distribution of CGP Mathematics Interest Score by Preferred Environment

TABLE OF CGPMI_0 BY ENVIRONMENT_1
CGPMI_0 CGP MATHEMATICS INTEREST SCORE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
VERY HIGH [25, 32]	1 0.7 0.3 1.82% 33.33% 7.69%	2 1.3 0.7 3.64% 66.67% 8.33%	0 1.0 -1.0 0.00% 0.00% 0.00%	3 5.45%
HIGH [17, 24]	3 2.1 0.9 5.45% 33.33% 23.08%	4 3.9 0.1 7.27% 44.44% 16.67%	2 2.9 -0.9 3.64% 22.22% 11.11%	9 16.36%
LOW [9, 16]	3 3.3 -0.3 5.45% 21.43% 23.08%	6 6.1 -0.1 10.91% 42.86% 25.00%	5 4.6 0.4 9.09% 35.71% 27.78%	14 25.45%
VERY LOW [0, 8]	3 2.8 0.2 5.45% 23.08% 23.08%	5 5.7 -0.7 9.09% 38.46% 20.83%	5 3.9 1.1 9.09% 38.46% 27.78%	13 23.64%
NOT TESTED	3 3.8 -0.8 5.45% 18.75% 23.08%	7 7.0 0.0 12.73% 43.75% 29.17%	6 5.2 0.8 10.91% 37.50% 33.33%	16 29.09%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

Table 47 shows that 49% of the sample reported mathematics interests in the lower ranges, while only 22% reported interests in the higher ranges. No scores were available for 29% of the sample. The deviations indicate that the distribution of mathematics interest scores with respect to environmental preference was generally consistent with the hypothesis of independence. The author has observed, however, that only two of the twelve students in the higher ranges (17%) preferred the LGM environment.

TABLE 48

Summary Statistics for CGP Mathematics Interest Score by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	6.000 2.828 4 10 6 3	9.000 7.000 0 18 18 8	11.667 8.380 3 23 20 3	8.929 6.943 0 23 23 14
MALE STUDENTS	16.286 7.420 4 30 26 7	16.000 7.318 2 29 27 9	9.333 5.077 3 18 15 9	13.680 7.390 2 30 28 25
ALL STUDENTS	13.200 7.947 4 30 26 10	12.706 7.976 0 29 29 17	9.917 6.157 3 23 20 12	11.974 7.584 0 30 30 39

Table 48 presents summary statistics for those students for whom mathematics interest scores were available in the PGCC archives. The ALL STUDENTS row shows that students in the LGM preference group reported a lower mean interest score than did students in the other two groups. The TOTAL SAMPLE column indicates that males reported a higher average interest score than did the females in the sample. The author observes, however, that overall mean scores for all preference groups and for both sexes were in the low range.

Minimum statistics in the individual cells indicate that males and females with low mathematics interest scores occurred in all preference groups. Maximum and mean statistics show, however, that males with high interest scores tended to prefer the IM and SGM environments. Difference between means in the female cells are not reliable due to small sample sizes. The reader can verify that the mean score for non-SGM females (8.835) was very similar to that for SGM females.[21]

---

[21] Individual data in appendix N reveals that three females (21% of those with scores) reported mathematics interest scores in the HIGH category. Two of these were in the SGM group and one was in the LGM group.

6.3.2.3 Summary of Placement Data

IM and SGM males had consistently higher mean scores for mathematics achievement and interest than did the respective female groups. The difference between SGM male and female achievement score means, however, was the smaller. The LGM mean male achievement score (but not interest score) was lower than that of the LGM females.

Through the study of combinations of CGP Elementary Algebra and Mathematics Interest scores, found in appendix N, the following overall patterns emerge. Male students tended to have higher achievement and interest scores than did female students, but this trend varied between environmental preference groups. SGM males scored generally lower on the achievement instrument, than did IM and LGM males. LGM males scored generally lower on the interest instrument, than did IM and SGM males.

6.3.3 College Data

The preceding portions of this section have presented archive data pertaining to high school grades and standardized placement test scores. Data related to college experience which occurred prior to this study is presented in this concluding portion of the section. This data includes previous developmental (remedial) mathematics experience, previous experience in the mini-courses used for the instructional phase of the study, total sessions of previous

college enrollment, and total previous college quality point averages.

6.3.3.1 Developmental Mathematics

During the mid-1970's, the developmental mathematics program (DVM) at Prince George's Community College was offered on a non-credit self-paced basis using programmed and semi-programmed texts. This course spanned a large collection of mathematics topics ranging from arithmetic and geometry review through intermediate algebra. Students were primarily identified for enrollment in developmental mathematics on the basis of CGP achievement test scores and curriculum.[22]

This collection of mathematics topics was reorganized into a self-paced developmental mathematics program in 1971. The course was identified as "developmental", rather than "remedial", because in many cases students had never studied algebra in high school, and were hence required to develop new skills as well as to review old skills. A "mastery learning" requirement was adopted to assure that students would not progress on to subsequent credit level courses

---

[22] The prerequisite for MAT 11B, the first study mini-course, was a score of 46 or higher on the CGP Elementary Algebra test. The reader may recall that the distribution of CGP scores presented in table 45 indicated that some students in the sample scored below this prerequisite level. This issue is discussed below.

offered by the Mathematics Department until they had "reasonably mastered" the appropriate prerequisite skills.

The wide variety of topics included in the self-paced DVM program were arranged is sequence, following an overall learning hierarchy. Due to the wide variety of prerequisites for different credit level mathematics courses, students were required to complete only those levels of the hierarchy necessary to meet the prerequisites for the credit courses in which they were preparing to enroll. Grades were awarded on the basis of progress made toward completion of these individualized DVM requirements.

Only "Pass-Fail" (P and F) grades were originally used for the developmental mathematics program. The "Towards Passing" (TP) grade was added later, since many students needed more than one semester to complete their DVM requirements. Students who were judged by their instructors to be making "satisfactory progress" toward the completion of their course objectives, but who need another semester to complete all of those objectives, were awarded the TP grade. The P grade signified that the student had completed her or his individualized requirements, and the F grade signified "insufficient progress" toward satisfying those requirements.

The developmental mathematics program still exists today, although both self-paced and instructor-paced sections are now available to most students. Other changes in textbooks, sequence of instruction, and grades have also

occurred over the years since 1971.[23] The original self-paced DVM format, however, remained in tack during the pre-study period when students in this study were enrolled in developmental courses.

The distribution of developmental mathematics grades for the students in this study who enrolled in DVM during the pre-study period is presented in table 49. This table indicates that the majority of the students in the study (82%) had never enrolled in the developmental mathematics program. Of the ten students who had previous DVM experience, one-half of those received TP grades. The remaining students grades were divided between the P and F grade categories.

---

[23] Due to the wide range of content in the developmental mathematics program it was impossible to determine from P, TP, and F grades alone, which of students have successfully completed which portions of the program. Subsequent to the Spring 1977 semester, when the instructional phase of this study occurred, P grades were coded with a numerical suffix (P1, P2, etc.) to indicate the appropriate level of completion.

TABLE 49

Distribution of Developmental Mathematics Grade by Preferred Environment

TABLE OF DVMG_0 BY ENVIRONMENT_1
DVMG_0 DEVELOPMENTAL MATH GRADE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
PASS (P)	0 0.7 -0.7 0.00% 0.00% 0.00%	1 1.3 -0.3 1.82% 33.33% 4.17%	2 1.0 1.0 3.64% 66.67% 11.11%	3 5.45%
TOWARDS PASSING (TP)	0 1.2 -1.2 0.00% 0.00% 0.00%	4 2.2 1.8 7.27% 80.00% 16.67%	1 1.6 -0.6 1.82% 20.00% 5.56%	5 9.09%
FAIL (F)	0 0.5 -0.5 0.00% 0.00% 0.00%	0 0.9 -0.9 0.00% 0.00% 0.00%	2 0.7 1.3 3.64% 100.00% 11.11%	2 3.64%
NEVER ENROLLED	13 10.6 2.4 23.64% 28.89% 100.00%	19 19.6 -0.6 34.55% 42.22% 79.17%	13 14.7 -1.7 23.64% 28.89% 72.22%	45 81.82%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

One notable feature of table 49 is that although students with no developmental mathematics experience were distributed among all three preference groups, no students

who studied in the self-paced DVM program expressed a preference for the IM environment.[24] The majority of the students who either passed or failed developmental mathematics preferred the LGM environment, while the majority of the students who earned TP grades preferred the SGM environment.

The primary prerequisite for MAT 11B, the first mini-course taught during the instructional phase of the study, was to have studied elementary algebra in high school, and to have earned a minimum score of 46 on the CGP Elementary Algebra test. The data in appendix N indicates that nine students (16%) scored below 46 on the CGP achievement test, of whom only one had passed the DVM course. Of the remaining eight students, half had attempted but not passed the DVM course, and the other half had made no attempt. In addition, of the fifteen students (27%) who had no achievement test score on record, one had passed the DVM course, two had attempted but not passed the course, and twelve had made no attempt.

On the basis of the CGP criteria, therefore, it would appear that twenty-four students (44%), as compared to ten (18%), should have either previously enrolled in (and passed) the DVM course, or taken and passed the CGP Elementary Algebra test. The individual data in appendix N shows

---

[24] The author conjectured earlier in chapter 5 that experience with the self-paced format in Developmental Mathematics may have influenced the environmental preferences for some students.

that at the start of the spring 1977 semester, twenty-two students (40%) met neither the CGP nor the DVM prerequisite for MAT 11B. It can be verified by the reader that these students were distributed among the three preference groups; 38% of the IM preference group, 50% of the SGM preference group, 28% of the LGM preference group failed to meet course prerequisites.[25]

6.3.3.2 Previous Course Enrollment

Table 50 presents the distribution of previous enrollment history in MAT 11B (or closely related courses in finite mathematics) with respect to environmental preference groups. The table shows that majority of the sample (87%) were enrolled in MAT 11B for the first time during the spring 1977 semester. The deviations in table 50 show that while both new and repeating students were distributed among the three environments in a manner generally consistent with the hypothesis of independence, only one repeating student preferred the LGM environment.

Individual student data in appendix N shows that six of the seven students repeating the course (86%) were males. The only female repeating MAT 11B was from the SGM

---

[25] College policy at the time was to advise, but not necessarily require, such students to enroll in Developmental Mathematics. The College has adopted a much more strict prerequisite enforcement policy in recent years, than existed in 1977.

preference group. Three of the repeating students did not meet the course prerequisite; two had taken the developmental mathematics course and earned TP grades.

TABLE 50

Distribution of Repeated Course Enrollment by Preferred Environment

TABLE OF RCE_0 BY ENVIRONMENT_1
RCE_0 REPEATED COURSE ENROLLMENT
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
FIRST ATTEMPT	11	20	17	48
	11.3	20.9	15.7	
	-0.3	-0.9	1.3	
	20.00%	36.36%	30.91%	87.27%
	22.92%	41.67%	35.42%	
	84.62%	83.33%	94.44%	
REPEAT ATTEMPT	2	4	1	7
	1.7	3.1	2.3	
	0.3	0.9	-1.3	
	3.64%	7.27%	1.82%	12.73%
	28.57%	57.14%	14.29%	
	15.38%	16.67%	5.56%	
TOTAL	13	24	18	55
	23.64%	43.64%	32.73%	100.00%

6.3.3.3 Previous College Enrollment

Table 51 presents the distribution of total sessions of previous college enrollment with respect to environmental preference. The term "session" is used indicate a college enrollment period, be it a traditional semester or summer session. "Session" does not imply any particular number of

courses or credits, either attempted or completed. The author has provided both separate summaries of PGCC and transfer institution data, and a combined summary for for each student. Table 51 is based upon the combined summaries.

TABLE 51

Distribution of Total Previous College Session Enrollments by Preferred Environment

TABLE OF TSPE_0 BY ENVIRONMENT_1
TSPE_0 TOTAL SESSIONS PREVIOUSLY ENROLLED
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEW STUDENT	0	3	1	4
	0.9	1.7	1.3	
	-0.9	1.3	-0.3	
	0.00%	5.45%	1.82%	7.27%
	0.00%	75.00%	25.00%	
	0.00%	12.50%	5.56%	
1 SESSION	3	6	8	17
	4.0	7.4	5.6	
	-1.0	-1.4	2.4	
	5.45%	10.91%	14.55%	30.91%
	17.65%	35.29%	47.06%	
	23.08%	25.00%	44.44%	
2 SESSIONS	1	2	1	4
	0.9	1.7	1.3	
	0.1	0.3	-0.3	
	1.82%	3.64%	1.82%	7.27%
	25.00%	50.00%	25.00%	
	7.69%	8.33%	5.56%	
TOTAL	13	24	18	55
	23.64%	43.64%	32.73%	100.00%

(CONTINUED)

TABLE OF TSPE_0 BY ENVIRONMENT_1
TSPE_0 TOTAL SESSIONS PREVIOUSLY ENROLLED
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
3 SESSIONS	4 2.8 1.2 7.27% 33.33% 30.77%	6 5.2 0.8 10.91% 50.00% 25.00%	2 3.9 -1.9 3.64% 16.67% 11.11%	12 21.82%
4 SESSIONS	2 1.4 0.6 3.64% 33.33% 15.38%	2 2.6 -0.6 3.64% 33.33% 8.33%	2 2.0 0.0 3.64% 33.33% 11.11%	6 10.91%
5 - 9 SESSIONS	3 2.8 0.2 5.45% 25.00% 23.08%	5 5.2 -0.2 9.09% 41.67% 20.83%	4 3.9 0.1 7.27% 33.33% 22.22%	12 21.82%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

This table indicates that a majority of the total sample (55%) had enrolled for three or more college sessions prior to the spring 1977 semester. Another 38% of the students had enrolled for one or two previous college sessions. There were only four students (7%) for whom the spring 1977 semester was their first college experience. The individual data in appendix N reveals that thirty-seven students (67%) had previously attended Prince George's

Community College. the remaining 26% had previous college experience at a transfer institution.

The deviations in table 51 indicate that the distribution of previous college experience with respect to environmental preference was generally consistent with the hypothesis of independence. The author has observed, however, that while individual cell deviations are small, fewer than expected numbers of new and single-session students preferred the IM environment. These "relatively new" college students constituted 50% of the LGM preference group.

6.3.3.4 Previous Quality Point Average

Quality point averages (QPA) were based upon total quality points earned and total credits attempted at both PGCC and transfer institutions prior to the spring 1977 semester. Quality point averages were computed according to the following formula:

QPA = Quality Points / Credits Attempted

Quality points were determined on the basis of

1. 4 points per credit for each A grade
2. 3 points per credit for each B grade
3. 2 points per credit for each C grade
4. 1 point per credit for each D grade
5. 0 points per credit for each F grade

Table 52 presents the distribution of the students' pre-study quality point averages (PREQPA_0) with respect to environmental preference groups. For purposes of tabulation, quality point averages have been categorized and associated with letter grades, as described below.

1. (3.5 - 4.0] - A
2. (3.0 - 3.5] - B+
3. (2.5 - 3.0] - B-
4. (2.0 - 2.5] - C+
5. (1.5 - 2.0] - C-
6. (1.0 - 1.5] - D+
7. (0.5 - 1.0] - D-
8. [0.0 - 0.5] - F

Summary statistics for PREQPA_0 by sex and environmental preference are presented in table 53.

This table shows that the majority of the sample (75%) had quality point averages which were distributed more or less uniformly over the range from 1.5 (C-) to 3.5 (B+.) No IM students and only one LGM student had QPA's below the C- range. Thus 100% of the IM students, 67% of the SGM students, and 89% of the LGM students had QPA's above 1.5.

The statistics in the ALL STUDENTS row of table 53 confirm that SGM students had somewhat lower QPA's than did students in the other environments. The TOTAL SAMPLE column shows that the male QPA mean was somewhat higher than the female mean. The individual female cell statistics show, however, that all females with QPA's below 2.4 preferred the SGM environment. Non-SGM females had a higher mean QPA (2.975) than did the males in any preference group. Conversely, SGM females had a lower mean QPA than did the males in any preference group. The SGM male mean, however, was still lower than either of the non-SGM male means.

TABLE 52

Distribution of Pre-Instruction Quality Point Average by Preferred Environment

TABLE OF PREQPA_0 BY ENVIRONMENT_1
PREQPA_0 PRE-INSTRUCTION QUALITY POINT AVERAGE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEW STUDENT	0 0.9 -0.9 0.00% 0.00% 0.00%	3 1.7 1.3 5.45% 75.00% 12.50%	1 1.3 -0.3 1.82% 25.00% 5.56%	4 7.27%
A (3.5 - 4.0]	1 0.9 0.1 1.82% 25.00% 7.69%	1 1.7 -0.7 1.82% 25.00% 4.17%	2 1.3 0.7 3.64% 50.00% 11.11%	4 7.27%
B+ (3.0 - 3.5]	4 2.8 1.2 7.27% 33.33% 30.77%	5 5.2 -0.2 9.09% 41.67% 20.83%	3 3.9 -0.9 5.45% 25.00% 16.67%	12 21.82%
B- (2.5 - 3.0]	3 2.1 0.9 5.45% 33.33% 23.08%	1 3.9 -2.9 1.82% 11.11% 4.17%	5 2.9 2.1 9.09% 55.56% 27.78%	9 16.36%
TOTAL	13 23.6%	24 43.6%	18 32.7%	55 100.0%

(CONTINUED)

TABLE OF PREQPA_0 BY ENVIRONMENT_1

PREQPA_0 PRE-INSTRUCTION QUALITY POINT AVERAGE

ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
C+ (2.0 - 2.5]	2 2.4 -0.4 3.64% 20.00% 15.38%	5 4.4 0.6 9.09% 50.00% 20.83%	3 3.3 -0.3 5.45% 30.00% 16.67%	10 18.18%
C- (1.5 - 2.0]	3 2.4 0.6 5.45% 30.00% 23.08%	4 4.4 -0.4 7.27% 40.00% 16.67%	3 3.3 -0.3 5.45% 30.00% 16.67%	10 18.18%
D+ (1.0 - 1.5]	0 0.7 -0.7 0.00% 0.00% 0.00%	2 1.3 0.7 3.64% 66.67% 8.33%	1 1.0 .0 1.82% 33.33% 5.56%	3 5.45%
D- (0.5 - 1.0]	0 0.2 -0.2 0.00% 0.00% 0.00%	1 0.4 0.6 1.82% 100.00% 4.17%	0 0.3 -0.3 0.00% 0.00% 0.00%	1 1.82%
F [0.0 - 0.5]	0 0.5 -0.5 0.00% 0.00% 0.00%	2 0.9 1.1 3.64% 100.00% 8.33%	0 0.7 -0.7 0.00% 0.00% 0.00%	2 3.64%
TOTAL	13 23.64%	24 43.64%	18 32.73%	55 100.00%

TABLE 53

Summary Statistics for Pre-Instruction Quality Point Average by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	3.012 0.217 2.705 3.170 0.465 3	2.143 0.989 0.330 3.574 3.244 12	2.938 0.418 2.414 3.438 1.024 3	2.420 0.918 0.330 3.574 3.244 18
MALE STUDENTS	2.634 0.713 1.571 3.750 2.179 10	2.242 0.796 0.762 3.250 2.488 9	2.653 0.711 1.500 4.000 2.500 14	2.535 0.758 0.762 4.000 3.238 33
ALL STUDENTS	2.721 0.654 1.571 3.750 2.179 13	2.185 0.913 0.330 3.574 3.244 21	2.704 0.678 1.500 4.000 2.500 17	2.495 0.820 0.330 4.000 3.670 51

It is clear from tables 52 and 53 that the IM and LGM preference groups included proportionally more previously successful college students than did the SGM group. Table 53 shows that the IM group had no new students and no student with an average below 1.57. Table 52 shows that 62% of the IM students had quality point averages above 2.5. The LGM group had only one new student, no student with an average below 1.50, and 56% of the LGM students had averages above 2.5. By comparison, the SGM group had three new students, and five students with averages of below 1.5.

Only 29% of the SGM students had quality point averages above 2.5.

6.3.3.5 Summary of College Data

Data pertaining to various types of college experience, which occurred before students enrolled for the spring 1977 semester, have been presented and discussed in this section. These data included previous developmental mathematics enrollments, previous enrollments in the finite mathematics course which was the instructional vehicle for this study, extent of total previous college enrollments, and degree of previous overall college success. The findings pertaining to pre-study college experience are summarized below.

The author presented data to show that the majority of the sample (82%) had never enrolled in developmental mathematics. None of the ten students (18%) who had previously enrolled in the DVM program preferred the IM environment. They were instead evenly divided between the SGM and LGM preference groups. Placement test data indicated that if prerequisites had been enforced, then twenty-two students (40%) would have needed either to take the CGP to qualify for enrollment in the study course, or to take developmental mathematics. This number included six of the ten DVM students who had not yet completed their developmental requirements at the time they enrolled for the study. With respect to the three preference groups, 38% of the IM, 50%

of the SGM, and 28% of the LGM group did not satisfy the study course prerequisites. No sex trend was observed.

Other data was presented which revealed that the majority of the sample (87%) were enrolled in the study course for the first time. Of the eight repeating students, seven were male students. There was a weak tendency observed for repeating students to prefer the alternative environments over the LGM environment

Enrollment history data showed that the majority of the students in the sample (93%) had previously attended at least one session at college. A total of 72% had attended two or more college sessions. The students with less than two sessions of college experience (38%) tended to prefer the SGM and LGM environments over the IM environment. No sex trend was observed.

The author observed that students who had experienced previous success in college, defined as a 2.5 or higher quality point average, tended to prefer the IM and LGM environments over the SGM environment. Conversely, students with low QPA's (below 1.5) tended to prefer the SGM environment. There was a strong indication that females who had been less successful in college tended to prefer the SGM environment.

6.3.4 Summary of Archive Data

In this section the author has presented and discussed various types of student data which were collected from the College archives. These data included:

1. High school
   a) Overall average grades
   b) Mathematics average grades
2. College placement exam
   a) Elementary algebra achievement
   b) Mathematics interest
3. College experience
   a) Previous enrollments in developmental mathematics
   b) Previous enrollments in finite mathematics
   c) Extent of previous college enrollments
   d) Previous quality point averages

The author has presented distributions of these various data with respect to environmental preference groups. Where appropriate, he has also presented tables of summary statistics by sex and preference group. His overall findings from the archive data, as they relate to each of the alternative learning environments, are summarized below.

1. Individual Mode (IM) Environment

   a) Students with average high school grades tended to prefer this environment. Students with low high school mathematics grades tended to prefer the other environments.

   b) Males with higher achievement scores tended to prefer this environment (or the LGM environment) over the SGM environment. Males with higher interest scores tended to prefer this environment (or the SGM environment) over the LGM environment.

c) Students with developmental mathematics experience (self-paced) preferred the other environments.

d) Students with the least college experience tended to prefer the other environments.

e) Students with more previous college success tended to prefer this environment (or the LGM environment) over the SGM environment. Students with less previous college success tended to prefer the SGM environment over this environment.

2. Small Group Mode (SGM) Environment

a) Students with average and higher high school grades tended to prefer the other environments. Students with low high school mathematics grades tended to prefer this environment (or the LGM environment) over the IM environment.

b) Males with higher achievement scores tended to prefer the other environments. Males with higher interest scores tended to prefer this environment (or the IM environment) over the LGM environment.

c) Students with developmental mathematics experience (self-paced) tended to prefer this environment (or the LGM environment) over the IM environment. Students who did not meet course prerequisites tended to prefer this environment.

d) Students with the least college experience tended to prefer this environment (or the LGM environment) over the IM environment.

e) Students with more previous college success tended to prefer the other environments. Students with less previous college success tended to prefer this environment.

3. Large Group Mode (LGM) Environment

a) Students with higher high school grades tended to prefer this environment.

b) Males with higher achievement scores tended to prefer this environment (or the IM environment) over the SGM environment. Males with higher interest scores tended to prefer the other environments.

c) Students with developmental mathematics experience (self-paced) tended to prefer this environment (or the SGM environment) over the IM environment.

d) Students who were repeating the course showed a weak tendency to prefer the alternative environments.

e) Students with the least college experience tended to prefer this environment (or the SGM environment) over the IM environment.

f) Students with more previous college success tended to prefer this environment (or the IM environment) over the SGM environment. Students with less previous college success tended to prefer the SGM environment over this environment.

PLEASE MAKE THIS THREE VOLUMES.

THIS IS VOLUME THREE.

THANK YOU.

Student Choice Among large Group, Small Group, and Individual Learning Environments in a Community College Mathematics Mini-Course.

by

Eldon C. Baldwin

Maryland
LD
3231
.M70d
Baldwin,
E. C.
Vol. 3
Folio

Chapter VII

POST-INSTRUCTION DATA

7.1 OVERVIEW

The data collected during this study has been divided into two general categories, pre-instruction data and post-instruction data. In chapters 5 and 6 the author presented and discussed a large body of pre-instruction data. This pre-instruction data included student preferences and characteristics which were measured at the end of the orientation phase of the study, and student academic data which had been archived by Prince George's Community College prior to the spring 1977 semester.

In this chapter, the author presents and discusses data pertaining to the post-instruction phase of the study. Academic outcomes of the first mini-course in the study are initially considered, followed by comparisons of pre- and post-instruction measured student preferences and other selected student characteristics. Evaluation data pertaining to the Choice Model and the three learning environments, as well and student assessments of the communication accessibility of their instructors are presented after that. Finally, the author presents academic archive data pertaining to the original sample of fifty-five students which were collected several years after the study.

The reader is reminded that various numeric suffixes for data variables have been used to associate each variable

with its time period relative to the study. In chapters 5 and 6, the suffixes _0 and _1 were introduced to distinguish between two types of pre-instruction data, pre-study data and post-orientation data. In this chapter two additional data suffixes are introduced. The _2 suffix identifies data which was collected at the end of the instructional phase during the spring 1977 semester. The _3 suffix identifies post-study data which was collected from the Prince George's Community College academic archives in 1981.

The data tables in this chapter primarily reflect distributions of post-instruction data (suffixes _2 and _3) with respect to the ENVIRONMENT_1 variable, the students' preferred instructional environments for the first mini-course. Continued and consistent use of the ENVIRONMENT_1 variable permits direct comparisons to be made between pre-instruction and post-instruction distributions. Post-instruction preferences were assessed with a second post-instruction take-home packet, and individual student values of the ENVIRONMENT_2 variable have been included with the data in appendix P to indicate changes in instructional environment which occurred after the first mini-course.

7.2 ACADEMIC OUTCOMES

Grades assigned by the instructors served as the primary measure of instructional outcomes for this study. Student grades for the first mini-course only are discussed in this chapter, although grades for all three mini-courses can be found in appendix O. Since no formal control group was used in the study, and grading criteria were determined independently by the respective instructors in each learning environment, many of the traditional statistical comparisons of instructional outcomes between groups and within groups are not appropriate. The distribution of grades and relationships between grades and other variables presented in this study, however, are still of interest for descriptive purposes.

7.2.1 Experimental Group Grade Distribution

The distribution of student grades for the first mini-course (MAT 11B) with respect to post-orientation environmental preference groups (ENVIRONMENT_1) is presented in table 54. A grade of A, B, C, or D indicates that the student satisfactorily completed all the course requirements; the respective criteria for earning these grades in each of the three environments have been described in chapter 4. A grade of F indicates that the student did not officially withdraw from the course, and did not satisfactorily complete the course requirements.

TABLE 54

Distribution of Course Grades
by Preferred Environment

TABLE OF GRADE_2 BY ENVIRONMENT_1

GRADE_2 MINI-COURSE 1 GRADE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
A	2	2	2	6
	1.4	2.6	2.0	
	0.6	-0.6	0.0	
	3.64	3.64	3.64	10.91
	33.33	33.33	33.33	
	15.38	8.33	11.11	
B	3	5	6	14
	3.3	6.1	4.6	
	-0.3	-1.1	1.4	
	5.45	9.09	10.91	25.45
	21.43	35.71	42.86	
	23.08	20.83	33.33	
C	6	7	4	17
	4.0	7.4	5.6	
	2.0	-0.4	-1.6	
	10.91	12.73	7.27	30.91
	35.29	41.18	23.53	
	46.15	29.17	22.22	
TOTAL	13	24	18	55
	23.64	43.64	32.73	100.00

(CONTINUED)

The F grade does not distinguish between students who attempted to complete all course requirements, and those who unofficially stopped participating at some point during the five-week session. A grade of W indicates that the student officially withdrew from the course before completing the

course requirements. The W grade reflects neither when during the course the withdrawal occurred, nor the academic standing of the student in the course at the time of withdrawal.

TABLE OF GRADE_2 BY ENVIRONMENT_1

GRADE_2 MINI-COURSE 1 GRADE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
D	0	2	1	3
	0.7	1.3	1.0	
	-0.7	0.7	0.0	
	0.00	3.64	1.82	5.45
	0.00	66.67	33.33	
	0.00	8.33	5.56	
F	2	3	5	10
	2.4	4.4	3.3	
	-0.4	-1.4	1.7	
	3.64	5.45	9.09	18.18
	20.00	30.00	50.00	
	15.38	12.50	27.78	
W	0	5	0	5
	1.2	2.2	1.6	
	-1.2	2.8	-1.6	
	0.00	9.09	0.00	9.09
	0.00	100.00	0.00	
	0.00	20.83	0.00	
TOTAL	13	24	18	55
	23.64	43.64	32.73	100.00

The grade distribution shown in Table 54 can be viewed from various perspectives. First the author compares the overall distribution with that of other sections of the

course which were offered by the College. Then he studies the relative performances of the three environmental preference groups. Finally, the author examines selected student pre-instruction characteristics with regard to grades in the course.

7.2.2 "Pseudo-Control Group" Grade Distribution

Table 54 shows that the overall grade distribution for students in this study was:

GRADE	NUMBER OF STUDENTS	PERCENT OF STUDENTS
A	6	11%
B	14	25%
C	17	31%
D	3	5%
F	10	18%
W	5	9%
TOTAL	55	100%

Lacking a true control group, the author selected other sections of the same course, taught by different instructors at different times, to form a "pseudo-control group" of 297 students. The experimental section was offered at 10:00am on a Monday-Wednesday-Friday schedule pattern, during the first five-week period of the spring 1977 semester. The sections in the "pseudo-control group" were offered at class hours ranging from 10:00am to 2:00pm on either a Monday-Wednesday-Friday or a Tuesday-Thursday schedule pattern, during either the first or second five-week sessions of the spring 1976, spring 1977, or spring 1978 semesters.

Since the three instructors for the experimental section did not teach any other sections of MAT 11B which met the above criteria, there was no overlap between the

instructors for the "pseudo-control group" and the instructors for the experimental group. While specific descriptions of the "control" instructional environments are not available, it is known that these instructors normally adhered to traditional methods of teaching mathematics, most similar to those of the LGM instructor. The grade distribution for the "pseudo-control group" is presented below:

GRADE	NUMBER OF STUDENTS	PERCENT OF STUDENTS
A	36	12%
B	53	18%
C	71	24%
D	32	11%
F	66	22%
W	39	13%
TOTAL	297	100%

Initial comparisons of the experimental and "control" grade distributions indicate that proportionally more experimental students received B and C grades, while proportionally more "control" students received D and F grades. Due to the fact that different instructors used different grading criteria, however, the author decided that comparisons based upon groupings by grade into three "success" categories might be somewhat more meaningful than simple grade-by-grade comparisons. The following categories are defined:

1. HIGH SUCCESS - students earning A and B grades.
2. LOW SUCCESS - students earning C and D grades.
3. NOT SUCCESSFUL - students earning F and W grades.

Using these definitions, the author has made the following observations:

1. 36% of the experimental students (11% + 25%) were in the HIGH SUCCESS category, as compared to 30% of the non-experimental students (12% + 18%.)
2. 36% of the experimental students (31% + 5%) were in the LOW SUCCESS category, as compared to 35% of the non-experimental students (24% + 11%.)
3. 27% of the experimental students (18% + 9%) were in the NOT SUCCESSFUL category, as compared to 35% of the non-experimental students (22% + 13%.)

Based upon the above observations, the author has drawn two conclusions, the statistical significance of which have not been tested:

1. Proportionally more students were highly successful in the experimental group, than in the "pseudo-control group."
2. Proportionally more students were not successful in the "pseudo-control group", than in the experimental group.

The author cautions however, that since there are so many uncontrolled variables in this study, the cause of the somewhat superior academic outcomes for the experimental group cannot be determined.

7.2.3 Comparison of Environmental Preference Groups Within the Experimental Group

Due to the small cell sizes in table 54, grade-by-grade comparisons among environmental groups in the experimental section are also risky. For this reason, a second distribution based upon success categories is presented in table 55. The same grade criteria given above were used to determine the success categories used in table 55.

Corresponding to the percentages presented above, table 55 shows that 36% of the total sample of students were in each of the HIGH and LOW SUCCESS categories, a 72% combined success rate, while 27% were NOT SUCCESSFUL. By comparison, 85% of the IM students (38.46% + 46.15%), 72% of the LGM students (44.44% + 27.78%), and 67% of the SGM students (29.17% + 37.50%) were in the successful categories.

The cell deviations in table 55 suggest that:

1. Somewhat more than the expected number of LGM students and somewhat fewer that the expected number of SGM students were in the HIGH SUCCESS category.
2. Somewhat more than the expected number of IM students and somewhat fewer that the expected number of LGM students were in the LOW SUCCESS category.
3. Somewhat more than the expected number of SGM students and somewhat fewer that the expected

number of IM students were in the NOT SUCCESSFUL category.

TABLE 55

Distribution of Course Success
by Preferred Environment

TABLE OF SUCCESS_2 BY ENVIRONMENT_1

SUCCESS_2 MINI-COURSE 1 SUCCESS (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
HIGH SUCCESS [A,B]	5	7	8	20
	4.7	8.7	6.5	
	0.3	-1.7	1.5	
	9.09	12.73	14.55	36.36
	25.00	35.00	40.00	
	38.46	29.17	44.44	
LOW SUCCESS [C,D]	6	9	5	20
	4.7	8.7	6.5	
	1.3	0.3	-1.5	
	10.91	16.36	9.09	36.36
	30.00	45.00	25.00	
	46.15	37.50	27.78	
NOT SUCCESSFUL [F,W]	2	8	5	15
	3.5	6.5	4.9	
	-1.5	1.5	0.1	
	3.64	14.55	9.09	27.27
	13.33	53.33	33.33	
	15.38	33.33	27.78	
TOTAL	13	24	18	55
	23.64	43.64	32.73	100.00

Interactions among sexes of the students, environmental preferences, and course grades are also of interest in this study. Although specific crosstabulation tables are too

lengthy to include here, the following findings are summarized. In appendix O, the reader will find the individual student data upon which these findings are based.

1. All three female IM students (100%) and eight out of ten male IM students (80%) were successful in the first mini-course.
2. A total of nine female SGM students (69%) and seven male SGM students (63%) were successful in the first mini-course.
3. Two female LGM students (67%) and eleven male LGM students (73%) were successful in the first mini-course.
4. A total of fourteen female students (74%) were successful in the first mini-course.
5. A total of twenty-six male students (72%) were successful in the first mini-course.

Based upon these data, the following trends regarding sex and grades have been observed by the author:

1. Both males and females in the IM preference group had the highest success rates, although differences among success rates for the different preference groups were probably not statistically significant.
2. Male students had the greatest success in the IM group and the least success in the SGM group.
3. Male and female students both experienced approximately the same overall success rates.

4. Small female sample sizes in the IM and LGM preference groups threaten the validity of comparisons among female success rates in the the environments, but in general, females in the SGM group experienced a lower level of success than did females in the other groups.

7.2.4 Comparison of Course Grades with Selected Pre-Instruction Characteristics

The distribution of course grades has thus far been studied with respect to both non-experimental student groups and differences among environmental preference groups. Now the author examines three different pre-instruction individual characteristics with respect to course grades, characteristics which were initially presented in chapter 6. The three characteristics to be examined are high school mathematics grades, mathematics attitude, and communication apprehension.

The distribution of average high school mathematics grades were originally presented in table 44. Likewise, data pertaining to mathematics attitude were presented in tables 21 and 22, while data pertaining to communication apprehension were presented in tables 41 and 42. Summary statistics for these three characteristics are now presented with respect to course grade in table 56. Due to small cell sizes, distributions by sex and environmental preference groups are not feasible. The individual data upon which

table 56 is based are provided in appendix O, however, so that the reader can identify the sex, preference, and other characteristics of each student.

In table 44, the distribution of average high school mathematics letter grades was presented. In order to compute the statistics presented in table 56, letter grades were assigned numerical point values according to the following scheme.

1. A - 4
2. B - 3
3. C - 2
4. D - 1

There were no F grades. High school grades were not available for eleven students. The cell frequencies in the HIGH SCHOOL MATH GRADE column of table 56 reflect only those forty-four students for whom data was available. The overall average high school mathematic grade for these students was 2.05.

Mathematics attitude and communication apprehension were assessed by self-report questionnaires contained in the first post-orientation take-home packet. These data were available for all fifty-five students in the original sample. For comparison purposes, table 22 (chapter 6) shows that the mean mathematics attitude score for the total sample was 0.077. Similarly, table 42 shows that the overall mean communication apprehension score was -0.233.

TABLE 56

Summary Statistics for Average High School Mathematics Grade, Mathematics Attitude, and Communication Apprehension by Course Grade

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	(TABLE 44) HIGH SCHOOL MATH GRADE	(TABLE 22) MATHEMATICS ATTITUDE	(TABLE 42) COMMUNICATION APPREHENSION
A	2.2 0.9 1.0 4.0 3.0 6	0.4 0.7 -0.8 1.2 2.0 6	-0.1 0.5 -0.8 0.9 1.7 6
B	2.2 0.4 2.0 3.0 1.0 13	0.1 0.8 -1.2 1.2 2.4 14	-0.2 0.6 -1.5 0.8 2.4 14
C	2.2 0.5 1.0 3.0 2.0 13	0.2 0.9 -1.5 1.5 2.9 17	-0.3 0.4 -1.2 0.8 1.9 17
D	1.5 0.5 1.0 2.0 1.0 2	0.1 0.5 -0.7 0.5 1.2 3	-0.5 0.2 -0.7 -0.2 0.5 3
F	1.8 0.4 1.0 2.0 1.0 5	-0.2 0.8 -1.8 1.0 2.8 10	-0.2 0.5 -0.7 0.8 1.5 10
W	1.8 0.4 1.0 2.0 1.0 5	.0 0.7 -1.4 0.5 1.9 5	-0.2 0.1 -0.2 -0.1 0.2 5

The mean high school mathematics grade averages by course grade in the first column of table 56 reveal a pattern of general consistency between high school and college mathematics performance. The means for A, B, and C students are all 2.2, which is somewhat above the overall mean of 2.05, and the means for students in all other grade categories are below 2.05. There also appears to be a pattern among those students for whom no high school data was available. Only one student in the A or B grade categories (5%) had no high school data, while ten students in the C, D, and F grade categories (33%) had no high school data available. This suggests that weak students were less likely to have (or to provide) high school transcripts than were strong students.[1]

In spite of the overall pattern of consistency between high school and college mathematics grades, however, table 56 also reveals some exceptions to this trend. The minimum cell statistics show that a student with a D average high school mathematic grade earned an A in the experimental course. The individual data in appendix O show that this

---

[1] It cannot be assumed, however, that weak students willfully withheld their high school transcripts. In a community college, high school graduation is not a requirement for admission, so it was not required that all students have high school transcripts. The data in appendix N indicates the high school and college transfer backgrounds of each student in the sample. A variety of hypotheses are possible concerning why certain students did not have high school transcripts in the College archive.

was a male student from the LGM group. Two IM male students who earned A's in the experimental course had C mathematics averages in high school. Likewise, two SGM female students who had C mathematics averages in high school earned A's in the experimental course. The data also shows that eleven of the fourteen students who earned B grades in the experimental course had C average mathematics grades in high school.

The second column of table 56 presents summary statistics pertaining to the mathematics attitude scores (MAS) of the students in each grade category. In general, the students in grade categories B, C, and D had mean MAS scores which were close to the overall sample mean of 0.077, given in table 22 of chapter 6. Students who earned A grades had a higher mean MAS score of 0.4. At the other extreme, students who received grades of F or W had lower mean MAS scores of -0.2 and 0.0 respectively. The minimum and maximum statistics in each cell, however, reveal both that some students who reported negative mathematics attitudes earned high grades, and that some students who reported positive mathematics attitudes earned low grades.

The final column in table 56 presents summary statistics of self-reported communication apprehension scores (PRCA) for students in each grade category.[2] With the

---

[2]The reader is reminded that a negative PRCA score reflects less communication apprehension than does a high score.

exception of the cell for students who earned D grades, the mean PRCA scores in all other grade categories were close to the overall sample mean of -0.233 which was presented in table 42. The minimum and maximum statistics reveal that students with both positive and negative PRCA scores earned grades of A, B, C, and F. No student who received a D or W grade reported a positive communication apprehension score.

Table 41 (chapter 6) indicates that there were five students who reported PRCA scores of 0.5 or higher. The table also shows that while one of these five students preferred the IM environment, the other four preferred the LGM environment. Appendix O shows that the IM student with a PRCA score of 0.72 was a female who earned a grade of B in the experimental course.[3] The appendix also shows that a female LGM student with a PRCA score of 0.84 also earned a grade of B. The other three students were LGM males with PRCA scores of 0.80, 0.76, and 0.88. These students earned grades of F, C, and A respectively.

---

[3] For reference purposes, a PRCA score of 0.72 in the -2.0 to +2.0 range, corresponds to a McCroskey score of of 93 in the 25 to 125 range.

7.2.5 Summary

In this section, the author has discussed the distribution of grades for the sample of fifty-five students with respect to both environmental preference and sex. He has compared the grade distribution for this experimental group with that of a "pseudo-control group." The author has also examined selected pre-instruction individual characteristics for student in each grade category, and he has observed the following trends.

1. In comparison with the "pseudo-control group" proportionally more students from the experimental sample were highly successful, and proportionally fewer experimental students were not successful.
2. Within the experimental group, the students in the IM group experienced the highest rate of success, and the students in the SGM group experienced the lowest rate of success.
3. Although overall success rates for males and females were similar:
   a) Males were most successful in the IM group and least successful in the SGM group.
   b) Non-SGM females were more successful than SGM females.
4. The overall pattern of college mathematics grades appeared to follow that of high school mathematics grades, and yet there were several individual exceptions in which students earned grades in the

experimental course which were higher than their average high school mathematics grades.

5. There was an indication that students who did not provide high school grade information when they applied to the College, were more likely to earn low college mathematics grades.

6. Although both students who reported positive mathematics attitudes and students who reported negative mathematics attitudes were found in all grade categories, students who earned A grades reported generally more positive attitude scores than did students who earned lower grades, and students who received F and W grades reported generally lower mathematics attitude scores than did students who earned higher grades.

7. There was no particular pattern of communication apprehension scores apparent with respect to course grades. Four of the five students who reported the highest levels of communication apprehension (80%) earned grades of C or higher. By comparison, 67% of the students in the total sample earned grades of C or higher.

7.3 POST-INSTRUCTION MEASURED PREFERENCES

In this section, environmental preference changes between the pre-instruction and post-instruction phases of the study are considered. Pre-instruction (before instruction in the first mini-course) and post-instruction (after completion of the first mini-course) preference measures were both obtained from identical questionnaires included in take-home packets. Pre-instruction preferences were assessed from questionnaires in the post-orientation take-home packet (appendix G.) The post-instruction take-home packet (appendix H) was distributed at the start of the second mini-course.

Since the continued enrollment of students in the second mini-course was contingent upon passing the first mini-course, grades in the first mini-course had a direct affect on the number of students for whom post-instruction measured data was available. In addition, some students who did continue with the second mini-course never returned their second take-home packets. As a result of these two factors, post-instruction preference measurements were only available for approximately one-half of the original group of fifty-five students.

The distributions of the post-instruction preference variables (PREF2_I, PREF2_S, and PREF2_L) are presented with respect to membership in the post-orientation preference groups (ENVIRONMENT_1), while controlling for the corresponding post-orientation preference variables (PREF1_I,

PREF1_S, and PREF1_L.) The distributions of post-orientation preference measurements were originally presented in chapter 5, tables 12 through 15. The post-instruction preference measurements are presented in tables 57 through 62 of this chapter.

Individual post-orientation preference scores can be found in appendix L, where individual data for the students in each environmental preference group are arranged in rank order order by sex and post-orientation preference score. Individual post-instruction preference scores are presented in appendix P. In order to facilitate comparisons, the individual data in appendix P are arranged in the same order as in appendix L. Post-orientation and post-instruction preference scores, for students who reported both, can be directly compared in appendix Q.

The same eighteen-item Lickert scale instrument was used in both take-home packets (appendices G and H) to measure environmental preferences. The scoring of this instrument was discussed previously in chapter 5. Whereas written comments concerning all three environments were collected at the end of the orientation phase, only comments concerning the instructional environment in which the student studied the first mini-course were collected in the second packet. For this reason, post-instruction preference comments are presented later in the model and environment evaluation section.

7.3.1 Post-Orientation Versus Post-Instruction IM Preference Scores

The distribution of post-instruction preferences scores for the individual mode of instruction (PREF2_I), while controlling for the corresponding pre-instruction (post-orientation) preference scores (PREF1_I), is presented in table 57. Summary statistics in table 58 provide another perspective for comparing pre-instruction and post-instruction IM preference scores. The magnitude of preference score changes for those IM students who responded to both preference instruments can be studied in table 58. Appendix Q contains the individual preference score data for all students who responded to both the post-orientation and post-instruction instruments.

Table 57 is a crosstabulation table of post-instruction IM preference scores by environmental preference group, in which post-orientation preference scores have been controlled. Table 57 is subdivided into five sections. Each section presents the crosstabulation of post-instruction IM preference scores for all students whose post-orientation IM preference scores fell within the same category.[4]

---

[4] Thus, each section of table 57 corresponds to one row of table 12, which the reader can find in chapter 5.

TABLE 57

Distribution of Post-Instruction Measured Individual Mode Preferences by Preferred Environment (Controlling for Post-Orientation IM Preference Scores)

TABLE OF PREF2_I BY ENVIRONMENT_1
SECTION 1 - CONTROLLING FOR PREF1_I=MOST NEGATIVE [-2.0,-1.5)

PREF2_I INDIVIDUAL PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	0	0	1 1.0 0.0 100.00 100.00 100.00	1 100.00
TOTAL	. .	. .	1 100.00	1 100.00

Since there was only one student whose post-orientation IM preference score (PREF1_I) fell in the MOST NEGATIVE category of table 12, the first section of table 57 reflects the post-instruction IM preference score (PREF2_I) for only that one student. Hence, table 57 shows in this case that the only student whose post-orientation IM preference score was MOST NEGATIVE did not respond to the post-instruction preference instrument.

TABLE OF PREF2_I BY ENVIRONMENT_1
SECTION 2 - CONTROLLING FOR PREF1_I=NEGATIVE [-1.5,-0.5)

PREF2_I INDIVIDUAL PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	0	0 0.3 -0.3 0.00 0.00 0.00	1 0.8 0.3 12.50 100.00 16.67	1 12.50
NEGATIVE [-1.5,-0.5)	0	0 0.3 -0.3 0.00 0.00 0.00	1 0.8 0.3 12.50 100.00 16.67	1 12.50
NEUTRAL [-0.5,+0.5)	0	2 1.0 1.0 25.00 50.00 100.00	2 3.0 -1.0 25.00 50.00 33.33	4 50.00
NO RESPONSE	0	0 0.5 -0.5 0.00 0.00 0.00	2 1.5 0.5 25.00 100.00 33.33	2 25.00
TOTAL	.	2 25.00	6 75.00	8 100.00

It is possible to identify various characteristics of this and other students reflected in table 57 by referring to the appendices. The author does not include such

detailed analyses in this study, but does provide a guide[5] so that interested readers can more easily do so if desired.

The second section of table 57 shows the distribution of post-instruction IM preference scores for eight students whose comparable post-orientation scores were in the NEGATIVE range.[6] This section of table 57 shows that four of the eight students (50%) reported increased IM preference scores in the NEUTRAL range, while only one student (13%) reported an IM preference score which was in a lower category.[7]

---

[5] The reader can verify from appendix L that the single student indicated in the first section of table 57 was the student assigned packet number 8, a nineteen year male student from the LGM environment. Appendix O shows that student number 8 earned an A grade in all three mini-courses. Appendix P shows that student number 8 continued in the LGM environment for all three mini-courses, but failed to return the second take-home packet. In a similar manner, the reader can check all of the data for student number 8 which is contained in the other data appendices.

[6] These are the eight students indicated in the second row of table 12.

[7] The following information is provided as an additional guide for the interested reader who wishes to more closely examine individual data for the students reflected in this and other data tables. It is first necessary to determine the packet identification numbers for the students included in the table, the second section of table 57 in this case:

1. Identify the students in appendix L with the appropriate scores for the controlling variable. (The reader is reminded that Appendix L contains post-orientation preference scores for all students, while appendix Q contains scores for only those students who responded to both the post-orientation and post-instruction instruments.) In this case, the packet numbers

(Footnote Continued)

While table 57 permits the study of general response and non-response trends for cross sections of the population, it is important to note that actual numerical changes

---

(Footnote Continued)
for students who have PREF1_I scores in the [-1.5, -0.5) interval are 75 and 10, two SGM females; 68, 3, 37, 7, 42, and 34, six LGM males.

2. In order to determine which individual students' responses were counted in which cells of the table, identify the corresponding post-instruction preference scores in appendix P for the students with the same packet numbers as those found in appendix L. In this case, students 75 and 10 were counted in the NEUTRAL-SGM cell; student 42 was counted in the MOST NEGATIVE-LGM cell; student 68 was counted in the NEGATIVE-LGM cell; students 37 and 34 were counted in the NEUTRAL-LGM cell; students 3 and 7 were counted in the NO RESPONSE-LGM cell. (Note: Although the SAS documentation describing the statistical computer procedure FREQ which produced the data tables states that borderline scores are assigned to the next highest category, it appears that the procedure does not do so consistently. As an example of this, student 42 had a PREF2_I score of -1.50 which was categorized by the SAS procedure as MOST NEGATIVE rather than NEGATIVE. Likewise student 37 had a +0.5 score which was categorized as NEUTRAL instead of POSITIVE. The discrepancy only occurs with borderline scores however, and any confusion can be resolved by careful comparison of the appropriate distribution table with the appendix scores.)

3. Identify other data of interest concerning these same students, in these and other data appendices, using the same packet numbers. Appendices O and P show, for instance, that student 3 was a nineteen year old male who did not respond to the survey because he received an F in the first mini-course and was thus ineligible to continue in the study, while student 7 was a nineteen year old male who received a B grade but failed to return the post-instruction questionnaire.

This procedure can be followed to find the individual data pertaining to each of the crosstabulation tables presented in this chapter. Completion of these steps is optional, and is generally left to the reader's discretion in the discussion of the remaining crosstabulation tables.

in preference scores cannot be accurately studied from this crosstabulation table. For instance, a score change from -1.5 to -0.6 would not be reflected as a change in the crosstabulation table, whereas a change from -0.6 to -0.4 would be indicated as a change from the NEGATIVE to the NEUTRAL category. Appendix Q permits the comparison of individual preference scores for those readers who are so inclined. Table 58, which is presented after the last section of table 57, provides a statistical summary of numerical scores and changes by environmental preference groups.

The third section of table 57 below shows that out of twenty-seven students who reported original IM preference scores in the NEUTRAL range, only one of the students was from the IM preference group. The reader can verify from table 12 or from appendix L that this student reported the lowest post-orientation IM preference score of all students in the IM preference group. Table 57 shows that the same student reported one of the highest possible post-instruction IM preference scores.

Section 3 of this table also shows that thirteen of the twenty-six SGM and LGM students (50%) who reported NEUTRAL post-orientation IM preference scores did not respond to the post-instruction instrument. Only two of the thirteen who did respond to the post-instruction survey (15%) reported IM preference scores in a lower category. The other eleven SGM and LGM students (85%) reported post-instruction IM prefer-

ence scores which were in the same NEUTRAL category as were their corresponding post-orientation scores.

TABLE OF PREF2_I BY ENVIRONMENT_1
SECTION 3 - CONTROLLING FOR PREF1_I=NEUTRAL [-0.5,+0.5)

PREF2_I INDIVIDUAL PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEGATIVE [-1.5,-0.5)	0	0	2	2
	0.1	1.3	0.7	
	-0.1	-1.3	1.3	
	0.00	0.00	7.41	7.41
	0.00	0.00	100.00	
	0.00	0.00	22.22	
NEUTRAL [-0.5,+0.5)	0	8	3	11
	0.4	6.9	3.7	
	-0.4	1.1	-0.7	
	0.00	29.63	11.11	40.74
	0.00	72.73	27.27	
	0.00	47.06	33.33	
MOST POSITIVE [+1.5,+2.0]	1	0	0	1
	0.0	0.6	0.3	
	1.0	-0.6	-0.3	
	3.70	0.00	0.00	3.70
	100.00	0.00	0.00	
	100.00	0.00	0.00	
NO RESPONSE	0	9	4	13
	0.5	8.2	4.3	
	-0.5	0.8	-0.3	
	0.00	33.33	14.81	48.15
	0.00	69.23	30.77	
	0.00	52.94	44.44	
TOTAL	1	17	9	27
	3.70	62.96	33.33	100.00

TABLE OF PREF2 I BY ENVIRONMENT 1
SECTION 4 - CONTROLLING FOR PREF1 I=POSITIVE [+0.5,+1.5)

PREF2 I INDIVIDUAL PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT 1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	2 2.3 -0.3 12.50 50.00 22.22	2 1.3 0.8 12.50 50.00 40.00	0 0.5 -0.5 0.00 0.00 0.00	4 25.00
POSITIVE [+0.5,+1.5)	2 1.1 0.9 12.50 100.00 22.22	0 0.6 -0.6 0.00 0.00 0.00	0 0.3 -0.3 0.00 0.00 0.00	2 12.50
MOST POSITIVE [+1.5,+2.0]	2 1.1 0.9 12.50 100.00 22.22	0 0.6 -0.6 0.00 0.00 0.00	0 0.3 -0.3 0.00 0.00 0.00	2 12.50
NO RESPONSE	3 4.5 -1.5 18.75 37.50 33.33	3 2.5 0.5 18.75 37.50 60.00	2 1.0 1.0 12.50 25.00 100.00	8 50.00
TOTAL	9 56.25	5 31.25	2 12.50	16 100.00

While more detailed study of individual data in the appendices is left to the reader's discretion, the author suggests that attention be given to students 23 and 71. These were the only students who changed environments after

the first mini-course. The columns in appendices P and Q labeled ENVIRONMENT COURSE 2 identity the preferred instructional environment for each student who participated in the second mini-course. Comparison of this column with the first column in that appendix reveals that both students changed from the SGM to the IM environment.

The fourth section of table 57 pertains to the sixteen students reported POSITIVE post-orientation IM preference scores. Nine of the sixteen (56%) were IM students, of whom six (67%) provided post-instruction scores. The table reflects no particular trend in IM preference score changes for these six IM students. Of the seven SGM and LGM students included in this table, five (71%) did not respond to the post-instruction survey, and the other two (29%) reported decreased IM preference scores in the NEUTRAL range.

The last section of table 57 shows that of the three IM students who reported MOST POSITIVE IM preference scores after the orientation phase, two (67%) did not respond to the post-instruction questionnaire. The third student (33%) reported a lower post-instruction IM preference score, although still in the POSITIVE category.

TABLE OF PREF2_I BY ENVIRONMENT_1
SECTION 5 - CONTROLLING FOR PREF1_1=MOST POSITIVE [+1.5,+2.0]

PREF2_I INDIVIDUAL PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
POSITIVE [+0.5,+1.5)	1 1.0 0.0 33.33 100.00 33.33	0	0	1 33.33
NO RESPONSE	2 2.0 0.0 66.67 100.00 66.67	0	0	2 66.67
TOTAL	3 100.00	.	.	3 100.00

7.3.1.1 Degree of Response to Post-Instruction Instruments

The five sections of table 57 show that a total of twenty-six students (47% of the original fifty-five student sample) did not respond to the survey. Although the NO RESPONSE data given above is for students who did not have post-instruction IM preference scores, it more generally reflects the number of students who did not return the second take-home packet, which contained all of the post-instruction instruments. The post-instruction administra-

tive data contained in appendix P[8] can be used by the reader to determine not only which students did and did not return packets, but also which students continued with the second mini-course.

Analysis of appendix P indicates the following information concerning the degree of response to the second take-home packet.

1. Twenty-eight students (51% of the total sample of fifty five students) returned the packet and continued in the second mini-course.
2. One student (2%) returned the second take-home packet, but did not continue in the second mini-course.
3. Ten students (18%) did not return the packet, but did continue in the second mini-course.
4. Sixteen students (29%) did not return the packet and did not continue in the second mini-course.

---

[8] The sixth column in appendix P labeled ENVIRONMENT COURSE 2 indicates which of the three environments the student attended during the second mini-course. A "." in this column indicates that the student did not attend the second mini-course. The eighth column in appendix P labeled SECOND PACKET indicates whether or not the student returned the second take-home packet.

7.3.1.2 Statistical Differences Between the Original Sample and the Reduced Sample

For the twenty-nine students who did respond to the second take-home packet, table 58 provides summary statistics by environmental preference group concerning changes between their post-orientation and post-instruction IM preference scores. Whereas the first row of table 15 (chapter 5) presents post-orientation IM preference score statistics for all fifty-five students, the first row of table 58 provides post-orientation IM preference score statistics for only the twenty-nine students who completed both preference instruments. The second row of table 58 provides post-instruction statistics for the same students, and the third row provides statistics on the numerical changes in IM preference scores for the twenty-nine students who completed both preference instruments.

Comparison of the frequency counts between tables 55 and 58 provides information relating degree of success in the first mini-course to degree of response to the second take-home packet.

1. Eight of the original thirteen IM students (62%) responded to the second packet, although eleven IM students (85%) were successful in the first course. Thus 73% of the successful IM students responded to the second packet.
2. Twelve of the original twenty-four SGM students (50%) responded to the second packet, although

sixteen students (67%) were successful in the first course. One of the twelve students who responded was not successful. Thus eleven successful SGM students (69%) responded to the second packet.

3. Nine of the original eighteen LGM students (50%) responded to the second packet, although thirteen (72%) were successful in the first course. Thus 69% of the successful LGM students responded to the second packet.

4. A total of twenty-nine students out of fifty-five (53%) responded to the second packet, although forty students (73%) were successful in the first course. One of the twenty-nine was not successful. Thus a total twenty-eight successful students (70%) responded to the second packet.

By comparing the first rows of tables 15 and 58, the reader can study the differences in post-orientation IM preference score statistics between the total sample of fifty-five students and the twenty-nine students who responded to the second take-home packet. Twenty-eight of the twenty-nine students included in table 58 statistics represent 70% of the forty students who were successful in the first mini-course. Similarly, fourteen of the twenty-six students excluded from table 58 statistics represent 93% of the fifteen students who were not successful in the first mini-course. Due to this built-in correspondence between

course success and post-instruction response to questionnaires, differences noted between full sample and reduced sample post-orientation statistics, provide clues for possible future research into differing characteristics of successful and non-successful students.

TABLE 58

Summary Statistics for IM Preference Score Change by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
POST-ORIENTATION IM PREFERENCE SCORE (PREF1_I)	0.96 0.53 0.00 1.67 1.67 8	-0.03 0.53 -0.83 0.83 1.66 12	-0.41 0.44 -1.00 0.33 1.33 9	0.13 0.73 -1.00 1.67 2.67 29
POST-INSTRUCTION IM PREFERENCE SCORE (PREF2_I)	1.11 0.60 0.21 2.00 1.79 8	0.02 0.32 -0.50 0.50 1.00 12	-0.35 0.64 -1.50 0.50 2.00 9	0.21 0.78 -1.50 2.00 3.50 29
IM PREFERENCE SCORE CHANGE	0.15 0.86 -1.00 2.00 3.00 8	0.05 0.44 -0.83 0.54 1.37 12	0.06 0.77 -1.00 1.33 2.33 9	0.08 0.69 -1.00 2.00 3.00 29

Based upon comparisons between the first rows of tables 15 and 58, for instance, the following trends concerning post-orientation IM preference scores have been observed.

1. Mean IM preference scores were somewhat lower for the reduced sample.
2. Standard deviations of IM preference scores were somewhat lower for the reduced sample.
3. Maximum IM preference scores were somewhat lower for the reduced sample.

These trends suggest that the group of students who did not respond to the second take-home packet had previously reported a somewhat higher average post-orientation IM preference score, than did those students who did respond to the second packet. The specific finding of lower maximum scores in table 58 suggests that there may have been a link between the students who self-reported the highest IM preference scores and those who did not complete post-instruction questionnaires. The additional fact that fourteen students of the twenty-six who did not respond to post-instruction questionnaires (54%) were also non-successful students, raises the possibility of a relationship between high post-orientation IM preference scores and non-success in the instructional phase of the study. Possible parallel relationships are examined in subsequent sections with regard to high SGM and LGM preference scores. The interested reader can study appendices L and P in order to examine the issue more fully.

The preceding discussion, based upon table 58 data, has explored various relationships between the full sample of fifty-five students and the reduced sample of twenty-nine

students. The general findings which do not specifically involve IM preference scores are also relevant to the analyses of other post-instruction data. Repetitive discussions of general findings in each such case will be avoided, however, with attention instead being given to specific score-related findings.

7.3.1.3 IM Preference Score Changes Within the Reduced Sample

Table 58 itself provides information concerning changes in self-reported IM preference scores within the reduced sample. The first two rows of table 58 provide statistics concerning the actual post-orientation and post-instruction preference scores. The third row provides statistics on the individual score changes. The author has observed the following trends.

1. The mean score changes were positive but small (+0.06 to +0.15) for all environmental preference groups.
2. The IM preference group retained the highest mean post-instruction IM preference score, and the LGM group retained the lowest mean post-instruction IM preference score.
3. There were no negative IM preference scores in the IM preference group, although there were negative change scores.

The author has concluded that the increased positive mean IM preference change score for the IM environmental preference group indicates that the IM instructional experience did have a generally positive affect on the IM preferences of those students. It is also noted, however, that while there were still no negative post-instruction IM preference scores reported from within the IM preference group, and the minimum score increased, some IM students did report lower post-instruction IM preference scores. The contrast in IM preference change score statistics between the SGM and LGM groups suggests varying interactions between experiences in one environment and preferences for another environment. Neither group experienced IM instruction, yet within the SGM group there was reduced variation of IM preferences, while increased variation was measured within the LGM group.

7.3.2 Post-Orientation Versus Post-Instruction SGM Preference Scores

The distribution of post-instruction SGM preference scores is presented in table 59. In a format like that of table 57, table 59 presents a crosstabulation of SGM preference scores with respect to environmental preference groups while controlling for post-orientation SGM preference scores. Also as before, the reader is encouraged to consult the appropriate appendices in order to identify by packet number those students who are represented by each section of

table 59, and to then examine other data pertaining to those individual students.

TABLE 59

Distribution of Post-Instruction Measured Small Group Mode Preferences by Preferred Environment (Controlling for Post-Orientation SGM Preference Scores)

TABLE OF PREF2_S BY ENVIRONMENT_1
SECTION 1 - CONTROLLING FOR PREF1_S=MOST NEGATIVE [-2.0,-1.5)

PREF2_S SMALL GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	0	0	1	1
	.	.	1.0	
	.	.	0.0	
	.	.	100.00	100.00
	.	.	100.00	
	.	.	100.00	
TOTAL			1	1
			100.00	100.00

The initial section of table 59 shows that the only student to report a MOST NEGATIVE post-orientation SGM preference score was an LGM student who did not respond to the post-instruction questionnaire.[9] The second section of

---

[9] The individual data contained in appendices L, O, and P shows this to be the same student number 8 who reported a MOST NEGATIVE post-orientation preference score for the IM environment. Further examination of this student's record is left to the reader.

table 59 pertains to seven students, none of whom were from the SGM environmental preference group. These seven students initially reported NEGATIVE post-orientation SGM preference scores.

TABLE OF PREF2_S BY ENVIRONMENT_1
SECTION 2 - CONTROLLING FOR PREF1_S=NEGATIVE [-1.5,-0.5)

PREF2_S SMALL GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVIDUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEGATIVE [-1.5,-0.5)	1 0.6 0.4 14.29 50.00 50.00	0	1 1.4 -0.4 14.29 50.00 20.00	2 28.57
NEUTRAL [-0.5,+0.5)	1 0.6 0.4 14.29 50.00 50.00	0	1 1.4 -0.4 14.29 50.00 20.00	2 28.57
NO RESPONSE	0 0.9 -0.9 0.00 0.00 0.00	0	3 2.1 0.9 42.86 100.00 60.00	3 42.86
TOTAL	2 28.57	. .	5 71.43	7 100.00

No particular pattern in post-instruction SGM student preferences is evident in the second section of table 59. Appendix L shows, however, that four of the six LGM students

included in the second section of table 59 were also included in the second section of table 57. This means that these four LGM students reported NEGATIVE initial preference scores for both the IM and SGM environments. It is also noted that all three of the non-respondents included in this section of table 59 were from the LGM environmental preference group. The reader can also verify in appendix L that two of these three students were the same non-respondents included in the second section of table 57.

The third section of table 59 presents the post-instruction SGM preference score distribution for twenty-one students who originally reported NEUTRAL SGM preference scores. The post-instruction responses of these students were mixed, although seven of the eleven students (64%) who did provide post-instruction responses did not report categorical preference changes. One striking exception to this trend was the IM student who changed from a NEUTRAL post-orientation SGM preference score to a MOST NEGATIVE post-instruction SGM preference score.[10]

---

[10] Appendix Q shows that this was student number 79, an eighteen year old male. He reported no strong post-orientation preferences for any of the environments, but all three of his post-instruction preference scores were extreme; MOST POSITIVE for the IM environment, and MOST NEGATIVE for the SGM and LGM environments.

TABLE OF PREF2_S BY ENVIRONMENT_1
SECTION 3 - CONTROLLING FOR PREF1_S=NEUTRAL [-0.5,+0.5)

PREF2_S SMALL GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	1 0.3 0.7 4.76 100.00 14.29	0 0.2 -0.2 0.00 0.00 0.00	0 0.5 -0.5 0.00 0.00 0.00	1 4.76
NEGATIVE [-1.5,-0.5)	0 0.7 -0.7 0.00 0.00 0.00	0 0.4 -0.4 0.00 0.00 0.00	2 1.0 1.0 9.52 100.00 20.00	2 9.52
NEUTRAL [-0.5,+0.5)	2 2.3 -0.3 9.52 28.57 28.57	1 1.3 -0.3 4.76 14.29 25.00	4 3.3 0.7 19.05 57.14 40.00	7 33.33
POSITIVE [+0.5,+1.5)	0 0.3 -0.3 0.00 0.00 0.00	0 0.2 -0.2 0.00 0.00 0.00	1 0.5 0.5 4.76 100.00 10.00	1 4.76
NO RESPONSE	4 3.3 0.7 19.05 40.00 57.14	3 1.9 1.1 14.29 30.00 75.00	3 4.8 -1.8 14.29 30.00 30.00	10 47.62
TOTAL	7 33.33	4 19.05	10 47.62	21 100.00

Section 3 of table 59 also includes the four students who reported the lowest post-orientation SGM preference scores of all the students in the SGM environmental preference group. Three of these four students (75%) did not respond to the post-instruction instrument. Although cell sizes are small, this degree of non-response is higher than would be expected by the hypothesis of independence.[11]

The fourth section of table 59 pertains to students whose original SGM preference scores were in the POSITIVE range. Twenty-three students, seventeen of whom were from the SGM environmental preference group, were included in this section of table 59. Seven of the eleven students (64%) who responded to the post-instruction instrument reported no categorical SGM preference changes. All cell frequencies, however, were close to expected values.[12]

Three students, all from the SGM preference group, were included in the fifth and final section of table 59. These students all reported MOST POSITIVE post-orientation SGM preference scores. All three students reported lower

---

[11] The reader may wish to examine the records of these students in the appendices. Appendix L shows that the student numbers for the four SGM students are 24, 50, 47, and 13.

[12] The reader may wish to examine the records of students with packet numbers 23 and 71. The two SGM students both requested changes from the SGM to the IM environment at the end of the first mini-course. Both students reported POSITIVE post-orientation SGM preference scores, and NEUTRAL post-instruction SGM preference scores.

post-instruction SGM preference scores. The individual data in appendix Q shows that two of the three students reported downward score changes of -1.50 and -1.71, while the third student reported a downward change of -0.67.[13]

TABLE OF PREF2_S BY ENVIRONMENT_1
SECTION 4 - CONTROLLING FOR PREF1_S=POSITIVE [+0.5,+1.5)

PREF2_S SMALL GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	1 0.7 0.3 4.35 25.00 25.00	3 3.0 0.0 13.04 75.00 17.65	0 0.3 -0.3 0.00 0.00 0.00	4 17.39
POSITIVE [+0.5,+1.5)	2 1.2 0.8 8.70 28.57 50.00	5 5.2 -0.2 21.74 71.43 29.41	0 0.6 -0.6 0.00 0.00 0.00	7 30.43
NO RESPONSE	1 2.1 -1.1 4.35 8.33 25.00	9 8.9 0.1 39.13 75.00 52.94	2 1.0 1.0 8.70 16.67 100.00	12 52.17
TOTAL	4 17.39	17 73.91	2 8.70	23 100.00

[13] For the reader who wishes to study this data further, the students' numbers are 4, 69, and 76.

TABLE OF PREF2_S BY ENVIRONMENT_1
SECTION 5 - CONTROLLING FOR PREF1_S=MOST POSITIVE (+0.5,+1.5)

PREF2_S SMALL GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT 1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	0	2 2.0 0.0 66.67 100.00 66.67	0	2 66.67
POSITIVE [+0.5,+1.5)	0	1 1.0 0.0 33.33 100.00 33.33	0	1 33.33
TOTAL	. .	3 100.00	. .	3 100.00

7.3.2.1 Statistical Differences Between the Original Sample and the Reduced Sample

Table 60, which is similar in format to table 58, presents summary statistics for the reduced sample of twenty-nine students who reported both post-orientation and post-instruction SGM preference scores. The first row of table 60 presents statistics for the reduced sample concerning post-orientation SGM preference scores. The second row presents comparable statistics for their post-instruction SGM preference scores, and the third row presents statistics

concerning SGM preference score changes. The individual data upon which these statistics are based can be found in appendix Q.

TABLE 60

Summary Statistics for SGM Preference Score Changes by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
POST-ORIENTATION SGM PREFERENCE SCORE (PREF1_S)	0.13 0.76 -1.33 1.00 2.33 8	1.11 0.44 0.50 1.83 1.33 12	-0.26 0.50 -1.33 0.33 1.66 9	0.41 0.82 -1.33 1.83 3.16 29
POST-INSTRUCTION SGM PREFERENCE SCORE (PREF2_S)	-0.19 0.89 -2.00 0.67 2.67 8	0.60 0.41 0.12 1.50 1.38 12	-0.26 0.60 -1.33 0.67 2.00 9	0.11 0.75 -2.00 1.50 3.50 29
SGM PREFERENCE SCORE CHANGE	-0.32 0.97 -2.17 1.45 3.62 8	-0.51 0.68 -1.71 0.83 2.54 12	-0.01 0.73 -1.00 1.45 2.45 9	-0.30 0.81 -2.17 1.45 3.62 29

Since tables 58 and 60 both pertain to the same reduced sample of students, the previous discussion relating student success and membership in the reduced sample is equally relevant here, and need not be repeated. Comparisons between the first row of table 60 and the second row of table 15, however, help to further distinguish between the

full sample of fifty-five students and the reduced sample of twenty-nine students. These rows pertain to post-orientation SGM preference score statistics for the respective samples.

The reader is reminded that the mean post-orientation IM preference scores were somewhat lower in all preference groups of the reduced sample (table 58) than were the respective mean IM preference scores for groups in the original sample (table 15). A comparable pattern pertaining to SGM preference scores, however, is not apparent.

1. In the SGM environmental preference group, the mean post-orientation SGM preference score was somewhat higher for the reduced sample (1.11 in table 60) than for the original sample (1.01 in table 15.)
2. In the IM preference group, the mean post-orientation SGM preference score was slightly lower (from 0.22 to 0.13) for the reduced sample.
3. In the LGM preference group and for the total sample, the mean post-orientation SGM preference scores in tables 15 and 60 were even closer.
4. Maximum SGM preference scores were lower in the IM and LGM preference groups of the reduced sample, but the maximum score in the SGM group was the same for both the original and the reduced sample.

Thus while there was some indication that students who reported the highest initial IM preference scores were less

likely to be included in the post-instruction reduced sample, no comparable trend emerged concerning high initial SGM preference scores.

7.3.2.2 SGM Preference Score Changes Within the Reduced Sample

It was noted in table 58 that mean IM preference score changes were small and positive for all environmental preference groups. The comparable mean SGM preference score changes indicated in table 60, however, were negative. While the mean change in SGM preference scores for the LGM environmental preference group was negligible (-0.01), the mean changes for the IM and SGM groups (-0.32 and -0.51 respectively - table 60) were greater in magnitude than comparable mean IM preference score changes (+0.15 and +0.05 - table 58) for those groups.

The mean decrease in SGM preference scores for students in the SGM preference group may be associated with actual learning experiences in that environment, downward adjustment of previously inflated preference scores, or some combination of these or other factors. The IM and LGM students, did not experience the SGM environment during the instructional phase, and yet the mean SGM preference score change for IM students more negative (-0.32) than was the mean change for LGM students(-0.01.) Again there are indications of differing interactions between learning

experiences in one environment and preferences for another environment.

7.3.3 Post-Orientation Versus Post-Instruction LGM Preference Scores

The crosstabulation of post-instruction LGM preference scores by environmental preference group, while controlling for post-orientation LGM preference, is presented in table 61. The format of table 61 corresponds to that of tables 57 and 59. The reader may consult the appropriate appendices in order to identify by packet number those students who are represented by each section of table 61, and to examine other data pertaining to those individual students. The initial section of table 61 shows that one IM student, whose original LGM preference score was MOST NEGATIVE, did not respond to the second instrument.[14]

---

[14] This was not the same student who reported the MOST NEGATIVE IM and SGM preference scores. The reader can find individual data for this student (packet number 73) in the appendices.

TABLE 61

Distribution of Post-Instruction Measured Large Group Mode Preferences by Preferred Environment (Controlling for Post-Orientation LGM Preference Score)

TABLE OF PREF2_L BY ENVIRONMENT_1
SECTION 1 - CONTROLLING FOR PREF1_L=MOST NEGATIVE [-2.0,-1.5)

PREF2_L LARGE GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	1	0	0	1
	1.0	.	.	
	0.0	.	.	
	100.00	.	.	100.00
	100.00	.	.	
	100.00	.	.	
TOTAL	1	.	.	1
	100.00	.	.	100.00

The second section of table 61 shows that seven students, none of them from the LGM environmental preference group, reported NEGATIVE post-orientation LGM preference scores. Five of these seven students (71%) responded to the post-instruction instrument. Four of the five respondents (80%) reported post-instruction LGM preference in the higher categories of NEUTRAL or POSITIVE.

TABLE OF PREF2_L BY ENVIRONMENT_1
SECTION 2 - CONTROLLING FOR PREF1_L=NEGATIVE [-1.5,-0.5)

PREF2_L LARGE GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEGATIVE [-1.5,-0.5)	1 0.4 0.6 14.29 100.00 33.33	0 0.6 -0.6 0.00 0.00 0.00	0	1 14.29
NEUTRAL [-0.5,+0.5)	0 0.9 -0.9 0.00 0.00 0.00	2 1.1 0.9 28.57 100.00 50.00	0	2 28.57
POSITIVE [+0.5,+1.5)	2 0.9 1.1 28.57 100.00 66.67	0 1.1 -1.1 0.00 0.00 0.00	0	2 28.57
NO RESPONSE	0 0.9 -0.9 0.00 0.00 0.00	2 1.1 0.9 28.57 100.00 50.00	0	2 28.57
TOTAL	3 42.86	4 57.14	. .	7 100.00

The third section of table 61 shows that twenty-eight students reported NEUTRAL post-orientation LGM preference scores. Twelve of these twenty-eight students (43%) responded to the post-instruction instrument. Ten of the

twelve respondents (83%) reported no categorical change of preference. The only student from the LGM environmental preference group, however, reported an increased post-instruction LGM preference score.

TABLE OF PREF2_L BY ENVIRONMENT_1
SECTION 3 - CONTROLLING FOR PREF1_L=NEUTRAL [-0.5,+0.5)

PREF2_L LARGE GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
MOST NEGATIVE [-2.0,-1.5)	1 0.2 0.8 3.57 100.00 16.67	0 0.6 -0.6 0.00 0.00 0.00	0 0.2 -0.2 0.00 0.00 0.00	1 3.57
NEUTRAL [-0.5,+0.5)	2 2.1 -0.1 7.14 20.00 33.33	8 6.1 1.9 28.57 80.00 47.06	0 1.8 -1.8 0.00 0.00 0.00	10 35.71
POSITIVE [+0.5,+1.5)	0 0.2 -0.2 0.00 0.00 0.00	0 0.6 -0.6 0.00 0.00 0.00	1 0.2 0.8 3.57 100.00 20.00	1 3.57
NO RESPONSE	3 3.4 -0.4 10.71 18.75 50.00	9 9.7 -0.7 32.14 56.25 52.94	4 2.9 1.1 14.29 25.00 80.00	16 57.14
TOTAL	6 21.43	17 60.71	5 17.86	28 100.00

TABLE OF PREF2_L BY ENVIRONMENT_1
SECTION 4 - CONTROLLING FOR PREF1_L=POSITIVE [+0.5,+1.5)

PREF2_L LARGE GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	1 0.8 0.3 6.25 25.00 33.33	1 0.8 0.3 6.25 25.00 33.33	2 2.5 -0.5 12.50 50.00 20.00	4 25.00
POSITIVE [+0.5,+1.5)	1 0.9 0.1 6.25 20.00 33.33	1 0.9 0.1 6.25 20.00 33.33	3 3.1 -0.1 18.75 60.00 30.00	5 31.25
MOST POSITIVE [+1.5,+2.0]	0 0.2 -0.2 0.00 0.00 0.00	0 0.2 -0.2 0.00 0.00 0.00	1 0.6 0.4 6.25 100.00 10.00	1 6.25
NO RESPONSE	1 1.1 -0.1 6.25 16.67 33.33	1 1.1 -0.1 6.25 16.67 33.33	4 3.8 0.3 25.00 66.67 40.00	6 37.50
TOTAL	3 18.75	3 18.75	10 62.50	16 100.00

The fourth section of table 61 summarizes the post-instruction LGM preference scores for sixteen students, ten (63%) of whom were from the LGM environmental preference group, whose post-orientation LGM preference scores were

POSITIVE. Ten of the sixteen students (63%) were also respondents to the post-instruction questionnaire. Only one of these ten students (10%) reported a higher post-instruction score in the MOST POSITIVE category, while four students (40%) reported lower NEUTRAL post-instruction scores. Five students (50%) reported no categorical change of LGM preference score.

TABLE OF PREF2_L BY ENVIRONMENT_1
SECTION 5 - CONTROLLING FOR PREF1_L=MOST POSITIVE [+1.5, +2.0]

PREF2_L LARGE GROUP PREFERENCE SCORE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	0	0	1 1.0 0.0 33.33 100.00 33.33	1 33.33
MOST POSITIVE [+1.5,+2.0]	0	0	1 1.0 0.0 33.33 100.00 33.33	1 33.33
NO RESPONSE	0	0	1 1.0 0.0 33.33 100.00 33.33	1 33.33
TOTAL	.	.	3 100.00	3 100.00

The last section of table 61 includes three students, all from the LGM environmental preference group, who reported MOST POSITIVE post-orientation LGM preference scores. One student reported an essentially unchanged MOST POSITIVE post-instruction LGM preference score, while a second student reported a decreased NEUTRAL LGM preference score. The third did not respond to the questionnaire.

7.3.3.1 Statistical Differences Between the Original Sample and the Reduced Sample

Table 62, which is similar in format to tables 58 and 60, presents summary statistics for the reduced sample of twenty-nine students who reported both post-orientation and post-instruction LGM preference scores. The first row of table 62 presents statistics for the reduced sample concerning post-orientation LGM preference scores. The second row presents comparable statistics for their post-instruction LGM preference scores, and the third row presents statistics concerning LGM preference score changes. The individual data upon which these statistics are based can be found in appendix Q.

In a manner analogous to that used to compare IM and SGM post-orientation preference scores for the total and reduced samples, the reader can compare the statistics in the first row of table 62, with those in the third row of table 15. The only notable difference between these statistics is that the mean post-orientation LGM preference score

for the reduced sample is higher (1.22 - table 62) than the comparable mean for the total sample (1.03 - table 15.) Mean LGM preference scores for the IM and SGM groups show little change between these tables.

TABLE 62

Summary Statistics for LGM Preference Score Changes by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
POST- ORIENTATION LGM PREFERENCE SCORE (PREF1_L)	-0.08 0.77 -1.17 1.17 2.34 8	-0.07 0.53 -1.00 0.83 1.83 12	1.22 0.48 0.50 2.00 1.50 9	0.33 0.84 -1.17 2.00 3.17 29
POST- INSTRUCTION LGM PREFERENCE SCORE (PREF2_L)	-0.01 0.95 -2.00 0.83 2.83 8	0.24 0.35 -0.33 0.83 1.16 12	1.07 0.61 0.00 2.00 2.00 9	0.43 0.78 -2.00 2.00 4.00 29
LGM PREFERENCE SCORE CHANGE	0.07 1.12 -2.00 1.66 3.66 8	0.31 0.50 -0.24 1.50 1.74 12	-0.15 0.66 -1.40 0.67 2.07 9	0.10 0.79 -2.00 1.66 3.66 29

7.3.3.2 LGM Preference Score Changes Within the Reduced Sample

The mean changes between post-orientation and post-instruction LGM preference scores followed neither of the patterns described previously for IM and SGM preference score changes. Students from the IM environmental preference group reported a small mean increase of 0.07, while the students in the SGM group reported a larger mean increase of 0.31. The students in the LGM environmental preference group, however, reported a mean decrease in preference scores of -0.15. Only in the case of these LGM students, can the changes in LGM preference scores be associated with instructional experiences in the LGM environment.

7.3.4 Summary

Two types of comparisons have been discussed in this section concerning post-orientation and post-instruction preference scores. The first type was the comparison between the total sample of fifty-five students who reported post-orientation preference scores, and the reduced sample of twenty-nine students who also reported post-instruction preference scores. The second type was the comparison within the reduced sample between post-orientation and post-instruction preference scores.

With regard to between sample comparisons of post-orientation preference scores, the following findings were described:

1. A large majority of the reduced sample of twenty-nine students (97%) were successful in the first mini-course.
2. A smaller majority of the twenty-six students excluded from the reduced sample (58%), those not responding to the second take-home packet, were not successful in the first mini-course.
3. All preference groups in the reduced sample reported lower mean post-orientation IM preference scores, than did the respective preference groups in the total sample.
4. The SGM preference group in the reduced sample reported a higher mean post-orientation SGM preference score, than did the SGM preference group in the total sample.
5. The LGM preference group in the reduced sample reported a higher mean post-orientation LGM preference score, than did the LGM preference group in the total sample.

With regard to within sample comparisons between post-orientation and post-instruction preferences, the following trends were noted:

1. Within the IM environmental preference group of the reduced sample, the mean IM and LGM preference scores increased, but the mean SGM score decreased.

2. Within the SGM environmental preference group of the reduced sample, the mean IM and LGM preference also scores increased, and the mean SGM score decreased.

3. Within the LGM environmental preference group of the reduced sample, the mean IM preference score increased, while the mean LGM score decreased.

4. Two students changed environment (from SGM to IM) between the first and the second mini-courses.

The findings and trends summarized above have not been tested for statistical significance; the changes noted range in absolute value from 0.05 to 0.51, on a score range from -2.00 to +2.00. Some relationships been hypothesized; the author has noted that some trends pertaining to the reduced sample may be associated with the high degree of successful academic performance achieved by that group, and the comparatively low degree degree of success in the remainder of the original sample.

The following are examples other possible factors which might have influenced within group preference score changes between post-orientation and post-instruction measurements.

1. Changes in preference scores for the environment in which the course was studied:

   a) May reflect a direct relation with either positive or negative experiences in that environment.

b) May reflect differential effects of inflated reporting on either the first or the second preference questionnaire, in order to assure assignment to the environment of choice.

c) May reflect measurement errors inherent in the instrument or its application.

2. Changes in preference scores for an environment in which the course was not studied:

a) May reflect an inverse relation with either positive or negative experiences in other learning environments.

b) May reflect informal feedback from students who did study the course in that environment.

c) May reflect differential effects of deflated reporting on either the first or the second preference questionnaire, in order to assure assignment to the environment of choice.

d) May reflect reduced influence of either positive or negative orientation experiences due to the passage of time.

e) May reflect measurement errors inherent in the instrument or its application.

7.4 POST-INSTRUCTION MEASURED STUDENT CHARACTERISTICS

Post-orientation student characteristics, measured by instruments included in the first take-home packet and presented in chapter 6, included mathematics attitude, self-concept, interpersonal relations orientation, and communication apprehension. These characteristics were measured for all fifty-five students in the total sample. The mathematics attitude and communication apprehension instruments were re-administered in the second take-home packet for the twenty-nine students in the reduced sample who returned those packets.

Two types of tables, similar in format to tables 57 and 58 are used in this section to present and compare both post-orientation and post-instruction measurements of mathematics attitude and communication apprehension for students in the reduced sample. The first type of table presents the crosstabulation of the post-instruction measured scores with respect to environmental preference for the total sample, while controlling for the level of response to the corresponding post-orientation instrument. The second type of table presents summary statistics for the reduced sample, showing post-orientation, post-instruction, and change statistics for the same characteristic.

7.4.1 Mathematics Attitude

Table 63 presents the crosstabulation of post-instruction mathematics attitude scores, measured by the Aiken and Dreger Mathematics Attitude Scale (MAS), with environmental preference groups. This table is presented in sections, in order to control for the level of post-orientation response to the same instrument, with one section corresponding to each category of post-orientation response. The data upon which table 63 is based can be found in appendices M, P, and R.

Following the last section of crosstabulation tabulation table 63, the reader will find table 64 which presents summary statistics for both post-orientation and post-instruction mathematics attitude scores. Whereas table 63 pertains to all fifty-five students in the total sample, table 64 pertains only to the reduced sample of twenty-nine students. The data upon which table 64 is based can be found in appendix R.

The first section of table 63 indicates that the only student to report a post-orientation mathematics attitude in the MOST NEGATIVE range did not respond to the post-instruction instrument. The second section of table 63 reflects the post-instruction mathematics attitudes for eighteen students, who reported post-orientation attitudes in the NEGATIVE category. This section shows that twelve out of the eighteen students (64%) responded to the post-instruction instrument. In addition, seven of those twelve

students (58%) report mathematics attitude scores in higher categories than they reported before the instruction began.

TABLE 63

Distribution of Post-Instruction Mathematics Attitude by Preferred Environment (Controlling for Post-Orientation Mathematics Attitude)

TABLE OF MAS_2 BY ENVIRONMENT_1
SECTION 1 - CONTROLLING FOR MAS_1=MOST NEGATIVE

MAS_2 MATHEMATICS ATTITUDE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	0	0	1 1.0 0.0 100.00 100.00 100.00	1 100.00
TOTAL	.	.	1	1
	.	.	100.00	100.00

TABLE OF MAS_2 BY ENVIRONMENT_1
SECTION 2 - CONTROLLING FOR MAS_1=NEGATIVE

MAS_2 MATHEMATICS ATTITUDE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEGATIVE [-1.5,-0.5)	1 0.3 0.7 5.56 20.00 100.00	2 2.5 -0.5 11.11 40.00 22.22	2 2.2 -0.2 11.11 40.00 25.00	5 27.78
NEUTRAL [-0.5,+0.5)	0 0.3 -0.3 0.00 0.00 0.00	3 3.0 0.0 16.67 50.00 33.33	3 2.7 0.3 16.67 50.00 37.50	6 33.33
POSITIVE [+0.5,+1.5)	0 0.1 -0.1 0.00 0.00 0.00	0 0.5 -0.5 0.00 0.00 0.00	1 0.4 0.6 5.56 100.00 12.50	1 5.56
NO RESPONSE	0 0.3 -0.3 0.00 0.00 0.00	4 3.0 1.0 22.22 66.67 44.44	2 2.7 -0.7 11.11 33.33 25.00	6 33.33
TOTAL	1 5.56	9 50.00	8 44.44	18 100.00

The third section of table 63 presents the post-instruction mathematics attitude scores for eighteen more students who reported post-orientation scores in the NEUTRAL category. Seven of these eighteen students (39%) reported

no categorical changes in mathematics attitude. The other eleven students (61%) did not respond to the post-instruction instrument.

TABLE OF MAS_2 BY ENVIRONMENT_1
SECTION 3 - CONTROLLING FOR MAS_1=NEUTRAL

MAS_2 MATHEMATICS ATTITUDE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	2 1.9 0.1 11.11 28.57 40.00	3 3.1 -0.1 16.67 42.86 37.50	2 1.9 0.1 11.11 28.57 40.00	7 38.89
NO RESPONSE	3 3.1 -0.1 16.67 27.27 60.00	5 4.9 0.1 27.78 45.45 62.50	3 3.1 -0.1 16.67 27.27 60.00	11 61.11
TOTAL	5 27.78	8 44.44	5 27.78	18 100.00

TABLE OF MAS_2 BY ENVIRONMENT_1
SECTION 4 - CONTROLLING FOR MAS_1=POSITIVE

MAS_2 MATHEMATICS ATTITUDE (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEGATIVE [-1.5,-0.5)	1 0.4 0.6 5.56 100.00 14.29	0 0.4 -0.4 0.00 0.00 0.00	0 0.2 -0.2 0.00 0.00 0.00	1 5.56
NEUTRAL [-0.5,+0.5)	1 1.9 -0.9 5.56 20.00 14.29	3 1.9 1.1 16.67 60.00 42.86	1 1.1 -0.1 5.56 20.00 25.00	5 27.78
POSITIVE [+0.5,+1.5)	3 1.2 1.8 16.67 100.00 42.86	0 1.2 -1.2 0.00 0.00 0.00	0 0.7 -0.7 0.00 0.00 0.00	3 16.67
MOST POSITIVE [+1.5,+2.0]	0 0.4 -0.4 0.00 0.00 0.00	1 0.4 0.6 5.56 100.00 14.29	0 0.2 -0.2 0.00 0.00 0.00	1 5.56
NO RESPONSE	2 3.1 -1.1 11.11 25.00 28.57	3 3.1 -0.1 16.67 37.50 42.86	3 1.8 1.2 16.67 37.50 75.00	8 44.44
TOTAL	7 38.89	7 38.89	4 22.22	18 100.00

The fourth and final section of table 63 presents the post-instruction mathematics attitude scores for yet another group of eighteen students.[15] The students all reported post-orientation mathematics attitude scores in the POSITIVE category. Ten of these eighteen students (56%) responded to the post-instruction instrument; one of the ten (10%) reported an increased post-instruction score in the MOST POSITIVE range, while six students (60%) reported categorically lower scores in the NEUTRAL or NEGATIVE ranges. Eight of the eighteen students (44%) did not respond to the post-instruction survey.

7.4.1.1 Statistical Differences Between the Original Sample and the Reduced Sample

In earlier sections of this chapter the author compared post-orientation preference statistics for both the total post-orientation sample and for the reduced post-instruction sample. Similar comparisons are possible for the mathematics attitude and communication apprehension data which were also measured by instruments included in both take home packets. The following discussion concerns differences in post-orientation mathematics attitude statistics between the total and reduced samples.

---

[15] There are only four sections for table 63, since no students reported post-orientation mathematics attitude scores in the MOST POSITIVE category.

TABLE 64

Summary Statistics for Mathematics Attitude Score Changes by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
POST-ORIENTATION MATHEMATICS ATTITUDE (MAS_1)	0.38 0.68 -0.95 1.15 2.10 8	-0.01 0.86 -1.45 1.45 2.90 12	-0.29 0.61 -0.80 0.85 1.65 9	0.01 0.78 -1.45 1.45 2.90 29
POST-INSTRUCTION MATHEMATICS ATTITUDE (MAS_2)	0.07 0.65 -0.85 1.15 2.00 8	.00 0.63 -0.90 1.60 2.50 12	-0.07 0.50 -0.85 0.75 1.60 9	.00 0.60 -0.90 1.60 2.50 29
MATHEMATICS ATTITUDE CHANGE	-0.30 0.47 -1.10 0.10 1.20 8	0.02 0.55 -1.00 1.00 2.00 12	0.22 0.67 -0.70 1.40 2.10 9	-0.01 0.61 -1.10 1.40 2.50 29

The first row of table 64 presents the post-orientation mathematics attitude statistics for the reduced sample. The third row of table 22 (chapter 6) presents comparable statistics for the total sample. The differences between corresponding post-orientation means for each environmental preference group are small, although consistently lower for the reduced sample. The largest difference in means of approximately -0.2 (-0.29 - -0.092) occurred in the LGM preference group.

The author concluded from this comparison, that there were no apparent trends involving differences between total and reduced sample mathematics attitude statistics. Not only were the differences between means small, but the only range changes occurred in the LGM group. Those students who reported both the maximum and minimum post-orientation mathematics attitude scores did not complete the post-instruction instrument, and were thus eliminated from the reduced sample.[16]

7.4.1.2 Mathematics Attitude Score Changes Within the Reduced Sample

While the first row of table 64 presents post-orientation MAS statistics for the reduced sample, the second row presents post-instruction MAS statistics for the same students. The third row of table 64 provides statistics on the individual changes in measured mathematics attitude scores. The individual students' scores and changes can be found in appendix R.

Although the data was limited and the mean changes were small, the author has observed some weak apparent trends with regard to MAS changes in the reduced sample.

---

[16] Interested readers can determine the packet numbers of these students by comparing MAS_1 scores in appendix M with the MAS_2 scores in appendix P.

1. The mean change for the IM environmental preference group was negative (-0.3.) In addition, the largest increase in mathematics attitude in the IM group was +0.1, while the largest decrease was -1.1.

2. The mean change for the SGM environmental preference group was very small (+0.02). The maximum increase and decrease in the SGM group (+1.0 and -1.0) were equal in magnitude.

3. The mean change for the LGM environmental preference group was positive (+0.22.) The largest increase (+1.4) was double the magnitude of the largest decrease (-0.7.)

In chapter 6, while discussing table 22, the author observed that there was a weak tendency for students in the IM environmental preference group to report somewhat higher mathematics attitude scores, and for the students in the LGM group to report somewhat lower scores. The second row of table 64 shows that evidence of this trend virtually disappeared when the post-instruction mathematics attitude scores were measured. The decrease of the IM mean score combined with the increase of LGM mean score, resulted in very similar means in the NEUTRAL range (+0.07, +0.00 and -0.07) for the IM, SGM, and LGM groups respectively.

One possible interpretation of these within sample changes, is that the instructional experience in the IM environment was in some way associated with the lowering of

some reported mathematics attitudes, and that the instructional experience in the LGM environment was in some way associated with the raising of some reported mathematics attitudes. Whether or not the differences in reported mathematics attitudes between preference groups, originally noted in chapter 6, were evidence of a real trend needs further study. In addition, the changes in reported mathematics attitudes within preference groups, as reflected in table 64, are also in need of further study.

7.4.2 Communication Apprehension

The Personal Report of Communication Apprehension (PRCA) was included in both the post-orientation and post-instruction take-home packets. Post-orientation scores were discussed previously in chapter 6. Table 65 presents the crosstabulation of post-instruction PRCA scores with environmental preference groups for the total sample, while controlling for post-orientation PRCA. The data upon which table 65 is based can be found in the PRCA_1 column of appendix M and the PRCA_2 column of appendix P.

Table 65 is presented in sections, similar in format to that used in table 63. The first section of table 65 pertains to the single student who reported a post-orientation communication apprehension score in the LOWEST

category. This student did not respond to the post-instruction instrument.[17]

TABLE 65

Distribution of Post-Instruction Communication Apprehension by Preferred Environment (Controlling for Post-Orientation Communication Apprehension)

TABLE OF PRCA_2 BY ENVIRONMENT_1
SECTION 1 - CONTROLLING FOR PRCA_1=LOWEST

PRCA_2 COMMUNICATION APPREHENSION (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NO RESPONSE	0	1	0	1
	.	1.0	.	
	.	0.0	.	
	.	100.00	.	100.00
	.	100.00	.	
	.	100.00	.	
TOTAL	.	1	.	1
	.	100.00	.	100.00

The second section of table 65 presents the distribution of post-instruction PRCA data for fifteen students who reported LOWER communication apprehension on the post-orientation instrument. This section shows that nine of

---

[17] The reader can verify in the appropriate appendices that this was a male SGM student (packet number 39) who was in the high success category for all three mini-courses, but who did not respond to the second take-home packet.

these students (60%) did not respond to the post-instruction instrument. The six students (40%) who did respond however, reported no categorical changes in communication apprehension.

TABLE OF PRCA_2 BY ENVIRONMENT_1
SECTION 2 - CONTROLLING FOR PRCA_1=LOWER

PRCA_2 COMMUNICATION APPREHENSION (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LOWER [-1.5,-0.5)	1	3	2	6
	2.0	2.0	2.0	
	-1.0	1.0	0.0	
	6.67	20.00	13.33	40.00
	16.67	50.00	33.33	
	20.00	60.00	40.00	
NO RESPONSE	4	2	3	9
	3.0	3.0	3.0	
	1.0	-1.0	0.0	
	26.67	13.33	20.00	60.00
	44.44	22.22	33.33	
	80.00	40.00	60.00	
TOTAL	5	5	5	15
	33.33	33.33	33.33	100.00

The third section of table 65 presents the distribution of post-instruction PRCA scores for thirty-four students who reported NEUTRAL post-orientation communication apprehension. Twenty-two of these students (65%) did respond to the post-instruction instrument. Seventeen of the twenty-two

respondents (77%) reported no categorical change in communication apprehension.

TABLE OF PRCA_2 BY ENVIRONMENT_1
SECTION 3 - CONTROLLING FOR PRCA_1=NEUTRAL

PRCA_2 COMMUNICATION APPREHENSION (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
LOWER [-1.5,-0.5)	0 0.6 -0.6 0.00 0.00 0.00	2 1.6 0.4 5.88 66.67 11.11	1 0.8 0.2 2.94 33.33 11.11	3 8.82
NEUTRAL [-0.5,+0.5)	6 3.5 2.5 17.65 35.29 85.71	7 9.0 -2.0 20.59 41.18 38.89	4 4.5 -0.5 11.76 23.53 44.44	17 50.00
HIGHER [+0.5,+1.5)	0 0.4 -0.4 0.00 0.00 0.00	0 1.1 -1.1 0.00 0.00 0.00	2 0.5 1.5 5.88 100.00 22.22	2 5.88
NO RESPONSE	1 2.5 -1.5 2.94 8.33 14.29	9 6.4 2.6 26.47 75.00 50.00	2 3.2 -1.2 5.88 16.67 22.22	12 35.29
TOTAL	7 20.59	18 52.94	9 26.47	34 100.00

TABLE OF PRCA_2 BY ENVIRONMENT_1
SECTION 4 - CONTROLLING FOR PRCA_1=HIGHER

PRCA_2 COMMUNICATION APPREHENSION (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
HIGHER [+0.5,+1.5)	1 0.2 0.8 20.00 100.00 100.00	0	0 0.8 -0.8 0.00 0.00 0.00	1 20.00
NO RESPONSE	0 0.8 -0.8 0.00 0.00 0.00	0	4 3.2 0.8 80.00 100.00 100.00	4 80.00
TOTAL	1 20.00	. .	4 80.00	5 100.00

The fourth and final section of table 65 presents the distribution of post-instruction PRCA scores for those five students who reported post-orientation communication apprehension in the HIGHER category.[18] The only student in this group who responded to the post-instruction instrument was from the IM environmental preference group. The other four

---

[18] As was the case with the mathematics attitude distribution, there is no fifth section of table 65 because no students reported a post-orientation PRCA score in the HIGHEST category.

students (80%), none of whom responded to the post-instruction instrument, were all from the LGM group.[18]

7.4.2.1 Statistical Differences Between the Original Sample and the Reduced Sample

Table 66 presents both post-orientation and post-instruction PRCA statistics by environmental preference group for the reduced sample of twenty-nine students. By comparing the first row of table 66 with the last row of table 42 (chapter 6) the reader can observe the statistical differences in post-orientation communication apprehension scores between the total sample and the reduced sample. Comparisons of mean scores between the two tables show only small differences (all less than 0.2) between the mean reported communication apprehension scores for each environmental preference group in the total sample (table 42) and the respective means for the reduced sample (table 66.)

---

[19] The interested reader can study the individual data for these students in the appendices. The packet number for the IM student was 67; The LGM student numbers were 41, 3, 80, and 8.

TABLE 66

Summary Statistics for Communication Apprehension Score Changes by Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
POST-ORIENTATION COMMUNICATION APPREHENSION (PRCA_1)	-0.20 0.47 -1.16 0.72 1.88 8	-0.35 0.29 -0.84 0.08 0.92 12	-0.21 0.36 -0.80 0.20 1.00 9	-0.27 0.38 -1.16 0.72 1.88 29
POST-INSTRUCTION COMMUNICATION APPREHENSION (PRCA_2)	-0.21 0.44 -1.08 0.56 1.64 8	-0.35 0.23 -0.80 0.00 0.80 12	-0.16 0.56 -0.96 0.68 1.64 9	-0.26 0.42 -1.08 0.68 1.76 29
COMMUNICATION APPREHENSION CHANGE	-0.01 0.18 -0.28 0.23 0.51 8	.00 0.23 -0.32 0.32 0.64 12	0.05 0.31 -0.36 0.56 0.92 9	0.01 0.25 -0.36 0.56 0.92 29

The author has concluded that there were no clear differences in the mean levels of reported post-orientation communication apprehension between the total and reduced samples. The author noted previously, however, while discussing table 42 in chapter 6, that there seemed to be a weak tendency for students (especially males) who preferred the LGM environment to report greater communication apprehension that those students who preferred the IM and SGM groups. The differences between post-orientation means, shown in the first row of table 66 for the various

environmental preference groups in the reduced sample, do not suggest this previously noted trend.[20] The author has therefore concluded that further study is needed to determine whether or not students who prefer the LGM environment do tend to report higher PRCA scores than do students who prefer the IM and SGM environments.

7.4.2.2 Communication Apprehension Score Changes Within the Reduced Sample

By comparing the various statistics within table 66 itself, the reader can look for changes in reported communication apprehension between the post-orientation and post-instruction measurements. The mean changes in PRCA scores for each environmental preference group, presented in the third row of table 66, however, are extremely small (0.05 or less.) From this the author concludes that there is no evidence that the instructional phase of the study had any significant impact on the overall levels of communication apprehension within the reduced sample. The largest individual changes, indicated by the maximum and minimum changes in the third row, both occurred in the LGM preference group.

---

[20] The reader who is interested in studying individual data for students who were excluded from the reduced sample is referred to appendix P to identify those students who did not respond to the second take-home packet. Individual post-orientation data for these students, as well as post-instruction grades and archive data, contained in the various appendices can then be reviewed.

One LGM student reported an increase of 0.56 in communication apprehension, and another LGM student reported a decrease of -0.36.[21]

7.4.3 Summary

Concerning the student characteristics of mathematics attitude and communication apprehension, for which both post-orientation and post-instruction measures were obtained, the author has observed no strong trends, but has recommended further research into some apparent weak trends.

1. Statistics presented in chapter 6 indicated that students preferring the IM environment reported a higher mean post-orientation mathematics attitude score than did those students preferring the LGM environment. Similar differences in means, however, were not evident in the corresponding post-instruction mathematics attitude statistics.
2. Statistics presented in chapter 6 also indicated that students preferring the LGM environment reported a higher mean communication apprehension score than did students preferring the other environments. Similar differences in post-orientation means for communication apprehension

---

[21] These students had packet numbers 40 and 12 respectively. The interested reader can study the individual data for these students, which contained in the various appendices.

scores in the reduced sample, however, were not evident.

7.5 POST-INSTRUCTION STUDENT EVALUATION OF THE CHOICE STUDY

One of the instruments included in the second take-home packet (appendix H) was a post-instruction Learning Environment Evaluation and Comment Form. On this form, students were requested to describe their thoughts pertaining to various aspects of both the Choice Model and the specific learning environments in which they studied. In a manner similar to that used for evaluating the Orientation Comment Form included in the first take-home packet (appendix G), the students' comments on the post-instruction form were evaluated by assigning a response score to each response. The response scores ranged from -2.0 for MOST NEGATIVE comments to +2.0 for MOST POSITIVE comments.[22]

Individual student response scores for the first five post-instruction evaluation comments are presented in appendix S. Tables of summary statistics derived from these individual scores are presented in this section of chapter 7. Statistics based upon those scores pertaining to comments concerning the Choice Model itself have been

---

[22] The reader may refer back to the Preference Comments portion of chapter 5 to review the quantification criteria used by the author in determining response scores.

combined in one table. Statistics for those response scores pertaining to a specific learning environment have been combined in a second table.

7.5.1 Student Evaluation of the Choice Model

The first two items on the post-instruction Learning Environment Evaluation and Comment Form, pertained to the Choice Model itself. These items were stated as follows:

1. "Please describe your thoughts about having been able to choose a learning environment."
2. "Please describe your thoughts about the way you were introduced to the three environments."

Summary statistics for the combined response scores to the above two items, by sex with respect to environmental preference groups, are presented in table 67. These statistics are based upon responses for twenty-eight of the twenty-nine students included in the reduced sample. One male student in the SGM group did not provide comments which were responsive to the stated items; his questionnaire was not evaluated.

TABLE 67

Summary Statistics for Model Evaluation
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	1.500 0.500 1.000 2.000 1.000 2	0.786 0.558 0.000 2.000 2.000 8	0.000 1.000 -1.000 1.000 2.000 1	0.850 0.726 -1.000 2.000 3.000 11
MALE STUDENTS	1.250 0.722 0.000 2.000 2.000 6	1.500 0.500 1.000 2.000 1.000 3	0.938 0.966 -2.000 2.000 4.000 8	1.147 0.845 -2.000 2.000 4.000 17
ALL STUDENTS	1.313 0.682 0.000 2.000 2.000 8	1.000 0.632 0.000 2.000 2.000 11	0.833 1.014 -2.000 2.000 4.000 9	1.037 0.816 -2.000 2.000 4.000 28

Due to small cell sizes, it is inappropriate to draw detailed conclusions from these statistics. The author does observe the following apparent tendencies, however, and suggests that they be investigated by further research.

1. While the mean response scores indicate that student comments concerning the Choice Model were generally positive, the means in the TOTAL SAMPLE column of table 67 indicate that male students (1.15) made comments which tended to be somewhat

more positive than those made by female students (0.85.)

2. Mean scores in the third row for ALL STUDENTS indicate that students in the IM environmental preference group (1.31) tended to make the most positive comments concerning the Choice Model, while students in the LGM preference group (0.83) tended to make the least positive statements.

7.5.2 Student Evaluation of the Environments

The following three items on the post-instruction comment form solicited comments pertaining to the learning environments in which the students had studied the first mini-course:

1. "Please describe your thoughts about this method of instruction."
2. "Please describe you thoughts about this instructor."
3. "Please describe your thoughts about this grading method."

Summary statistics based upon the combined responses to these three items are presented in table 68. Once again, only comments by twenty-eight of the students from the reduced sample were included in these statistics. Table 68 presents the statistics by sex and environmental preference group.

TABLE 68

Summary Statistics for Environment Evaluation
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	1.667 0.471 1.000 2.000 1.000 2	1.042 0.735 -1.000 2.000 3.000 8	1.333 0.943 0.000 2.000 2.000 1	1.182 0.757 -1.000 2.000 3.000 11
MALE STUDENTS	1.333 0.577 0.000 2.000 2.000 6	1.000 0.816 0.000 2.000 2.000 3	1.250 0.595 0.000 2.000 2.000 8	1.235 0.644 0.000 2.000 2.000 17
ALL STUDENTS	1.417 0.571 0.000 2.000 2.000 8	1.030 0.758 -1.000 2.000 3.000 11	1.259 0.644 0.000 2.000 2.000 9	1.214 0.691 -1.000 2.000 3.000 28

Detailed conclusions are not justified due to small cell sizes, but the means in table 68 indicate that students tended to make generally positive comments regarding all three learning environments. The author has also made the following observations.

1. There appears to be no significant difference between the mean response scores for male (1.24) and female (1.18) students pertaining to learning environment evaluations.

2. Mean scores in the third row for ALL STUDENTS indicate that students in the IM environmental preference group (1.42) tended to make the most positive comments concerning the the IM environment, while students in the SGM preference group (1.03) tended to make the least positive statements about the SGM learning environment.

7.5.3 Teacher Receptivity

A second type of post-instruction evaluation was obtained from the Teacher Receptivity Scale, [Falcione, 1985] A preliminary form of this instrument, an eighty-seven item Lickert scale questionnaire (appendix H), was included in the second take-home package. This scale provides a general measure of how accessible the students determined their instructors to be, based upon the students' evaluations of their instructors' observed communication traits. Each student was requested to evaluate only that instructor under whose instruction she or he studied the first mini-course.

The instructions on the Teacher Receptivity Scale asked each student to indicate the degree to which each of eighty-seven statements applied to his or her instructor by circling one of possible responses. The responses are listed below, along with the numerical response score to each.

1. Strongly agree
2. Agree
3. Uncertain
4. Disagree
5. Strongly disagree

As indicated previously, a preliminary eighty-seven item version of the scale was administered. Subsequent to its inclusion in the second take-home packet, Falcione analyzed responses to the preliminary instrument by other students using the factor analysis technique. Falcione concluded from his analysis that the instrument measured only one dimension of teacher receptivity. He provided this author with the following table of weighting factors (in the range from -1.0 to +1.0) to use in computing the Teacher Receptivity score.

Falcione concluded from his factor analysis that forty-four of the original eighty-seven items did not contribute significantly to the Teacher Receptivity Scale, so he provided weighting factors of 0.0 for those items. These weightings were in turn used by this author to evaluate student responses to the preliminary form of the instrument. For the convenience of readers who may wish to use this scale in future research, the author has omitted those forty-four unnecessary items from both the table of weighting factors and from the instrument included in appendix H, resulting in a forty-three item Teacher Receptivity instrument.

Twenty-nine of the items included in the abbreviated instruments are stated in a positive context, so that

student responses in agreement with those statements indicate "positive" communication traits which are associated with greater teacher receptivity. Item 1 is an example of a statement in a positive context: "My instructor seems open to communication with me."

The remaining fourteen items are stated in a negative context, so that student responses in agreement with those statements indicate "negative" communication traits which are associated with lesser teacher receptivity. Item 12 is an example of a statement in a negative context: "I feel my instructor is not interested in me as a person." In order to account for the negative context of fourteen of the statements, their respective weighting scores have been set to negative numbers, while the other twenty-nine weighting scores have been left as positive numbers.

TABLE 69

Teacher Receptivity Scale Weighting Factors

ITEM	WEIGHTING
1	.819
2	.794
3	.804
4	.719
5	.643
6	.721
7	.792
8	-.660
9	-.716
10	.743
11	-.779
12	.618
13	-.656
14	.640
15	.839
16	.798
17	.688
18	.727
19	-.629
20	-.797
21	.836
22	.849
23	.733
24	-.838
25	.726
26	.609
27	.834
28	.800
29	-.633
30	.741
31	-.610
32	-.668
33	.746
34	-.660
35	.613
36	.671
37	.747
38	.621
39	.778
40	.654
41	-.690
42	-.708
43	-.624
Positive Sum	21.300
Negative Sum	-9.670
Difference of Sums	30.970

To compute each student's Teacher Receptivity Scale score, his or her forty-three "meaningful" response scores (1 to 5) were first adjusted to the -2.0 to +2.0 scale used in this study, by subtracting 3 from each response score. The adjusted response scores were then multiplied by the respective weightings given in table 70. These products were then added, yielding a maximum possible sum of 61.94.[23] In order to compute a final score in the +2.0 to -2.0 range, each sum was divided by 61.94, and then multiplied by 2.

The individual Teacher Receptivity Scale scores have been provided in appendix P. The distribution of these scores by response category and environmental preference group is given in table 70. The reader will note that scores are available for all twenty-nine students in the reduced sample; the twenty-six students who did not respond are those who did not return the post-instruction take-home packet. Table 70 shows that only five students (17% of the respondents) reported Teacher Receptivity scores in the NEUTRAL range, and no lower scores were reported. The deviations printed in table 70, all in the range of +1.8 to -1.2, indicate that the distribution of scores was in close agreement with the hypothesis of independence.

---

[23] If a student strongly agreed with all positive context items (+2.0) and strongly disagreed with all negative context items (-2.0), then the resulting score would be 2 times the difference of the positive and negative sums given in table 69.

TABLE 70

Distribution of Measured Teacher Receptivity by Preferred Environment

TABLE OF IA_2 BY ENVIRONMENT_1

IA_2 INSTRUCTOR ACCESSIBILITY (POST-INSTRUCTION)
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
NEUTRAL [-0.5,+0.5)	1 1.2 -0.2 1.82 20.00 7.69	2 2.2 -0.2 3.64 40.00 8.33	2 1.6 0.4 3.64 40.00 11.11	5 9.09
POSITIVE [+0.5,+1.5)	7 5.2 1.8 12.73 31.82 53.85	9 9.6 -0.6 16.36 40.91 37.50	6 7.2 -1.2 10.91 27.27 33.33	22 40.00
MOST POSITIVE [+1.5,+2.0]	0 0.5 -0.5 0.00 0.00 0.00	1 0.9 0.1 1.82 50.00 4.17	1 0.7 0.3 1.82 50.00 5.56	2 3.64
NO RESPONSE	5 6.1 -1.1 9.09 19.23 38.46	12 11.3 0.7 21.82 46.15 50.00	9 8.5 0.5 16.36 34.62 50.00	26 47.27
TOTAL	13 23.64	24 43.64	18 32.73	55 100.00

TABLE 71

Summary Statistics for Teacher Receptivity
by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	1.120 0.050 1.07 1.17 0.10 2	0.600 0.377 -0.12 1.02 1.14 8	1.440 .000 1.44 1.44 0.00 1	0.771 0.434 -0.12 1.44 1.56 11
MALE STUDENTS	1.000 0.281 0.42 1.28 0.86 6	1.168 0.447 0.87 1.94 1.07 4	1.038 0.653 -0.07 1.91 1.98 8	1.054 0.514 -0.07 1.94 2.01 18
ALL STUDENTS	1.030 0.250 0.42 1.28 0.86 8	0.789 0.483 -0.12 1.94 2.06 12	1.082 0.628 -0.07 1.91 1.98 9	0.947 0.504 -0.12 1.94 2.06 29

Table 71 presents summary statistics for Teacher Receptivity scores, by sex and environmental preference group, reported by the twenty-nine students in the reduced sample. Due to small sample sizes, detailed analyses are not appropriate. The author does provide the following general observations, however, which represent potential topics for future studies.

1. The mean and maximum scores reported by female students appear to be somewhat lower than those reported by male students.

2. The mean score reported by all SGM students is somewhat lower that the mean scores reported by all IM and all LGM students.

These observed phenomena may be more closely related than one would otherwise have cause to believe, because of the following facts.

1. The majority of the SGM students reporting Teacher Receptivity scores were female.
2. The majority of the female students were in the SGM environmental preference group.
3. The SGM instructor was a male, and the mean score for SGM males was somewhat higher than for SGM females.[24]

7.5.4 Summary

Two post-instruction instruments, the Learning Environment Evaluation and Comment Form and the Teacher Receptivity Scale, were administered in the second take-home packet. From these forms, three evaluation scores were derived and presented in this section. General conclusions have been summarized as follows.

---

[24] More detailed sex and age information, for both instructors and students, was presented at the beginning of chapter 5. The reader is reminded that the IM and SGM instructors were both males, and that the LGM instructor was female. The number of IM and LGM females reporting, however, was too small permit the study of any teacher receptivity/sex patterns for those environments.

1. Concerning the Choice Model itself, female student evaluations appeared to be somewhat lower than did male student evaluations, and LGM student evaluations appeared to be somewhat lower than average, while IM student evaluations appeared to be somewhat higher than average.

2. Concerning evaluations of the respective instructional environments, no significant sex differences were detected, but SGM evaluations appeared to be somewhat lower than average, while IM evaluations appeared to be somewhat higher than average.

3. Concerning teacher receptivity, female scores appeared to be somewhat lower than male scores, especially those scores reported by SGM female students, which pertained to the male SGM instructor.

7.6 POST-INSTRUCTION COLLEGE ARCHIVE DATA

In the last major section of chapter 6, the author presented and discussed three types of pre-instruction academic archive data; those being high school, placement test, and college archive data. The variables used to identify the different components of the pre-instruction archive dataset were each assigned the suffix _0. This

suffix indicated that those variables represented pre-study student information which had been archived before the Spring 1977 semester.

In this section of chapter 7, the author presents post-instruction college archive data. The variables used to identify the different components of the post-instruction archive dataset have been assigned the suffix _3. This indicates that these variables represent student information which accumulated in the Prince George's Community College archive from the time of the initial application of each student up to the beginning of the fall 1981 semester. Thus the post-instruction archive data was collected by the author approximately four years after the final classroom phase of the study. For convenience and clarity, the author refers this post-instruction archive data as post-study data, so that it will not be confused with data which was collected immediately after the instructional phase of the study.

Three types of post-study data are presented here. First, data pertaining to earned AA degrees for the total sample is presented. Corresponding to table 51 in chapter 6, which presented the distribution of previous college session enrollments (TPSE_0), the distribution of total college session enrollments (TSE_3) four years after the instruction occurred is presented in this section of chapter 7. Corresponding to tables 52 and 53 in chapter 6, which presented data concerning pre-instruction quality

point averages (PREQPA_0), similar tables in this chapter present data concerning total post-study quality point averages (TQPA_3.)

The data upon which the tables in this section are based can be found in appendix T. Total sessions and quality point information are given both for PGCC and for the total college experience. The enrollment and quality point tables are based upon total college experience, which includes that transfer data from other colleges which was available in the PGCC archive. Since archive data was available for the total sample of fifty-five students, comparisons between the total sample and the reduced sample are not necessary in this section.

7.6.1 Associates Degrees Earned

The degree awarded at Prince George's Community College for successful completion of a two-year (full-time equivalent) program of study is called the Associate of Arts (AA) degree. Table 72 presents the distribution of the number AA degrees earned prior to the fall semester of 1981 with respect to post-orientation environmental preference groups. The deviations in table 72 indicate that the distribution of earned AA degrees over preference groups is consistent with the independence hypothesis.

TABLE 72

Distribution of PGCC Degrees Earned
by Preferred Environment

TABLE OF PGCCD_3 BY ENVIRONMENT_1

PGCCD_3 PGCC DEGREE EARNED
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI- DUAL	SMALL GROUP	LARGE GROUP	TOTAL
EARNED AA DEGREE	4 3.1 0.9 7.27 30.77 30.77	5 5.7 -0.7 9.09 38.46 20.83	4 4.3 -0.3 7.27 30.77 22.22	13 23.64
NO EARNED DEGREE	9 9.9 -0.9 16.36 21.43 69.23	19 18.3 0.7 34.55 45.24 79.17	14 13.7 0.3 25.45 33.33 77.78	42 76.36
TOTAL	13 23.64	24 43.64	18 32.73	55 100.00

Table 72 indicates that thirteen students from the total sample of fifty-five (24%) had earned degrees by 1981. Based upon the last sessions of attendance for students who earned AA degrees, given in appendix T, the following data shows the annual rate degree attainment for the students in the sample.

TABLE 73

Degree Attainment for Sample Students
by Academic Year

YEAR[25]	STUDENTS[26]	DEGREES	PERCENT
1977	55	3	5.45%
1978	52	3	5.77%
1979	49	3	6.12%
1980	46	1	2.17%
1981	45	3	6.67%
Annual Average	48.6	2.6	5.35%

For comparison purposes, the corresponding data pertaining to AA degrees awarded to all transfer students at PGCC is provided. Although, the thirteen students in the study who earned AA degrees did not necessarily earn them in transfer programs[27], the mini-courses in which these students were enrolled at the time of this study were normally taken by students enrolled in transfer curricula.

---

[25] In this table, the YEAR column refers to academic year, beginning with the fall semester. The 1977 academic year, for example, includes the fall 1976, spring 1977, and summer 1977 sessions.

[26] This column reflects the number of students remaining from the original sample of fifty-five students, who had not yet completed AA degree programs.

[27] An AA transfer program is a two-year (full-time equivalent) program of study which is designed to satisfy most of the freshman and sophomore requirements in a corresponding BA degree program at a four-year college or university.

TABLE 74

Degree Attainment for Transfer Students
by Academic Year

YEAR	STUDENTS	DEGREES	PERCENT
1977	6109	400	6.55%
1978	6337	343	5.41%
1979	5652	322	5.70%
1980	5600	349	6.23%
1981	6012	308	5.12%
Annual Average	5,942	344	5.80%

The data from table 73 show that students in the study sample earned degrees at an average rate of 5.35% during the years 1977 to 1981. The corresponding college data in table 74 show that transfer students earned degrees at a rate of 5.80%[28] for the same period. The author concludes that the degree attainment rate for sample students, while lower than one might expect in a traditional four-year college or university, is not appreciably different from the comparable PGCC degree attainment rate.

---

[28] The reader who is unfamiliar with the Maryland community college system should be aware that many academically successful transfer students either do not need to or do not choose complete AA degree programs at PGCC before transferring to a four-year college or university. In addition, PGCC provides many non-transfer and non-degree-producing programs to serve the diverse needs of the student population. For these reasons, it is not appropriate to draw conclusions concerning community college effectiveness, on the basis of transfer degree production alone.

7.6.2 Total College Enrollments

This section deals in essence with the academic persistence of the sample students. The traditional four-year pattern of enrollment by college and university students might lead one to predict that the majority of successful students at a "two-year" community college would enroll for two years, with many of the unsuccessful students dropping-out sooner than that. The fact that three of the students who participated in the 1977 instructional phase of this study completed their degrees in 1981 suggests, however, that the traditional college patterns may not apply to community college students.

Table 75 presents the crosstabulation of total college sessions enrolled with post-orientation environmental preference. Consistent with the use of the term in chapter 6, "session" refers to a college enrollment period, be it a traditional semester, trimester, quarter, or summer session. Total college enrollments include not only PGCC enrollments, which are specified in appendix T, but also transfer enrollments which can be found in appendix N.[29]

---

[29] The reader should note in appendix N, that some of the transfer enrollments occurred before the spring 1977 semester, and some occurred after that semester. This transfer data, which was collected in 1981, reflects that which was reported in transcripts provided by the students to PGCC prior to the time of collection. Transfer data pertaining to students who did not enroll at PGCC after the transfer college experience was not available.

The combined totals of PGCC and reported transfer enrollments are also indicated in appendix T.

While table 75 does not address the success of students in the sample, it does show that the majority of these students were enrolled for more that two years (i.e. four sessions following the traditional semester system of enrollment.) Table 75 shows that eleven students (20%) were enrolled for four or fewer sessions, seventeen students (31%) were enrolled for five or six sessions, thirteen students (24%) were enrolled for seven to nine sessions, and fourteen students (25%) were enrolled for ten to twenty sessions. The data in appendix T shows that in addition to the three students who earned degrees in 1981, five others had enrolled for courses during the spring 1981 semester.

TABLE 75

Distribution of Total College Sessions After Four Years by Preferred Environment

TABLE OF TSE_3 BY ENVIRONMENT_1

TSE_3 TOTAL SESSIONS ENROLLED
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
1 - 3 SESSIONS	0 0.7 -0.7 0.00 0.00 0.00	2 1.3 0.7 3.64 66.67 8.33	1 1.0 0.0 1.82 33.33 5.56	3 5.45
4 SESSIONS	3 1.9 1.1 5.45 37.50 23.08	1 3.5 -2.5 1.82 12.50 4.17	4 2.6 1.4 7.27 50.00 22.22	8 14.55
5 SESSIONS	2 2.1 -0.1 3.64 22.22 15.38	4 3.9 0.1 7.27 44.44 16.67	3 2.9 0.1 5.45 33.33 16.67	9 16.36
6 SESSIONS	4 1.9 2.1 7.27 50.00 30.77	3 3.5 -0.5 5.45 37.50 12.50	1 2.6 -1.6 1.82 12.50 5.56	8 14.55
TOTAL	13 23.64	24 43.64	18 32.73	55 100.00

(CONTINUED)

TABLE OF TSE_3 BY ENVIRONMENT_1

TSE_3 TOTAL SESSIONS ENROLLED
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
7 SESSIONS	1	4	1	6
	1.4	2.6	2.0	
	-0.4	1.4	-1.0	
	1.82	7.27	1.82	10.91
	16.67	66.67	16.67	
	7.69	16.67	5.56	
8 SESSIONS	1	1	2	4
	0.9	1.7	1.3	
	0.1	-0.7	0.7	
	1.82	1.82	3.64	7.27
	25.00	25.00	50.00	
	7.69	4.17	11.11	
9 SESSIONS	2	1	0	3
	0.7	1.3	1.0	
	1.3	-0.3	-1.0	
	3.64	1.82	0.00	5.45
	66.67	33.33	0.00	
	15.38	4.17	0.00	
10 - 20 SESSIONS	0	8	6	14
	3.3	6.1	4.6	
	-3.3	1.9	1.4	
	0.00	14.55	10.91	25.45
	0.00	57.14	42.86	
	0.00	33.33	33.33	
TOTAL	13	24	18	55
	23.64	43.64	32.73	100.00

Although the cell sizes in table 75 are generally small, there are some indications of possible relationships between preference of learning environment and number of enrollments. The deviations in the second row of table 75 indicate that fewer than expected numbers of SGM students

were enrolled for exactly four sessions. The deviations in the last row of table 75 indicate that fewer than expected numbers of IM students were enrolled for more than nine sessions. When the combined frequencies for six or fewer enrollments and seven or more enrollments are computed, the following pattern emerges.

1. Nine IM students (69%) were enrolled for six or fewer sessions, while four IM students (31%) were enrolled for seven or more sessions.
2. Ten SGM students (42%) were enrolled for six or fewer sessions, while fourteen SGM students (58%) were enrolled for seven or more sessions.
3. Nine LGM students (50%) were enrolled for six or fewer sessions, and nine LGM students (50%) were enrolled for seven or more sessions.
4. A total of twenty-eight students (51%) were enrolled for six or fewer sessions, while twenty-seven students (49%) were enrolled for seven or more sessions.

The reader is reminded that table 75 provides a measure of student persistence during the community college years. One can safely infer neither academic success in the community college nor the lack thereof from frequency of enrollment data alone. With this caution in mind, the author observes that there appears to be a tendency for students who preferred the IM environment to enroll for fewer than the average number of sessions at PGCC (including transfer

enrollments), and for students who preferred the SGM environment to enroll for more than the average number of sessions.[30]

7.6.3 Total Quality Point Averages

While frequency of enrollment serves as a measure of academic persistence, the quality point average provides an indicator of academic success. Pre-instruction quality point averages (QPA's) were first presented in tables 52 and 53 (chapter 6) of this study. The author then observed that 62% of the IM students and 56% of the LGM students had pre-instruction QPA's above 2.5[31], and that no students in either of these two environmental preference groups had pre-instruction QPA's below 1.5. In the SGM group, however, only 29% of the students had pre-instruction QPA's above 2.5, and 21% of the SGM students had QPA's of 1.5 or lower. Overall pre-instruction quality point averages were 2.42 for females, 2.54 for males, and 2.50 for all students. By

---

[30] The reader is reminded that since the majority of the female students in the study preferred the SGM environment, this observed trend may be related to the sex of the student as well as to his or her environmental preference. Since there were also differences in number of enrollments between the IM and LGM environmental preference groups, however, and since both of these groups were predominantly male, the author does not believe the enrollment trend can be explained on the basis of sex differences alone.

[31] Quality points at PGCC range from 0.0 to 4.0, corresponding to a letter grade range from F to A. The reader should refer back to chapter 6 for further details concerning computation of quality point averages.

preference group, the overall QPA's were 2.72 for IM students, 2.19 for SGM students, and 2.70 for LGM students.

The distribution of total quality point averages, computed four years after completion of the instructional phase of this study, is presented in table 76, and summary statistics are presented in table 77. The format of table 76 is equivalent to that of table 52, with each cell corresponding to a 0.5 range in QPA's. There is of course no NEW STUDENT category in table 76, and there were no longer any students in the 0.0 to 0.5 QPA range when the data was collected in 1981.

TABLE 76

Distribution of Total Quality Point Average After Four Years by Preferred Environment

TABLE OF TQPA_3 BY ENVIRONMENT_1

TQPA_3 TOTAL QUALITY POINT AVERAGE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
A (3.5-4.0]	1 0.7 0.3 1.82 33.33 7.69	1 1.3 -0.3 1.82 33.33 4.17	1 1.0 0.0 1.82 33.33 5.56	3 5.45
B+ (3.0-3.5]	3 3.1 -0.1 5.45 23.08 23.08	6 5.7 0.3 10.91 46.15 25.00	4 4.3 -0.3 7.27 30.77 22.22	13 23.64
B- (2.5-3.0]	3 2.1 0.9 5.45 33.33 23.08	1 3.9 -2.9 1.82 11.11 4.17	5 2.9 2.1 9.09 55.56 27.78	9 16.36
C+ (2.0-2.5]	5 3.8 1.2 9.09 31.25 38.46	6 7.0 -1.0 10.91 37.50 25.00	5 5.2 -0.2 9.09 31.25 27.78	16 29.09
TOTAL	13 23.64	24 43.64	18 32.73	55 100.00

(CONTINUED)

TABLE OF TQPA_3 BY ENVIRONMENT_1

TQPA_3 TOTAL QUALITY POINT AVERAGE
ENVIRONMENT_1 POST-ORIENTATION ENVIRONMENT

FREQUENCY EXPECTED DEVIATION PERCENT ROW PCT COL PCT	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL
C- (1.5-2.0]	1 1.4 -0.4 1.82 16.67 7.69	4 2.6 1.4 7.27 66.67 16.67	1 2.0 -1.0 1.82 16.67 5.56	6 10.91
D+ (1.0-1.5]	0 1.4 -1.4 0.00 0.00 0.00	4 2.6 1.4 7.27 66.67 16.67	2 2.0 0.0 3.64 33.33 11.11	6 10.91
D- (0.5-1.0]	0 0.5 -0.5 0.00 0.00 0.00	2 0.9 1.1 3.64 100.00 8.33	0 0.7 -0.7 0.00 0.00 0.00	2 3.64
TOTAL	13 23.64	24 43.64	18 32.73	55 100.00

Corresponding to the pre-instruction QPA statistics summarized above, the author has computed comparable post-study QPA statistics based upon the data presented in table 76.

1. Seven IM students (54%) had averages above 2.5, and no IM students had averages below 1.5.
2. Eight SGM students (33%) had averages above 2.5, and six SGM students (25%) had averages below 1.5.

3. Ten LGM students (56%) had averages above 2.5, and two LGM students (11%) had averages below 1.5.

4. A total of twenty-five students (45%) had averages above 2.5, and a total of eight students (15%) had averages below 1.5.

While some differences between pre-instruction and post-study percentages are evident, the apparent trend observed with regard to the pre-instruction distribution does not seem to have changed significantly with regard to post-study QPA's.

Table 77 presents summary statistics for post-study quality point averages by sex and environmental preference group. While the SGM female mean QPA is lower than either the IM or the LGM female means, small cell sizes cast doubt on the significance of those differences. The QPA minima for female students, however , in the first row of table 77, show that all of the female students in this study, who four years after the instructional phase of the study had averages below 2.5, were from the SGM environmental preference group. The individual data in appendix T shows that nine of the thirteen SGM females (69%) had total post-study QPA's below 2.5. Thus while nine of the total of nineteen females (47%) had QPA's below 2.5, they were all from the SGM group.

TABLE 77

Summary Statistics for Total Quality Point Average by Sex and Preferred Environment

MEAN STD DEV MINIMUM MAXIMUM RANGE FREQUENCY	INDIVI-DUAL	SMALL GROUP	LARGE GROUP	TOTAL SAMPLE
FEMALE STUDENTS	3.109 0.330 2.65 3.39 0.74 3	2.241 0.806 0.91 3.65 2.74 13	2.887 0.371 2.50 3.39 0.89 3	2.480 0.782 0.91 3.65 2.74 19
MALE STUDENTS	2.531 0.582 1.64 3.74 2.10 10	2.242 0.839 0.56 3.38 2.82 11	2.457 0.689 1.23 3.52 2.28 15	2.412 0.722 0.56 3.74 3.18 36
ALL STUDENTS	2.665 0.587 1.64 3.74 2.10 13	2.241 0.821 0.56 3.65 3.09 24	2.529 0.667 1.23 3.52 2.28 18	2.436 0.744 0.56 3.74 3.18 55

A parallel trend with regard to male students is less clear. The SGM male mean is somewhat lower than either the IM or the LGM male means, and the minima in the second row of table 77 show that the male student with the lowest QPA was also from the SGM preference group. By referring to the data in appendix T, however, the reader can verify that six out of ten IM males (60%), six out of eleven SGM males (55%), and seven out of fifteen LGM males (47%), for a total of nineteen out of the thirty-six males in the study (53%), had post-study QPA's below 2.5.

Whether due to features of the environments, characteristics of the instructors, the manner in which the alternatives were presented, or some combination of these factors, a relationship between overall academic success and environmental preference apparently existed for the students in this study. The distribution presented in table 76 indicates that proportionally fewer of the high success students and proportionally more of the low success students preferred the SGM environment. The summary statistics presented in table 77 suggest that this trend was predominantly true for female students.

7.6.4 Summary

In chapters 5 and 6, the author presented and discussed pre-instruction data pertaining to the sample of fifty-five students at the beginning of the classroom phase of this study. Pre-instruction data included:

1. Student sex and age.
2. The orientation process and student environmental preferences.
3. Mathematics attitude, self-concept, interpersonal relations orientation, and communication apprehension.
4. Pre-study high school, placement test, and college archive data.

In chapter 7, the author has presented and discussed post-instruction data pertaining to the same sample. Some

types of data, however, were only available for a reduced subset of the full sample. Post-instruction data included:

1. Academic outcomes of the instructional phase.
2. Environmental preference changes.
3. Mathematics attitude and communication apprehension.
4. Evaluations of the model, instructional environments, and instructors.
5. Post-study college archive data.

In this final section of chapter 7, the author has presented the post-study college archive data, including level of degree attainment, overall academic persistence, and overall academic success. It was first observed in this section that the distribution of number of degrees earned was generally independent of membership in any specific environmental preference group. It was also observed that the level of degree attainment for the sample was generally consistent with PGCC statistics. The author further noted that many of the students in the sample took more than two years to complete their AA degree programs.

Frequency of enrollment data was presented next as a measure of academic persistence. The author first observed that the majority of the students in the sample attended college for more than four sessions, suggesting that many community college students take longer than two years to complete their programs. The author also noted that there was a tendency for IM students to attend fewer that the

average number of sessions for the sample, and for SGM students to attend more than the average number of sessions. He cautioned, however, that it would be inappropriate to draw conclusions concerning students success on the basis of this data. The author also noted that since the majority of the sample female students were in the SGM preference group, it followed that student sex was a possible factor in the persistence trend noted for SGM students.

Finally, the author presented data concerning overall student quality point averages. He noted a consistent trend in both pre-study and post-study QPA's. Fewer high success students and more low success students seemed to prefer the SGM environment. The author demonstrated that this trend was especially associated with the female students in the sample.

In the concluding chapter, the author collects and summarizes the findings of this study. In addition, he briefly describes some relevant developments within the field of education, which have occurred during the past decade, but which were not included in this study. Finally, the author presents his recommendations for further study of learning environments and student choice. His recommendations are based both upon the findings of this study and upon recent developments in the field.

Chapter VIII

FINDINGS, OBSERVATIONS, AND CONCLUSIONS

8.1 OVERVIEW

The data collected during this study have been presented and analyzed in the three previous chapters. Pre-instruction preference data were discussed in chapter 5, pre-instruction student data were discussed in chapter 6, and post-instruction data were discussed in chapter 7. Due to the large size and diversity of the complete data base, observations and summaries were included in the data chapters as an integral part of the presentation and discussion.

An initial set of research questions was presented at the end of chapter 1. This initial set of questions was expanded, however, as the full scope and focus of the study evolved. The expanded set of research questions was presented at the end of chapter 4. For the convenience of the reader, the complete set of research questions is also presented here. The questions have been regrouped into three categories, however, one category pertaining to each of the data chapters. Overlapping original questions and additional questions have been combined in some cases, and the wording of some questions has been modified for the sake of consistency.

Pre-Instruction Environmental Preference Questions:

1. How were the students' preferences for the learning environments distributed?
2. How accurately did the Likert scale preference instrument measure students' true environmental preferences?
3. How did timing and sequence of the orientation experience affect the distribution of preferences?
4. How were gender of the student and age distributed with respect to environmental preference?
5. How and to what extent were the distributions of the students by gender and age related to genders and ages of the instructors?
6. When did students form their preferences for learning environments offered in the study, and what aspects of those environments were most significant to the students?

Pre-Instruction Student Trait and Characteristics Questions:

1. How and to what extent were the students' preferences for the learning environments associated with individual traits, as measured by selected normed instruments?
   a) How did self-reported mathematics attitude and gender of the student interact with environmental preference?

b) How did self-reported self-concept, self-ideal-concept, and gender of the student interact with environmental preference?

c) How did gender of the student and the FIRO-B interpersonal traits of expressed and withheld affection, control, and inclusion interact with environmental preference?

d) How did self-reported communication apprehension and gender of the student interact with environmental preference?

2. How and to what extent were the students' preferences for the learning environments associated with previous individual academic characteristics, as determined from pre-instruction archive data?

a) How did gender of the student and high school grades interact with environmental preference?

b) How did gender of the student and standardized measures of mathematics achievement and interest interact with environmental preference?

c) How did gender of the student and various indicators of previous college experience interact with environmental preference?

Post-Instruction Questions:

1. How did gender of the student and course grades interact with environmental preference?
2. How did the grade distributions for the total study group compare with the normal College grade distributions for the same course?
3. How and to what extent were the students' grades earned during the study associated with high school mathematics grades?
4. How were environmental preferences effected by the instructional phase of the study?
5. How and to what extent were the students' grades earned during the study associated with environmental preference scores?
6. How and to what extent were the students' mathematics attitudes affected by the study?
7. How and to what extent were the students' grades earned during the study associated with mathematics attitude?
8. How and to what extent was communication apprehension effected by the instructional phase of the study?
9. How and to what extent were students' grades earned during the study associated with communication apprehension?
10. To what extent did students value the opportunity to choose a learning environment?

11. How and to what extent did gender of the student and environmental preference interact with student evaluations of the Choice Model?

12. How and to what extent did student evaluations of their respective learning environments differ?

13. How and to what extent did student evaluations of their respective instructors' accessibilities differ?

14. How and to what extent did post-study academic archive data relate to the pre-study archive data, gender of the student, and environmental preferences?

The author explained in chapter 4 how the nature of this study gradually evolved through a series of pilot studies from a comparative study with tight controls to a descriptive study in which individual instructors were given significant individual freedom in fashioning unique learning environments. In part because of this loosening of controls, and in part because additional research questions were added as the study evolved, hypotheses with respect to research questions were neither posed nor tested. Instead, the author presented the results of his examination of the data collected in descriptive form, supported by numerous crosstabulation and statistical summary tables, and summarized those findings which were apparent on the basis of that examination.

In the next three sections of this final chapter, one section corresponding to each category of research questions, the author summarizes the findings of this study which address each of questions in that category. In the final sections, the author poses hypotheses suggested by the findings of this study which he believes warrant further research, suggests other pertinent issues related to student preference of learning environment which might be addressed by future studies, and provides some concluding remarks.

8.2 PRE-INSTRUCTION ENVIRONMENTAL PREFERENCE FINDINGS

The course used in this study was one of a series of five-week mini-courses in finite mathematics which were offered during the spring 1977 semester. Many students who enrolled in this course planned to transfer to four-year institutions in the fields of business or social science. A sample of sixty students who enrolled in the mini-course being used in this study were initially oriented to three alternative learning environments. These environments, which have been described in chapter 4, were named the Large Group Mode (LGM), Small Group Mode (SGM), and Individual Mode (IM).

The formal orientation phase, which is described in chapters 4 and 5, was completed during the first two class meetings. Each class meeting was divided into two twenty-five minute sessions. The student sample was divided alphabetically into three groups; each group was assigned to

a different classroom. Each instructor was assigned to one of these classrooms for the first class meeting. During this first class meeting, the first session (twenty-five minute period) was used for orientation to the course, and the second session was used for orientation to a specific learning environment. During the two sessions on the second class day, the instructors repeated their respective environment orientations for the other two groups of students.

After the orientation phase individual student preferences for each of the alternative environments were assessed in three ways. First the students were asked to complete the Orientation Comment Form (appendix G), in which they wrote brief assessments of each environment. Next the students were asked to complete the Learning Environment Preference Scale (appendix G) which provided Likert scale measurements of their relative preferences for the three environments. After the students were assigned to environments, on the basis of their responses to these two written questionnaires, they were given the opportunity to request environment changes on the basis of oral preference statements.

A total of fifty-five students were assigned to learning environments on the basis of this procedure. Distributions and summary statistics relating student gender and age to environmental preferences are presented in tables 6 through 8 in chapter 5. Distributions of environmental preferences with respect to sequence of orientation exposure

are presented in tables 9 through 11. Tables 12 through 14 show how many students were assigned to each environment, and how their Likert scale preference scores for each environment were distributed. Table 15 presents summary statistics of the Likert scale preference scores. Tables 16 through 18 provide distributions of mean written response scores with respect to each environments, which were based upon written responses to the comment form. Individual scores are presented in Appendix L.

This sample of fifty-five students was not representative of the total community college population with regard to the distribution of ages and genders; the predominant group in the sample were young adult males. While 53% of the total student population during that semester were female, only 35% of the sample were female. Although 87% of the sample were twenty-five years old or younger, only 57% of the total student population was in that age range. Even though specific age and gender data for all students enrolled all sections of the mini-course were not available, the author proposed two partial explanations for these differences in age and gender distributions between the sample and the total population.

1. Male predominance in the mathematics course enrollment may have been a reflection of generally higher levels of mathematics anxiety among female students in our society. The literature of mathematics anxiety reports that females are less

likely than males to choose career goals which require mathematics training.

2. Young adult predominance in the sample may have been a reflection of the time-of-day (late morning) when the course was offered. That portion of the College population which attends evening classes tends to be older than the portion which attends morning classes.

How were the students' preferences for the learning environments distributed?

Thirteen students (24%) were assigned to the IM environment on the basis of the preference determination method which is described above. Twenty-four students (44%) were assigned to the SGM environment and eighteen students (33%) were assigned to the LGM environment.

How accurately did the Likert scale preference instrument measure students' true environmental preferences?

Accuracy in preference measurement was assessed through comparisons of Likert scale preference scores with written and oral statements of preference. It was determined that forty-six students (84%) were accurately placed on the basis of the Likert scale preference measurements. Six students (11%) wrote preference comments which differed from their highest measured preference scores. Three students (5%) made oral requests for environment changes after the initial assignments were made.

Comparisons between Likert scale preference scores and written comment response scores reveal overall consistency in most respects. This consistency is not so apparent, however, with regard to negative scores. Tables 12 through 14 in chapter 5 show that approximately 15% of the students reported negative range preference scores with respect to each environment. Tables 16 through 18 indicate that approximately 4% of the students wrote comments concerning each environment which were in the negative range. In addition, approximately 25% of the students gave no written responses concerning each environment. The author conjectures two possible explanations concerning these differences.

1. Some students may be have felt more secure reporting negative feelings in the more impersonal format of the Likert scale, than in writing specific negative comments about instructors or instructional modes.
2. Some students may have given distorted reports of negative feelings using the Likert scale format, perhaps in order to assure that they would be assigned to their preferred instructional environments.

How did timing and sequence of the orientation experience affect the distribution of preferences?

The design of the orientation phase called for each each orientation group to be exposed to their first day instructor for a full fifty minute class meeting. On the second class day, the groups were only exposed to the other instructors for twenty-five minute sessions. The author was unable to detect any consistent pattern in the distribution of environmental preferences, however, which related to the planned variations timing and sequence of the orientation phase.

The author did find evidence which suggested that the orientation phase may have produced some unanticipated effects on the formation of preferences.

1. The author played dual roles in the study as experimenter and SGM instructor. Although similar effects were not observed in earlier pilot studies, some environmental selections may have been indirectly effected by this duality.
2. Some students missed portions of the orientation phase because they did not attend both class meetings. Instructors may have unintentionally influenced the environmental preferences of some of these students in favor of nontraditional environments by advising them to attend orientation sessions in those environments with which they were least familiar.

When did students form their preferences for learning environments offered in the study, and what aspects of those environments were most significant to the students?

Specific data identifying when environmental preferences were formed is not available. There are indications in the existing data, however, which suggest that some preferences may have been directly influenced by specific prior learning experiences, and some preferences may have been influenced by the preferences of other students. Some students did report specific earlier learning experiences with some of the instructional modes. The most frequent comment concerning the LGM environment was that it was traditional, although few students specifically indicated whether they considered that attribute to be an asset or a liability. Some students reported prior positive or negative experiences with regard to the alternative individual and small-group modes of instruction. Some students did report prior experience with specific instructors. While it was clear that in some cases these prior experiences were influential in the formation of preferences, most student comments tended to be noncommittal with regard to what effected their preferences and when their preferences were formed.

Self-reports by students of orientation attendance indicated that only 55% of the sample attended orientation sessions for all three environments. The author believes that actual attendance was higher than that reported by the

students. Due to the structure of the orientation phase, however, with instructors moving among the three classrooms during the first two class meetings, complete attendance data for all orientation sessions was not available.

The author did find some inconsistencies between the sequences in which the instructors made their orientation presentations to different groups and the reports of students in those groups. These inconsistencies suggest that some students exercised selectivity in reporting their orientation comments with regard to specific environments. It is the conjecture of the author that two forms of selectivity occurred.

1. It may be that some students did not report orientation exposure in environments which were not preferred.
2. Another form of selectivity may have been to not attend orientation in environments which were not preferred.

The apparent fact that not all students reported attendance at all orientation sessions suggests that prior experiences may have influenced the preferences of some students.

The author also found evidence which suggested that sufficient sociometric structure evolved within orientation groups during the two day orientation period to effect the environmental preferences of some students. Specifically, there was evidence that some of the nine students whose written or verbal preferences differed from their measured

preference scores may have requested assignments to the same learning environment that was preferred by another member of the same orientation group, although in some cases it was evident that the instructional modes offered in other environments were preferred by those students. The author noted a particular tendency for female students to report preferences for the same environments which were reported by other females in the same orientation groups. Thus it would appear that some student preferences were formed during the two-day orientation experience, and were influenced by the preferences of other students.

How were gender of the student and age distributed with respect to environmental preference?

The majority of the female students (68%) preferred the SGM environment. The preferences of the remaining females were evenly divided between the IM and LGM environments. Male environmental preferences were more uniformly divided, with 42% preferring LGM, 31% preferring SGM, and 28% preferring IM. The distribution of students by age among the three environments was generally consistent with the overall distribution of students. The author did note weak tendencies, however, for the older female students to prefer the SGM environment, and for the younger male students to prefer the LGM environment.

How and to what extent were the distributions of the students by gender and age related to genders and ages of the instructors?

The IM instructor was a male over forty. The SGM instructor was a male in his mid-thirties. The LGM instructor was a female over forty. The author found no clear evidence in the data to suggest that the distribution of students by gender and age was effected by the ages and genders of the instructors. He notes for the record, however, that older female students tended to prefer the SGM environment which was offered by the younger male instructor, and the younger male students tended to prefer the LGM environment which was offered by the only female instructor.

8.3 PRE-INSTRUCTION STUDENT CHARACTERISTICS FINDINGS

The presentation and discussion of pre-instruction student traits and characteristics were divided into two major categories within chapter 6. Section 6.2 addressed personal student traits of mathematics attitude, self-concept, communication apprehension, and interpersonal relations orientation. These traits were measured by self-report take-home instruments which were collected at the end of the orientation phase of the study. Distributions and summary statistics of these measured data were presented in tables 21 through 42. Individual student data relating to these traits were presented in appendix M.

Section 6.3 addressed student academic characteristics as reflected by high school grades, achievement and interest test scores, and previous college enrollment history. These characteristics were assessed on the basis of data found in the College archives. Distributions and summary statistics of these archive data were presented in tables 43 through 53. Individual student academic archive data were presented in appendix N.

How did self-reported mathematics attitude and gender of the student interact with environmental preference?

Self-reported mathematics attitudes for the total sample, measured with the Aiken and Dreger Mathematics Attitude Scale, were uniformly distributed among positive, neutral, and negative categories. Distributions with respect to gender and environmental preference, however, were not uniform. Proportionally more male students who reported negative mathematics attitudes preferred the SGM and LGM environments over the IM environment. Proportionally more female students who reported positive mathematics attitudes preferred the SGM environment over either of the other two alternatives.

How did self-reported self-concept, self-ideal-concept, and gender of the student interact with environmental preference?

The Bledsoe Self-Concept Scale, which provides measures of self-reported self-concept and self-ideal-concept, was designed for use with younger students. The college-age students in this sample tended to report relatively high self-concept scores. With only one exception, students reported self-ideal-concepts which were higher than their self-concepts. The majority of self-ideal-concept scores were in the highest score category. In cannot be determined from this data whether these predominantly high scores reflected realistic measures of many students true self-concepts, a tendency to intentionally inflate self-reports of what many students wished the experimenter to believe concerning their self-concepts, or a tendency for college-age students self-reports to saturate the high end of an instrument designed for younger students.

On the average, female students reported higher self-concept scores than did male students. Female students with high self-concept scores tended to prefer the IM and SGM environments over the LGM environment. Self-concept scores for male students tended to be distributed uniformly with respect to environmental preference groups.

How did gender of the student and the FIRO-B interpersonal traits of expressed and withheld affection, control, and inclusion interact with environmental preference?

Six interpersonal traits were measured using the Schutz Fundamental Interpersonal Relations Orientation - Behavioral self-report instrument. The majority of the sample (80%) reported low-to-midrange tendencies to express affection. A smaller majority of the sample (60%) reported low-to-midrange tendencies to withhold affection. On the average, males reported an slightly higher tendency to express affection than did females, and males reported a slightly lower tendency to withhold affection than did females.

Males and females with stronger tendencies to express affection seemed to prefer the SGM and LGM environments, although males who tended not to express affection also seemed to prefer the LGM environment, and females who tended not to express affection seemed to prefer the SGM environment. Males with midrange tendencies to express affection seemed to prefer the IM environment, while females with midrange tendencies seemed to prefer either the IM or the LGM environment.

Males who tended to withhold affection seemed to prefer the IM and LGM environments, while males who tended not to withhold affection seemed to prefer the SGM environment. The relationships for withheld affection tendencies in females, however, were almost the reverse of the male relationships. Females who tended to withhold affection

seemed to prefer the SGM environment, and females with midrange tendencies to withhold affection seemed to prefer the IM and LGM environments.

The majority of the sample (75%) reported generally low tendencies to express control. Likewise, a majority of the sample (76%) reported correspondingly high tendencies to withhold control. On the average, females tended to express less control than did males, and females were somewhat less likely to withhold control than were males.

A minority of the sample (5%) reported high tendencies to express control; these were all males who preferred the IM or LGM environment. Otherwise, the distributions of expressed control tendencies for males in all preference groups were similar to that of the total sample. All females in all preference groups reported low-to-midrange tendencies to express control, although SGM females reported the lowest average tendency to express control.

A minority of the sample (5%) reported low tendencies to withhold control; these were all males who preferred the IM or LGM environment. Of the students who were most inclined to withhold control, the majority were also males who preferred the IM and LGM environments. The majority of males who preferred the SGM environment seemed to report moderately high tendencies to withhold control. While the majority of female students reported moderately-high-to-midrange tendencies to withhold control, SGM females were

generally more inclined to withhold control than were non-SGM females.

The majority of students in the sample (78%) reported tendencies to express inclusion which fell in the middle categories. On the average, males were less inclined to express inclusion than were females. The majority of the sample (53%) reported very strong tendencies to withhold inclusion, although the next largest concentration of students (33%) reported low tendencies to withhold inclusion. On the average, females were slightly more inclined to express inclusion than were males.

In both the male and female segments of environmental preference groups, students who reported greater tendencies to express inclusion tended to prefer the SGM environment. Conversely, students of both genders who tended to express less inclusion seemed to prefer the non-SGM environments. Within the IM and SGM preference groups, males were more inclined to express affection than were females. Within the LGM preference group, females were more inclined to express inclusion than were males.

Student reports of withheld inclusion tendencies reveal clear evidence of interaction between gender and environmental preference. Males in the sample reported polarized withheld inclusion scores. Males with low tendencies to withhold inclusion preferred the SGM environment, while males with high tendencies to withhold inclusion preferred the non-SGM environments. Female withheld inclusion scores

were less polarized than were male scores. While no preference trend was evident for females with low tendencies to withhold inclusion, females with high tendencies to withhold inclusion preferred the SGM environment.

Thus within the SGM preference group, females reported generally high tendencies to withhold inclusion, while males reported generally low tendencies to withhold inclusion. The pattern was reversed in the LGM environment, with females reporting low tendencies to withhold inclusion and males reporting high tendencies to withhold inclusion. Due to the concentration of sample females in the SGM environment, however, it can not be determined from this data that the tendency to withhold inclusion is a female trait which interacts with environmental preference. Indeed, one would suspect that students with low tendencies to withhold include inclusion would be attracted to the SGM environment, as was the case for male students. It may be the case that other factors were sufficiently important in the formation of environmental preferences for female students to take precedence over the tendency to withhold inclusion.

How did self-reported communication apprehension and gender of the student interact with environmental preference?

The majority of the sample (62%) reported neutral levels of communication apprehension, using the McCroskey Personal Report of Communication Apprehension. On the average, females reported slightly higher levels of communication apprehension than did males. The data revealed weak

tendencies for males with higher apprehension to prefer the LGM environment, and females with lower apprehension to prefer the SGM environment. IM males tended to report lower levels of apprehension than did IM females.

How did gender of the student and high school grades interact with environmental preference?

Both overall and mathematics high school average grades for students in the sample were studied. The majority of the sample (56%) had earned average grades of C in high school, while 20% had earned average grades of B. No grades were available for 18% of the sample. Students with grades of A or B tended to prefer the LGM environment, and tended to avoid the IM environment. Although students with C averages were found in all preference groups, more than the expected number preferred the IM environment. There were no gender trends evident with respect to overall average high school grades.

Average high school mathematics grades tended to be somewhat lower for the sample. The majority (60%) had earned C average mathematics grades. Only 9% earned B average mathematics grades, and an equal number earned D average mathematics grades. No high school mathematics grades were available for 20% of the sample. There were no evident gender trends with respect to the overall distribution of high school mathematics grades. Nor were there any strong tendencies with respect to high school mathematics grades and environmental preference. The only females with

B mathematics grades (two students) preferred the non-SGM environments, and the only female with a D mathematics grade preferred the SGM environment. No students with D mathematics grades (four males and one female) preferred the IM environment.

How did gender of the student and standardized measures of mathematics achievement and interest interact with environmental preference?

Elementary algebra achievement and mathematics interest were assessed by scores from the Comparative Guidance and Placement test battery. A majority of the sample (64%) scored in the middle categories of the achievement test; no scores were available for 27% of the sample. The average male score was in the moderate range, while the average female achievement score bordered on the low range. This pattern prevailed in all preference groups. Both males and females with high achievement scores tended to prefer the IM and LGM environments over the SGM environment. Males and females with low scores were distributed over all three preference groups.

The distribution of mathematics interest scores was weighted toward the low end, with 49% of the sample reporting low-to-very-low mathematics interest scores. Mathematics interest scores were not available for 29% of the sample. On the average, mathematics interest was higher for males than for females. Females with high interest scores seemed to avoid the IM environment, however, while males

with high interest scores tended to avoid the LGM environment. Students with low mathematics interest scores were distributed over all preference groups.

How did gender of the student and various indicators of previous college experience interact with environmental preference?

The prerequisite for the mathematics course used in this study was satisfactory completion of elementary algebra. Archive data shows that 40% of the sample did not satisfy this prerequisite when they enrolled in the study course, and that one-half of these students preferred the SGM environment. The archive data also shows that 18% of the sample had enrolled in a developmental mathematics course prior to their enrollment in the study course, although only one-third of these students successfully completed that course. Developmental mathematics was only offered in a self-paced individual mode of instruction at that time. None of the students who had previously enrolled in the developmental program preferred the IM environment. No gender pattern was evident with respect to developmental mathematics enrollment.

The archive data shows that 87% of the sample were enrolled in the study course for the first time. Students who were repeating the course tended to avoid the LGM environment. Of the seven students repeating the course, six were males and one was female.

Archive data shows that only 7% of the sample were enrolled in a college course for the first time, while 31% had completed one previous semester of college, and 55% had completed three or more college sessions. No particular gender trend with respect to number of previous college enrollments was evident. The was a tendency, however, for students with the least college experience to avoid the IM environment.

The majority of the sample (75%) had earned previous college quality point averages (QPA's) in the range from 1.5 to 3.5 on a 0-to-4 point scale. Averages were uniformly distributed over this range. The average male QPA was slightly higher than the average female QPA; the overall average QPA was 2.5. New students and students with low quality point averages tended to avoid the IM environment, while students with high QPA's were distributed among all preference groups. New students and students with QPA's below 1.5 showed a strong tendency to prefer the SGM environment. All female students with QPA's of 2.4 or lower also preferred the SGM environment. These trends resulted in lower average QPA's for both SGM females and males.

8.4 POST-INSTRUCTION FINDINGS

Post-instruction data were presented and discussed in chapter 7. The academic outcomes of the study were assessed in terms of grades earned by students in the course. Grade

data were presented in tables 54 through 56, as well as in appendix O. Combined grade distributions for other sections of the course offered at similar times during the spring semesters of 1976 through 1978 were presented in chapter 7 for comparative purposes.

Chapter 7 also presented post-instruction environmental preference data in tables 57 through 62. Corresponding individual student data were presented in appendices P and Q. These data were collected in a post-instruction take-home packet (appendix H), which contained both written and Likert scale instruments, similar to those used in the post-orientation packet (appendix G.)

Post-instruction preference data were only available for a reduced sample of twenty-nine students (53% of the original sample) who returned the second take-home packet. Whereas response to the original packet was required of all students in order to be assigned to their preferred instructional environments, the instructors could only encourage students to return the second packet. Some of the students who did not respond to the post-instruction instruments (29% of the original sample) did not continue with the second course. Most of these students were not successful in the first mini-course. Other students who did not respond (18%) did continue with the second course.

The measured student characteristics of mathematics attitude and communication apprehension were reassessed for the reduced sample at the end of the first mini-course.

Assessment instruments, identical to those in the post-orientation packet (appendix G) were also included in the post-instruction packet (appendix H.) These data were presented in tables 63 through 66 of chapter 7. Corresponding individual student data were presented in appendices P and R.

Student evaluations of the Choice Model, the instructional environments, and the instructors were also assessed from instruments in the post-instruction packet. These data, which were only available for the reduced sample, were presented in tables 67 through 71 of chapter 7. Individual student data were presented in appendices P and S.

Post-study academic data were presented in tables 72 through 77 of chapter 7. Corresponding individual data were presented in appendix T. These data, which were collected from the College academic archives several semester after the conclusion of the instructional phase of the study were available for all fifty-five students who participated in the study. These data included degree attainment, total sessions of college enrollment, and total quality point average.

How did gender of the student and course grades interact with environmental preference?

The majority of the sample (56%) earned grades of either B or C. A total of 27% of the sample either withdrew from the course or earned failing grades. The success rates

for male and female students were essentially similar. Males were most successful in the IM environmental preference group and least successful in the SGM group. Females were more successful in the non-SGM environmental preference groups than in the SGM group.

How did the grade distributions for the total study group compare with the normal College grade distributions for the same course?

There was no "true" control group for this study. Grade distributions of other sections of the course offered at similar times during the three spring semesters spanning 1977 were studied. It was found that proportionally more students in the experimental section earned high grades, and that proportionally fewer students in the experimental section failed or withdrew.

How and to what extent were the students' grades earned during the study associated with previously earned high school mathematics grades?

There was a general tendency for students who earned higher mathematics grades in high school to also earn higher mathematics grades in the experimental course. It was noted, however, that several individual students earned grades in the experimental course which exceeded their high school mathematics average grades. Not all students had provided high school transcripts at the time they applied to the College. There was a tendency for such students to earn low grades in or to withdraw from the experimental course.

How were environmental preferences effected by the instructional phase of the study?

Within the reduced sample, the following differences between post-orientation and post-instruction and preference scores were noted. Not all of the differences noted were large, however, and none have been tested for statistical significance. Little direct evidence as to the cause of these changes was available, but the author summarized several possible contributing factors in chapter 7.

1. Within the IM preference group, the mean IM and LGM preference scores increased, while the mean SGM preference score decreased.
2. Within the SGM preference group, the mean IM and LGM preference scores increased, while the mean SGM preference score decreased.
3. Within the LGM preference group, the mean IM preference score increased, while the mean LGM preference score decreased.
4. Two students (7% of the reduced sample) changed environments after the first mini-course. Both changed from SGM to IM.

How and to what extent were the students' grades earned during the study associated with environmental preference scores?

Due to the manner in which post-instruction preferences were assessed, data were only available for a reduced sample of twenty-nine students, of whom 97% were successful in the first mini-course. By comparison, only 42% of the students omitted from the reduced sample were successful in the course. The study of post-orientation preferences revealed statistical differences between the full and reduced samples.[1] Due to small cell sizes, comparisons among grades and post-instruction preference scores within the reduced sample were not studied.

1. Mean IM preference scores were lower for all environmental preference groups in the reduced sample.
2. The mean SGM preference score was higher for the SGM preference group in the reduced sample.
3. The mean LGM preference score was higher for the LGM preference group in the reduced sample.

---

[1] These are not a priori differences affected by the instruction itself, but rather a posteriori differences. Due to the differences in success rates for the reduced sample and the omitted sample, these pre-instruction preference differences may contain information which would be useful in characterizing the students in each preference group.

How and to what extent were the students' mathematics attitudes affected by the study?

No strong affects were found. Whereas the mean post-orientation mathematics attitude score was highest for the IM preference group within the reduced sample, only small differences among the post-instruction preference group mean scores were apparent.

How and to what extent were the students' grades earned during the study associated with mathematics attitude?

Both students who reported positive mathematics attitudes and students who reported negative mathematics were found in all grade categories. There was a tendency for the students who earned A grades in the experimental course, however, to have reported generally more positive attitudes than had students in the lower grade categories. There was also a tendency for the students who received F or W grades in the experimental course, to have reported generally more negative attitudes than had students in the higher grade categories.

How and to what extent was communication apprehension effected by the instructional phase of the study?

Small individual increases and decreases in measured PRCA scores were noted in each preference group, but no pattern of change in communication apprehension was evident.

How and to what extent were students' grades earned during the study associated with communication apprehension?

No particular grade trend with respect to communication apprehension scores was apparent. It was noted, however, that students who had reported the highest apprehension scores had a higher rate of success in the experimental course (80% earned grades of C or better) than had the total sample (67%.) While this statistic has not been tested for significance, it does seem to indicate the students with relatively high communication apprehension scores were generally able to succeed in their preferred environments.

To what extent did students value the opportunity to choose a learning environment?

Students who were successful in the first mini-course were generally positive concerning the choice opportunity. Twenty-eight students, all but one of whom passed the experimental course, provided written comments concerning the opportunity to choose a learning environment. Three written comments (11%) were neutral and no negative comments were written. Eight students (29%) wrote very positive comments, and the remainder (61%) wrote generally positive comments.

How and to what extent did gender of the student and environmental preference interact with student evaluations of the Choice Model?

Student comments with respect to the Choice model itself, not including their evaluations of the specific learning environments, were generally positive. Two negative comments, one by an LGM male and one by an LGM female, were written concerning the orientation procedure. Male comments overall tended to be more positive than did female comments. Students in the IM preference group were the most positive, and students in the LGM group were the least positive.

How and to what extent did student evaluations of their respective learning environments differ?

Student evaluations of their respective learning environments were generally positive. Only one negative comment, concerning the SGM instructor, was written. Evaluations of the IM environment tended to be the most positive, and evaluations of the SGM environment tended to be the least positive.

How and to what extent did student evaluations of their respective instructors' accessibility differ?

Instructor accessibility scores were generally positive for both males and females in all three environmental preference groups. SGM female scores tended to be less positive, however, than were the scores reported by other male and female subgroups. The SGM instructor was a male,

and the majority of all females reporting scores were from the SGM preference group (73%.) There were only small differences in the mean accessibility scores reported by males in the three preference groups.

How and to what extent did post-study academic archive data relate to pre-instruction academic data, gender of the student, and environmental preferences?

Thirteen students from the original sample (24%) earned associates (AA) degrees during the five year period following the study. This rate of degree attainment was found to be comparable to that of the institution for students enrolled in transfer curricula. No patterns in degree attainment with respect to gender differences were noted. Students from the IM preference group earned proportionally more AA degrees, and students from the SGM group earned proportionally fewer degrees. This finding is generally consistent with the pre-instruction findings that the most experienced college students tended to prefer the IM environment, and the least successful college students tended to prefer the SGM environment.

Approximately one-half of the sample had enrolled in six or fewer college sessions[2] by the fifth year following

---

[2] College sessions include regular semesters and shorter summer sessions at PGCC, as well as sessions at transfer institutions which occurred prior to the last enrollment at PGCC. Sessions at transfer institutions which occurred after transfer from PGCC have not been accounted for.

the study. The other half of the sample had enrolled in seven or more college sessions. Proportionally more of the IM students (69%) had enrolled for six or fewer sessions, and proportionally more of the SGM students (58%) had enrolled for seven or more sessions. This finding is generally consistent with pre-instruction academic data and degree attainment rates, as it appears to reflect the fact that the SGM preference students tended to have less college experience and less college success than did IM preference students.

The finding that a majority of the SGM students enrolled for more than six community college sessions also suggests that these students were generally persistent in their attempts to succeed in college. The community college literature identifies persistence as one of the characteristics which is common in nontraditional students. Although the author has not attempted to systematically identify individual subjects as either traditional or nontraditional students, he suspects that several similarities in the characteristics of the SGM preference students and nontraditional students can be established through additional research.

Individual student quality point averages were computed both for the pre-instruction period, and for the combined pre- and post-instruction periods which extended into the fifth academic year after completion of instruction in the experimental course. A majority of the IM and LGM students

(ranging from 54% to 62%) had quality point averages above 2.5[3], for both the pre-instruction period and for the combined periods. In contrast, approximately one-third of the SGM students had quality point averages above 2.5 for either period of time. In contrast, few IM or LGM students (ranging from 0% to 11%) had quality point averages below 1.5 for either time period, while approximately one-fourth of the SGM students had quality point averages below 1.5 for both enrollment periods.

Mean quality point averages for males and females in the SGM group were essentially similar. Male SGM students had a lower mean quality point average than did non-SGM males. A similar result was found for female students. Standard deviations indicated greater variability in quality point averages for both male and female SGM students than for their counterparts in the other preference groups. The quality point average trends noted above were similar for both the pre-instruction period and for the combined enrollment periods. Differences between preference groups and between genders were somewhat diminished, however, for the combined enrollment periods.

---

[3]Quality points at PGCC range from 0 for an F grade to 4 for an A grade.

8.5 OBSERVATIONS, IMPLICATIONS, AND RECOMMENDATIONS FOR FURTHER STUDY

In the preceding sections of this chapter, the author described the general findings of the study. These findings were presented in the form of answers to specific research questions which were formulated during the evolution of the Choice Model. Due to the broad scope and descriptive nature of the study, however, in conjunction with the the relatively small size of the sample, few hard conclusions can be drawn.

In chapter 4, the author described a philosophical change of purpose for the study from one which was primarily comparative in nature, to a study which is basically a description of the evolution of the Choice Model and the experience of conducting research involving accommodation of student preferences for alternative learning environments. The absence of hard conclusions, therefore, is not inconsistent with the ultimate nature and purpose of the study, nor is it inconsistent with the observations pertaining to individual differences research which were presented in the first chapter. In the words of Cronbach [1967: 37], referring to the accommodation of individual differences through alternative instructional methods, "... it will be a long time before we have adequately validated rules of adaptation that take into account even a half-dozen differential variables."

The general purpose of this study, as the author described it in chapter 1, was to address two questions concerning instruction in secondary and post-secondary educational institutions.

1. To what extent do different existing teaching styles accommodate individual differences among students?
2. How can educational institutions attempt to match different student learning styles with the different existing teaching styles?

The purpose of this final section is to provide a synthesis of the findings presented above, together with other observations by the author which are based upon his experience working with and studying instructional environments and the Choice Model. While the synthesis which follows focuses upon these two original questions, the author cannot of course provide full and complete answers to those questions. He can and does suggest partial answers, however, which are derived from implications of this study of student choice of instructional environments. In addition, the author suggests various directions for future research which are based upon the implications of this study.

8.5.1 Accommodation of Individual Differences Among Students

While this study was not designed to directly address accommodation of specific individual differences, its findings do suggest that accommodation of some individual differences occurred through the employment of the Choice Model. The author bases this conclusion on the fact that the study provided evidence of various relationships between environmental preferences and individual differences. These relationships are summarized below.

1. With respect to gender of the student, more females preferred the SGM environment over the other two environments, although it is not clear which aspects of the SGM environment were most attractive to females.[4]
2. With respect to age, older females seemed to prefer the SGM environment, while younger males seemed to prefer the LGM environment.
3. With respect to mathematics attitude, males who reported negative attitudes tended to avoid the IM

---

[4] There were no reliable ways in this study to distinguish between environmental preferences which were most closely associated with the mode of instruction itself, preferences which were most closely associated with the characteristics of the instructors participating in the study, and preferences which were most closely associated with the characteristics of other students participating in the study.

environment, and females who reported positive attitudes tended to prefer the SGM environment.

4. With respect to self-concept, females who reported high self-concepts seemed to avoid the LGM environment.

5. With respect to interpersonal behavioral traits, the following relationships with environmental preferences were found:

   a) Both those students with strong tendencies to express affection and those students with strong tendencies not to express affection seemed to avoid the IM environment. Of those students who tended not to express affection, females were most likely to prefer the SGM environment, while males were most likely to avoid the SGM environment.

   b) Males who tended to withhold affection were most likely to avoid the SGM environment, while females who tended to withhold affection seemed to prefer the SGM environment.

   c) Students with low tendencies to express control were most likely to prefer the SGM environment, while students with higher tendencies to express control were most likely to avoid the SGM environment.

   d) Students with moderate tendencies to withhold control were most likely to prefer the SGM

environment, while students with the highest tendencies to withhold control were most likely to prefer the LGM environment.

e) Students who tended to express inclusion were most likely to prefer the SGM environment.

f) Males who tended not to withhold inclusion were most likely to prefer the SGM environment, while males who did tend to withhold inclusion were most likely to avoid the SGM environment. Females who tended to withhold inclusion, however, seemed to prefer the SGM environment.

6. Males who reported higher levels of communication apprehension showed some tendency to prefer the LGM environment, while females who reported lower levels of communication apprehension seemed to prefer the SGM environment.

7. Students with high algebra achievement test scores tended to avoid the SGM environment.

8. Students who had previously enrolled in a self-paced developmental mathematics course which used semi-programmed textbooks avoided the IM environment.

9. Students who were repeating the course avoided the LGM environment.

10. Students with the least college experience avoided the IM environment. New college students were most likely to prefer the SGM environment.

11. The students with lower college quality point averages were most likely to prefer the SGM environment.

The relationships described above are not attributable to direct instructional affects of the Choice Model, since all of the student characteristics and preferences which have been summarized thus far were derived from pre-instruction data. Some of the relationships strongly suggest, however, that previous instructional experiences may have affected student preferences for learning environments. The author considers it very likely, for instance, that the experiences of students who had previously enrolled in the self-paced program of developmental mathematics instruction at the college had a negative affect upon their preferences for the IM environment. Similarly, it appears likely to the author that the instructional experiences of students who were repeating the course being studied, experiences which most likely occurred in traditional learning environments, affected their preferences for the most traditional LGM environment in a negative way.

There seems to have been a tendency for many of the students in high-risk groups[5] to prefer the SGM environment and to avoid the IM environment. The LGM environment was the most traditional, and was therefore most similar to the majority of the other learning environments to which these community college students had been exposed. It seems plausible to hypothesize, therefore, that students who had experienced low levels of success in high school and college may have been more attracted to a less traditional learning environment than were the more successful students. On the other hand, based upon the conclusions of the PSI literature reviewed in chapter 3, it appears that an IM environment may require students to be more self-motivated and self-sufficient in their learning activities. Hence, it also seems plausible to hypothesize that some students in the high-risk groups may have tended to avoid the IM environment on this basis. If in fact both of these are valid hypotheses, then they would tend to have a combined effect of funneling greater than expected numbers of high-risk students into the SGM environment, as was observed in this study.

In addition, the tendency for high-risk students to prefer the SGM environment may have been due in part to the

---

[5] The author includes first semester college students, students with low quality point averages, students who were repeating the course, and students with developmental mathematics experience in these high-risk groups.

manner in which the orientation phase was conducted. Students who missed class on the first day, missed a portion of the orientation phase of the study. Because of this, there was a tendency for late arriving students to be sent to the author for administrative instructions and guidance. But the author was also the SGM instructor in the study. His dual role as experimenter and instructor may have affected the students' perception of his status relative to the other instructors when they were sent to him for instructions. The author also suspects, on the basis of his teaching experience in the community college, that there is a tendency for more high-risk students to be among those who miss class on the first day. If true, this hypothesis further suggests that the orientation procedure inadvertently contributed to the apparent tendency for high-risk students to prefer the SGM environment.

Specific investigation of the attributes and preferences of high-risk students as a group was not included in the design of this study. Much has been written in the community college literature, however, concerning high-risk students. In particular, the work of Cross [1971, 1976] concerning the category of "New Students[6]" was reviewed in chapter 3. The author considers possible environmental

---

[6] Cross defined New Students to be those who ranked in the lowest third of high school graduates on traditional academic achievement tests.

preference patterns of "New" and high-risk student subgroups to be issues which are worthy of additional research. It may be possible, through further examination of existing archive data for the students in this sample, to expand the existing database so that these student subgroups can be more clearly identified. While subsequent analysis of the existing database may lead to additional hypotheses concerning the environmental preferences of high-risk student groups, research involving a larger sample will be required in order to fully investigate such hypotheses.

Many of the differences in individual student attributes for which relationships with environmental preferences were found concerned attributes which were more personal than academic in nature. The most obvious of these personal attributes was gender of the student. While the tendency for female students to prefer the SGM environment was clear, the causes of this tendency were not made clear by the study. Is small group discussion inherently more attractive to females than is either large group instruction or individual study, or were there other specific environmental differences peculiar to this study, in addition to differences among modes of instruction, which resulted in a general female preference for the SGM environment?

Apparent interactions were also found between gender of the student, environmental preferences, and a variety of other personal characteristics. While the author was able to detect possible relationships and interactions at the

time he was performing the data analysis, the study was not specifically designed to investigate gender differences. It is the author's hypothesis, based upon the partial evidence revealed by this study, that the attribute of gender of the student, perhaps in conjunction with gender of the instructor, is a significant factor which must be carefully considered if the relationships between other personal characteristics and environmental preferences are to be understood. Further analysis of the data presented in this study may provide additional clues concerning the gender factor, but additional research with larger students samples is needed in order to conduct a thorough investigation.

The author also recognizes that other personal attributes of community college students may be related to preferences for alternative learning environments. While student age did not appear to be a significant factor in this study, the age distribution was heavily weighted toward the younger end of the scale. Current community college enrollment trends are resulting in an increasingly older student population. The author believes that the full age spectrum of the student population must be more uniformly sampled before valid conclusions can be drawn concerning the age factor and environmental preferences.

Student race data was not collected during this study, although Prince George's Community College does have a large black student population. It may be possible, through additional research, to add the race variable to the

existing base of data collected for this study, and to then investigate the possibility of a race factor in environmental preferences. As the number of factors being investigated increases, however, the limitation of the small sample size becomes more severe. Interactions between gender, age, race, and other student characteristics would certainly be difficult to assess with with a reasonable degree of accuracy without the employment of a larger database.

In addition to the above pre-instruction findings of the study, other post-instruction findings address possible instructional affects of the Choice Model. These findings are summarized below.

1. Students were more successful in the non-SGM learning environments.
2. Proportionally more students who participated in the study earned high grades than did students who were not offered a choice of instructional environment.
3. Proportionally fewer students who participated in the study withdrew or earned failing grades than did students who were not offered a choice of instructional environment.
4. Although students with higher high school mathematics grades also tended to earn higher grades under the Choice Model, several students in the sample demonstrated improved performance in the

study course relative to their respective high school mathematics average grades.

5. Although students with more positive mathematics attitudes tended to earn higher grades under the Choice Model, several students in the sample earned high grades despite negative mathematics attitudes.

6. Students with relatively high communication apprehension scores were generally able to succeed in their preferred environments.

7. Students who were successful in the course expressed generally positive feelings pertaining to the Choice Model, their preferred learning environments, and the communication responsivity of their instructors.

8. Proportionally more of the students in the sample who preferred the IM environment subsequently earned AA degrees.[7]

9. Students in the sample who preferred the SGM environment tended subsequently to enroll in more college sessions than did students who preferred the other environments.[8]

---

[7] Students in the IM preference group tended to have the most college experience prior to participation in the study.

[8] The SGM preference group included those students who tended to have the least college experience prior to

(Footnote Continued)

10. Five years after the instructional phase of the study, students with higher college quality point averages tended to be from the non-SGM preference groups, and students with low quality point averages tended to be from the SGM preference group.

11. No consistent relationships between gender of the student and academic success were found.

While the author cannot draw many hard conclusions concerning the direct instructional effects of the Choice Model, he has found the available evidence to be generally encouraging. There were discernible differences between the three environmental preference groups with respect to a variety of individual difference variables. Some students with negative mathematics attitudes and most students with relatively high levels of communication apprehension, students who are generally considered to be high-risk college mathematics students, experienced academic success in the study course. The available evidence suggests that overall levels of success for the total sample were at least as high as for students in traditional instructional environments. Successful students expressed generally positive feelings with regard to their instructional experiences.

(Footnote Continued)
participation in the study, and students who had experienced low levels of academic success in college prior to the study.

The author has generally concluded that permitting students to choose between carefully designed alternative learning environments can lead to at least partial accommodation of some individual differences.[9] Direct evidence of accommodation through improved academic performance is weak at best, but the existence of discernible differences between the three environmental preference groups in the study demonstrates that relationships do exist between measurable individual differences and preferences for alternative learning environments. In addition, positive student evaluation data pertaining to the Choice Model and the three environments suggests that the choice experience holds a potential positive attitudinal affect, which can be realized through careful accommodation of individual student preferences for alternative learning environments.

The author has deliberately stressed the need for care both in the design learning environments, and in the structure the choice experience. His experiences in early attempts to structure the Choice Model, as described in chapter 4, serve to illustrate the importance of careful design and execution. One additional element which the author believes should be included in the design of future studies of environmental preference concerns the personal

---

[9] The author believes that this study presents convincing evidence that individual differences among preferences for alternative learning environments were largely accommodated.

attributes and characteristics of the instructors themselves. The author collected very little data other than age, gender, and communication responsivity concerning instructor traits. It is personal his belief, however, that the characteristics of each individual instructor who participated in the study were inextricably related both to the characteristics of the respective learning environments which they designed, and to the net affects of their presentations of those environments during the orientation phase of the study.

8.5.2 Matching Different Learning Styles With Different Teaching Styles

In this study the author has developed and investigated the Choice Model, which is one method by which institutions can attempt to accommodate individual differences among students. By its very nature, however, the Choice Model as presented in this study is limited to employment in high registration courses at relatively large institutions. In order to offer a choice among three alternative learning environments, seventy-five to one hundred students need to register for the same course at the same time. Even at an institution the size of Prince George's Community College, this proved to be a difficult task in the 1970's. With the declining enrollments which are now being experienced in the 1980's, the feasibility of the model is even more limited in all but the largest institutions.

The author believes that the Choice Model should continue to be used in specific situations and for specific purposes. For research purposes, he believes the Model can and should be employed at large colleges and universities, using high enrollment courses. At such institutions, the Choice Model can be employed with different learning environments, different student populations, and in different subject areas. In this way it does appear feasible to systematically investigate over a period of time the myriad of variables which appear to be related to and interact with student preferences for alternative learning environments.

In addition to further investigation of the student characteristics which were addressed by this study, the author recommends that additional student characteristics also be studied.

1. Student samples should be carefully studied for possible relationships among the students' personal attributes of gender, age, and race, and the students' individual environmental preferences.
2. Interactions among environmental preferences, personal attributes, and academic background characteristics should be carefully investigated.
3. Interactions with other measurable student characteristics should also be studied.
   a) An improved measure of self-reported-concept, one more suitable for use with adult students should be selected and administered.

b) A more recent mathematics attitude/anxiety instrument should be selected and administered.

c) Communication traits of both the instructors and the students should be more carefully investigated.

d) Interpersonal traits of both the instructors and the students should be more carefully investigated.

e) Other student characteristics and traits such as those measured by the "Strong-Campbell Interest Inventory" [1983], the "Myers-Briggs Type Indicator" [1976], and the Kolb "Learning Styles Inventory" [1976] should be considered.

The author believes that a systematic approach to further research into student preferences for alternative learning environments is essential. Not only are there many possible student characteristics to consider, but there are also many possible learning environments to investigate. The three basic instructional modes (individual, small group, and large group) were selected on the basis that they were already in use at the institution. The author concluded from his early research, however, that in order to provide a meaningful variety of alternative environments from which students could choose, each instructor who participated in the Choice Model needed to be given wide latitude in fashioning a unique environment which was

compatible with his or her own personal style and professional philosophy.

The author hypothesizes that through additional research, educators can eventually establish the existence of certain general patterns relating specific student characteristics with preferences for specific types of learning environments. At that time, instructors may find it useful to modify the design of specific learning environments in ways which capitalize on those patterns. For example, if it were established that mature women who suffer from mathematics anxiety also tend to prefer the SGM environment, then it might prove useful for the SGM instructor to design a small-group environment which would better accommodate the needs of that specific type of student. The possibility of such a development suggests a cyclic process in which an environment is modified to accommodate the individual differences of students who prefer that environment, which it turn leads to a modification of the established pattern of student preferences. What begins as an effort to accommodate mature math-anxious women, might prove attractive to other women or other math-anxious students as well.

For this reason, the author recommends a systematic approach to the combined study of learning environments, student characteristics, and student environmental preferences. L. Lee Knefelkamp [1984] has assembled A Workbook for the Practice-to-Theory-to-Practice Model, which is

designed to be used with a video tape. The PTP Model, which is intended to assist the professional educator in the process of translating educational theory into educational practice, is an example of the type of systematic approach to learning environment research which the author advocates. Knefelkamp describes the translation process from the perspective of a Student Affairs professional:

> This is perhaps the most complex task of our profession ..... we are all about translation ..... translating educational goals into practice ..... helping students hear their own voices and translating themselves to themselves ..... translating the general descriptions that theory provides into specific characteristics of specific students .....and then translating and advocating student needs to the larger educational community ..... translating political concerns to ethical considerations. [Knefelkamp, 1984: 3]

In addition to advocating further learning environment research, the author believes that educational institutions should systematically strive to provide a variety of alternative learning environments from which their students can choose. In order to more generally institutionalize a system by which students are given opportunities to make informed choices, however, it is clear that some alternative choice vehicles are needed. It does not appear to be feasible to broadly institutionalize the Choice Model in its present form. The author therefore proposes several alternative models which he believes are deserving of further investigation.

Oakland Community College, in Oakland, Michigan, adopted the system of Cognitive Style Mapping, which is described in chapter 1. While student choice <u>per se</u> is not

specifically emphasized in their literature, students do meet with trained counselors during the academic advisement process. One method by which informed choice might be offered students along the lines of the Oakland system is:

1. To systematically develop alternative learning environments within the institution.
2. To specifically schedule different sections of courses which employ different learning environments at different times of day.
3. To provide students, faculty, and counselors with specific descriptions of these learning environments, to include mode of instruction, instructor identity and characteristics, and environmental policies and procedures.
4. To provide a system for assessing various individual student characteristics which research has shown to be related to environmental preferences.
5. To specifically train academic advisors so that they can assist students in making informed choices among the alternative environments, based upon the students' previous academic experiences, personal characteristics, and learning styles.

A second possible method to provide students with choice opportunities, particularly at smaller institutions, might be through the use of a modified Choice Model within an interdisciplinary block of classes. By way of example, an institution might coordinate the scheduling of three

specific sections each of an English class, a math class, and a psychology class, using nine different instructors. At 9:00, an IM English class, an SGM math class, and an LGM psychology class might be scheduled. At 10:00, SGM English, LGM math, and IM psychology classes might be scheduled. At 11:00, LGM English, IM math, and SGM psychology classes might be scheduled.

One hundred students could then be given the opportunity to register for all three classes together during the three-hour time block between 9:00 and 12:00. Registered students could first be oriented to all three learning environments for all three subject areas. Orientation to the individual mode, for instance, would encompass the English, math, and psychology IM environments. The students could then express their individual preferences in terms of instructional mode. Students who preferred the IM mode would subsequently be assigned to the 9:00 IM English class, the 10:00 IM psychology class, and the 11:00 IM math class.[10]

A third alternative version of the Choice Model might be to offer only two alternatives instead of three. This would involve only two instructors and fewer students than

---

[10] A potential drawback of this approach is that student environmental preferences may well vary among different disciplines. Separate choices with respect to each course of study could not be supported under this particular version of the Choice Model.

the three environment model, thus making it more feasible for use at smaller institutions. Although only two environments would be offered, it might be feasible in some instances to combine more than one instructional mode within a single environment. With the support of student assistants, for instance, one instructor might choose to provide both the IM and SGM alternatives within a single nontraditional learning environment.

8.6 CONCLUSION

The author anticipates that some educators, perhaps most, who review this study will be inclined to wait for "proof" that accommodation of student preferences for alternative learning environments really makes a difference. He also anticipates that some researchers may be hesitant to undertake studies which are as complex as those recommended here. It is clear to this author, however, that there are few easy answers to significant educational questions, particularly not to those which deal with individual differences.

During the past decade, many teachers in secondary and post-secondary institutions have been questioned by students concerning the relevancy of the subject matter which the students are required to study in their educational programs. As a teacher of mathematics in a community college, this author is not unfamiliar with such questioning. Complete answers do not always come easily, and students are

not always satisfied with the answers which are provided. Sometimes it appears that the questions of relevancy are asked out of defiance by students in search of some excuse for not working hard to master the topic at hand. At other times in the authors experience, however, it has appeared that the relevancy question really represented a conscientious student's plea for reassurance that the skill or concept causing difficulty was really important enough to justify the pain and suffering involved in its mastery.

It is natural in our society for human beings, students and educators alike, to look ahead for that proverbial "light at the end of the tunnel." It is often that "light" which inspires us to proceed. When we cannot anticipate the outcome for ourselves, educators sometimes turn to "higher authorities", much like students turn to teachers, for reassurance and inspiration. In the hope that the readers will find sufficient reassurance and inspiration in this study to proceed with the formidable and yet potentially rewarding task of accommodating student preferences for alternative learning environments, the author has assembled here for review, some key quotations found in the earlier chapters of this dissertation.

> Any idea or problem or body of knowledge can be presented in a form simple enough so that any particular learner can understand it in a recognizable form. [Bruner, 1968: 44]

> Therefore, we must begin with what seems to this investigator to be a wholly warranted article of faith, vis., that a limited number of basic genotypes underlie the welter of phenotypic [individual differences] in learning. [Jensen, 1964: 45]

> If two treatments are about equally good on the average, the decision about the subject requires a predictor that correlates with payoff under one treatment and does not correlate under the other treatment.... [Cronbach, 1967: 30]

> As I see it, our greatest hope for fitting the school to the individual lies in the development of theory that finally marries the differential and the experimental approaches to learning. [Cronbach, 1967: 37]

> One could argue that in a situation involving a choice between teaching materials or methods that retained the conventional classroom structure and dynamics and methods that changed the classroom in some basic way, the burden of proof should be upon the former. [Boocock, 1972: 170]

> What a student thinks of the learning environment may be as important, if not more so, than what is cognitively gained from a given learning experience. [Smith, et al., 1976: 119]

> The concept of choice in a democracy is much more crucial than curricular content. Without choice, curriculum can become static, often irrelevant, ... totally unacceptable. [Smith, et al., 1976: 125]

> When choice and flexibility are offered, when direct experiences are called for, when teaching is by discussion, and when evaluation involves frequent communication concerning the substance of behavior and performance, the ability to analyze and synthesize is fostered, as are sense of competence, freeing of interpersonal relationships, and development of autonomy, identity, and purpose. [Chickering, 1969: 148]

The preceding quotations represent some of the "higher authorities" to which this author has turned for spiritual renewal during the long years he has labored over this study. Out of this labor has come the conviction that while accommodation of student preferences through choice of learning environment is not an easy task, it holds the promise of long term benefits for all who participate. This author sees student choice of learning environment as a potential key to truly meaningful changes in the

instructional processes which are presently being employed in secondary and post-secondary educational institutions.

There are some who no doubt feel that students have already been given too much opportunity for choice. During the 1980's, many have assailed the failures of secondary schools. Some have said that students are given too many curriculum options, and that competency standards have slipped. Many point to the decline in SAT scores earned by graduating seniors and the increasing number of developmental skills programs in colleges and universities as evidence of these failures. It is important to distinguish, however, between student choice of curricular content and student choice of learning environment; between alternative learning environments and lower standards of competency. While learning environments are inextricably involved in instructional processes, choice of learning environment need not imply alteration of either curricula or standards.

At the most fundamental level, choice of instructional environment provides a technique for matching differences among how teachers teach with differences among how students learn. Many of the difficulties which instructors and experimenters are likely to encounter if they implement a program of choice at their own institutions, some of which the author has already addressed, involve the issues of instructional management and support. This author believes that the administrative burden on individual faculty participants could be substantially reduced if a program of

student choice of learning environment were addressed at an institutional level. Appropriate institutional resources could then be employed to encourage and support:

1. Evaluation and modification of existing learning environments.
2. Development and testing of new alternative learning environments.
3. Development and operation of teacher training programs.
4. Arrangement of multiple-environment course sections.
5. Publication of alternative environment descriptions.
6. Assessment and analysis of student characteristics.
7. Orientation, advisement, and counseling of new and returning students.

It is this author's opinion that the greatest potential advantage of an institutional approach to student choice of learning environment, however, is not simply that the management and support burden would be more broadly distributed. He believes it is reasonable to hypothesize, based upon the literature reviewed in this study, that numerous and varied positive effects could result if a program of student choice of instructional environment were to be widely and appropriately implemented within an institution.

Specifically, this author hypothesizes that in such an ideal situation:

1. Instructors would be encouraged to develop, through a cyclic process of evaluation and revision, unique learning environments to complement their individual characteristics.
2. Not only would a greater variety of learning environments evolve within the institution, but the characteristics of individual environments would be more likely to continue in a state of evolution, in response to student choices and evaluations, rather than to become static.
3. Students would be assisted in assessing their respective individual characteristics and in learning to select compatible learning environments.
4. Learning would be enhanced due to a variety of interacting affects.
   a) A larger variety of alternative effective learning environment.
   b) Greater compatibility among teaching and learning styles.
   c) Enhanced commitment of students to learning, resulting from the opportunity for choice.
   d) Enhanced dedication and enthusiasm of instructors in response to enhanced student commitment and success.

5. Academic success (and hence retention), cognitive development, and personal development would all be enhanced within the student population.

6. Students would be more inclined to look upon learning as the lifelong process it is and needs to be.

7. Morale and a sense of instructor professionalism would be enhanced within the faculty population.

For the reasons described above, this author sees institutional implementation of a program of choice among alternative learning environments as the ultimate stage of evolution for the Choice Model. In order to be successful, however, the process of institutional implementation must be planned with great care and deliberation. The experiences of the "new math" era must not be ignored! An institutional model must address the needs of all the constituencies of the educational community - students, faculty, administration, and staff - and the model must address all segments of each constituency. An institutional Model is unlikely to succeed if only a handful of instructors participate, or if it is perceived as a program for only one segment of the student population, be that an honors or a developmental skills segment.

This author believes that implementation of an institutional Choice Model must be both preceded and accompanied by an extensive and ongoing program of staff development. Faculties and administrations have been conditioned by the

educational research of the past to think in terms of comparisons among alternative instructional environments, randomization of subjects, and isolation of variables. Many educators have apparently been lulled into a state of instructional complacency by the inability of educational researchers to demonstrate the superiority or inferiority of specific instructional modes or environments. This complacency has contributed to a tendency for administrative policy makers at many institutions to take a laissez faire approach with respect to instructional techniques and practices.

Some may feel that laissez faire instructional administration is essential in order to maintain academic freedom or to assure peace and harmony between the faculty and administration. Implementation of an institutional choice model, however, is likely to require significant changes in both the administrative and faculty spheres of operation. Administrators will need to rely on faculty to develop and refine alternative instructional environments in a variety of courses and disciplines. Faculty will need to rely on administrators to implement and refine scheduling, orientation, counseling, advisement, and registration programs and procedures which encourage and support student choice of learning environments.

In order to achieve these changes, mutual involvement, mutual trust, and mutual support among administrators and faculty members will be essential. It is this author's

opinion that many educators will find this change process to be difficult and at times threatening. The philosophies and practices of many individual classroom instructors will be subjected to level of semipublic scrutiny which seldom now occurs, and teachers whose learning environments fail to attract interested students will feel new and stronger pressures to evaluate and modify those environments. Administrators may feel new pressures too. Some may sense a loss of power as new and varied priorities and points-of-view get factored into decision making processes. Others will likely find their jobs are made more difficult when decisions which were once made on the basis of administrative convenience, now must be changed because of instructional program requirements.

It is clear to this author that an institutional decision to develop and implement a program in support of student choice among alternative instructional environments will not come easily. Success will require a broad base of commitment and cooperation. But true commitment will not be obtained from those who believe that there are no significant differences among alternative learning environments. Cooperation is not likely to occur if the risks associated with the program are perceived to outweigh the potential for reward, nor if the majority feel that they are being manipulated by a nonrepresentative minority.

For these reasons that the author believes that a staff development program will be absolutely essential in order

for an institutional program of student choice among alternative learning environments to be a success. Such a staff development program should provide for the following elements.

1. Exposure to prominent research findings and theories which address:
   a) Individual differences.
   b) Personal and cognitive development.
   c) Student and instructor characteristics.
   d) Learning environment characteristics.
   e) Alternative instructional models.
   f) Choice
2. Examination and discussion of institutional characteristics:
   a) Student population.
   b) Faculty and staff.
   c) Instructional program.
   d) Current problems.
   e) Future trends.
3. Discussion of the Choice Model and development of alternative models which are appropriate to the needs and characteristics of the institution.
4. Discussion and development of an institutional strategy for implementation.
5. Ongoing monitoring, evaluation, and revision of the institutional strategy.

6. Ongoing evaluation and revision of alternative Choice Models.

7. Ongoing evaluation and support of individual faculty needs.

Institutional change is a major undertaking. It involves many people, much time, extensive planning, and a great deal of energy. Change can start with a single individual, however; an individual who has an idea, envisions a way in which that idea might result lead to a more effective way of functioning, and shares that idea with others. The author believes that it is an individual responsibility of professional educators to seek, to share, and to pursue ideas which hold potential for enhancing the effectiveness of the education process.

The professional responsibilities of educators, however, are sometimes easier to ignore than to confront. It is with this in mind that the author has included the following definition of <u>responsibility to yourself</u> by Rich.

> Responsibility to yourself means refusing to let others do your thinking, talking, and naming for you; it means learning to respect and use your own brains and instincts; hence .... grappling with hard work.
>
> Responsibility to yourself means that you don't fall for shallow and easy solutions. [Rich, 1979]

In this study the author has examined a variety of ideas, findings, and opinions concerning student choice and alternative instructional environments. He has in these volumes attempted to carefully document and describe those ideas, findings, and opinions. It is his hope that the

reader will find in this study sufficient reason and motivation to pursue the issues related to student choice and learning environments, to seek additional knowledge in this regard, and to share her or his own ideas, findings, and opinions.

APPENDIX A

DeCoster and Mable [1981] reported on an extensive series of student interviews conducted during the late 1970's. This author included a few brief selected quotations from the work of DeCoster and Mable in chapter 3, to convey some of the feelings toward college instruction which had been expressed by the students. Since the author believes that it is important for college instructors to listen to and heed these student voices which have been carefully preserved by the work of DeCoster and Mable, he has included in this appendix a more extensive collection of student quotations which address the topic of college instruction.

Over six hundred students representing twenty-eight colleges and universities participated in small group discussions for the College Student Life Project between the years of 1977 and 1981. It is important to note in the context of this discussion however, that only fifteen percent of the interview sample was at or above the median age of the community college population, and approximately ninety percent of the interview sample was drawn from four-year colleges and universities.

Student comments in these interviews confirmed the view that higher education is essentially unavoidable.

> Female: It's accepted in society that you go to college. It's like going to the bathroom; you have to do it.

Female: College was a conscious decision because the job market is the way it is for high school graduates. People are becoming so materialistic and money-oriented that college is a necessity.

Female: My situation is somewhat the same. I found myself at home with nothing to do and not being able to get a job doing what I wanted to do. I wanted a job as a dental technician, and there weren't any jobs available so I decided to take a course in teacher's aide training. It was also a good time to get away from home and do something different and worthwhile. After I got started, I liked it so well that I am majoring in early childhood education.

Male: I came to college because that was the only place to go once I got out of high school. In high school, you're in a basic academic program and not taught in a certain field so you have to go to college to figure out what it is you want to do. And that's the only way to get anywhere nowadays - to have a college education. [1981: 8]

Students frequently mentioned career and financial issues. DeCoster and Mable reported that students revealed strong and consistent concerns about having personally satisfying life-styles and careers.

Male: I know I'm one of the best when I do a good job. I know that I'm needed - that they need me. Choosing a career means security in the position, ability to grow in the company, on-the-job training, and opportunity to use intelligence. It also means power, prestige, and promotion.

Male: The things I'm looking at in choosing a career are the location of the position and the kind of atmosphere I'm going to be in. I want a job because of money, location, and how I can fit in with the standards of the company.

Female: I want a job where I can live comfortably, enjoy life, and feel some excitement about the future. So in the next couple of months when I start looking at jobs, I must consider how much leisure will I have, and what commitments I could have to possible job offers.

Female: I know this is different. Mostly right now, I'm just trying to learn as much as possible. I know it's never-ending, but I think I could be happy with just knowing myself and trying to understand what's

going on in the world. I could probably be happy doing just about anything.

Female: I think it would be satisfying to know that I might have helped someone, somewhere. That's my motivation for my career and my future.

Male: I feel that if you're going to college, you might as well get into something that is interesting. Even if you can't find a job right away, you can always take another job in something else and wait for an opening. There's no reason for doing something for the rest of your life that you don't want to do and that you don't like. [1981: 13-14]

Extracts from one discussion contrasted the more self-centered mood of students of the 1970's, with that of the more issue-centered students of the 1960'.

Male: College students today are more professional than they were in the sixties. Students aren't as passionate about issues. They are also more conservative than they were before.

Male: A few students today worry about small issues. The issues are far less significant than they were years ago. Students are so career-oriented. They want to establish themselves in society. I think we're very materialistic.

Female: I think college students are more content than they were when everyone was fighting for civil rights and demonstrating for the end of the Vietnam War; the whole country is more content. People today are security-minded because the economy is so schizoid. There isn't as much security as we once thought there was. Students worry about jobs that they may or may not have when they get out of college.

Female: Today, the mood is finding out what's going on, investigating what's going on, and finding out what you're doing before you do it. I think it's reflected in college students. People want to look into things more. They're not just letting things ride by - they're simply not so easily swept up and away by every issue that comes along. [1981: 64]

DeCoster and Mable cautioned that while students expressed a general disinterest in political and social issues, it would be a mistake to assume that they do not

have any concerns. The students recognized their needs to develop confidence and to establish their identities; needs addressed by Erikson, Keniston, Chickering, and others.

> Female: How important to your development is knowing yourself? How do you go about knowing yourself?
>
> Male: If anyone had the answer to knowing yourself, they would have the key to unlocking a lot of problems. Like I said before, you can't really learn to like or love other people unless you like or love yourself.
>
> Male: If I look back on these last four college years, I'd have to say that one of the biggest parts of my education has been getting to know myself, finding out those things about myself that I like and things that I don't like. One of the most important parts of personal growth is learning to accept yourself.
>
> Female: It's through other people that you really get to know yourself. It's also from the experiences you have and how you react to the experiences. I keep a journal, and I've been trying to write down a lot of what I feel about things that have happened to me or just things that have been going on.
>
> Male: Knowing yourself is a process that never stops. It doesn't end in college. For the rest of your life, you'll be getting bits and pieces of everyone's opinion, and you're constantly influenced by the people around you. All of this is part of knowing yourself, liking yourself, and accepting yourself ... then, you can begin to work on fulfilling yourself. [1981: 65]

Another set of issues discussed by students participating in the College Student Life Project concerned the college learning environment. DeCoster and Mable presented student perspectives concerning faculty, grades, and cheating. The following discussion revealed general disdain for faculty who teach courses and tend to forget students.

> Male: Professors just throw work at you, come to class and bull you have to get the knowledge yourself. Academic freedom is so evasive. Professors have just about all the rights they want, even the right to screw you over!

Female: The classes I enjoy most are the ones that I can really express myself in. I don't like classes where the professor lectures to the class about all this stuff, and a lot of it doesn't even make sense. No interactions. No questions. The professor just talks for the whole period.

Male: I pay a lot of money, and I want to be satisfied with the teachers. I have this one teacher who is ripping off the school and me too. I am paying for him to be there. He says, "You are students and you will regurgitate and give back what I say. Nothing else about you is important to me."

Female: It doesn't really matter what I write on student evaluations of instructors. The deception makes me feel bad. I didn't even fill them out this year. [1981: 11]

Other comments and discussions revealed the importance of individual student-faculty relationships. DeCoster and Mable found that students tended to stereotype faculty as "intimidating, stuffy intellectuals:"

Female: I haven't gotten close to one of my teachers. I haven't had that many large classes, but I don't know if I have the initiative to go up and really get to know them. The only profs that I've had have been TA's, and I admire a lot of profs you know, and I think they're really great teachers. They're interesting and I can respect them, but I just haven't been able to get close enough to really get to know them.

Male: It's hard to get to know them. I had a couple of profs last year who I really respected. They were really intelligent and had some great ideas, but they were so far over my head. I felt if I really tried to talk to them down on my level, you know - I felt really uncomfortable. I felt like I was just some jerk taking up this guy's time - this brilliant professor or something. [1981: 43]

Not all of the comments reported by DeCoster and Mable were negative however. Some students reported that not all college professors were not as bad as they had been lead to believe.

Female: Before I came, I heard so many horror stories about college professors. One teacher had a story every day about the horrors of college. Nobody gives a damn about you, and you just might as well hang things up if you can't think on your own. If you're having problems, most of the time, they don't care. But I haven't found that here at all. I don't know that many of my teachers because I haven't had too much of a problem so far in my classes. But the classes where I did have problems, there was someone willing to help me out. I didn't expect that at all. I had been pumped so full of horror stories that I thought, "God what am I getting myself into." On the other hand, I have this math lab that's so impersonal that I just hate to go in there. I hate going to that class - it's an effort for me. I just hate to have to sit there for an hour. All I see is this book in front of me and three white walls. You just don't have contact with anyone. It just makes for a very boring period.

Male: When she was talking about horrors, I was thinking about my high school. They told me that I'd only be a number. That's the only thing you'd be is a number. Nobody would know your first name, your last name, you're just a social security number. Somebody else could come into class and take your test and they wouldn't know any difference if they used your social security number. I find that not to be true. In the majority of my classes they know my name. In my biology class - like everything has two sides to it - we've got 150 people in there, and all he know was my number. It depends on the class and how large it is.

Male: I was told the same thing when I was in high school. They said that you'll only be a number in college. But when I came the people here said that "It's up to you" and that's true. Most of my teachers, I have to go to them. The more I go to them and the more I talk to them, it seems like the better it is when I get to class. Because when I go to class, I sit down and just listen to the teachers and I say, "Aw, this teacher's boring." I go see him after class and talk to him, he's a different person .... If you go to the teacher and talk to him, that releases some of the tension. I feel that when I take time to get to know the professor, that I'm one step ahead of the other people. Most students just come to class and they leave. As far as relationships with faculty go, right now it's okay. I'm not having any problems. [1981: 45-46]

Students tended to judge faculty members in terms of how they present themselves in the classroom. DeCoster and

Mable illustrated the importance of classroom image with the following anecdote:

> I can get along a lot better with professors that keep me relaxed. Those guys in the economics department know their stuff - if they could just be comfortable with people. I think there's a lot of difference when you have a guy up there talking to you who is relaxed, opposed to the guy coming on in a three-piece Botany 500 suit, with his custom attache case, engraved Cross pen set, and the whole bit. He puts in his fifty minutes and leaves. I say, "Man I wouldn't go talk to you for anything, mister." They're talking at you instead of to you .... Last semester I had to go up and get my final grade in economics before I went home. I was looking at the grades posted on the professor's door when he walked up. He grabbed me and we sat down and talked for an hour. I just kicked myself for not doing it earlier. There's a guy who knows his stuff, and it was the most enjoyable class because it was new material, and he was really well prepared. I'm just sorry that I didn't go in and talk to him earlier because he was a whole different person out of the classroom situation. [1981: 46]

In addition to their opinions concerning the quality and characteristics of classroom instruction and instructors, students expressed differing points of view regarding the ultimate purposes and outcomes of taking college courses; learning versus grades.

> Female: I don't think about learning anything, really. I think I want to get a good mark in this course. I want to keep my average up. That's all I think about. I have to do this and I have to do that for the course. And that's what I do. It's so stupid - I'm doing all this work for a grade and I'm not even thinking about what I'm learning or even if I'm learning anything.
>
> Male: No one ever asks if you learned anything from a course. They ask what grade did you get in the course. That's just like swallowing the material instead of really thinking about it.
>
> Female: Well, I have to enjoy the classes and I have to enjoy what I'm doing no matter what grades I get. It doesn't bother me as long as I enjoy the class and learn something.

Female: Grades drive me nutty. It's almost like the essence of my whole education. They really do put a lot of pressure on me. I need to get good grades.

Male: I think, for me, grades aren't really that important. They're only important in that I don't want to flunk out and I don't want a low average or anything like that. School is more than just grades. Like there are a lot of other things around campus that students can get involved in. I think that I learn a lot by being involved with things or just talking to another person. These things matter just as much to me as grades. [1981: 10]

In part because of the emphasis on grades, many students were particularly concerned about cheating. Based upon student discussions like the one which follows, DeCoster and Mable concluded that academic dishonesty on college campuses was both open and widespread.

Male: We're talking about large percentages. You're always going to have cheaters in class but as far as I'm concerned the guys in my class - they cheat and they just laugh in the back of the room. The teachers know about it, and you go up and tell the teacher that the people back there are cheating, and they don't even act like they care - and you're fighting for a grade just to make it.

Female: Yeah, I mean you can rationalize it by saying that they're going to lose out in the long run but to have a teacher turn around and say, "Tough, I can't do anything about it ...."

Female: If you're going to go up there and risk a lot of peer agitation - going up there and saying, "Hey, they're cheating back there" ... a lot of your peers will look down at you. Maybe it isn't a big thing to have people who are cheating looking down ....

Female: The same with term papers, you know, they're floating around all over the place, too.

Female: If they can't take the time to write it themselves, they really don't deserve to get the grade on it anyway.

Female: They do, they end up getting the grade, and they end up getting a better score than you. You stay up two nights working on it, and they went down and

paid about fifteen dollars for a term paper, and maybe they just erase the name and type in their name. They end up getting an "A" and you end up getting a "C." There's no way you can qualm about that because that's just the way it is.

Male: Term papers are rather hard to check on cheating. You can prevent people from cheating on tests - nobody can tell me you can't. If the teacher would write up four or five different series of tests, all having the same questions, all you would have to do is rotate the questions or use a different series of tests each semester - do that instead of using the same test over and over again. That can prevent it, plus having the teachers watch the class when they take a test. Most of the time, teachers don't even care. They just walk out.

Female: Walk out, that just encourages cheating .... Students feel if he doesn't care enough to watch over what we're doing then, you know - forget it. If he doesn't care that much, I'm just going to get a better grade if I can.

Male: In one tech class I took ... there were quite a few people in there who were cheating, and we all knew it. There were about eight or nine of them who would just sit in the back of the room and cheat. It was hard enough to make a grade in the class as it was, well, the teacher was confronted with it. A bunch of guys went up and told him that there was cheating going on and he was using the same old tests that he used last year. Well, of course he didn't say too much. He said, "Yeah, well, okay, I know what's going on."

Female: And then forgets about it.

Male: Right ... all he would do was give you a quiz everyday instead of lecturing and when he did get up for the lecture, he had no structure to his lecture. You didn't know what to take notes on. His tests would have nothing to do with what he lectured on, and his attitude was just really, "Well, I don't care." So finally I just got smart, and I started getting tests, saying, "Well, if that's the way it's going to be, you know, I'm going to get tests too." [1981: 31-32]

DeCoster and Mable summarized that students often got the massage that some cheating is okay, as long as it was not too obvious. The authors cited "Poor teaching, arbitrary grading systems, and the general lack of interest

on the part of faculty members to prevent dishonesty ..." as the principal means by which this message was transmitted to students. The authors found a resulting confusion and resentment which carries potential negative consequences for moral development in college students today.

> Female: The only person who is rewarded is the best ... they never take the honest person, they take the best person ....
>
> Male: The thing that disturbs me is that somewhere along the line we've lost the rules.
>
> Female: From our youth we have been taught to be honest, that we should think of other people. Yet when we get into college and start interacting with society, the family rule no longer holds up. We start competing and become selfish. [1981: 33]

APPENDIX B

Patricia Cross [1976] reported that the American College Personnel Association (ACPA) issued several statements concerning the use of groups in educational settings: "A Statement of Position" [1972], "Guidelines for Group Facilitators in Higher Education" [1974], and "Guidelines for the Preparation of Professional Group Facilitators" [1975]. Although the ACPA guidelines did not focus specifically on instructional uses of small groups, this author believes that small group practitioners should nonetheless be familiar with these guidelines.

The original ACPA position statement addressed the following points.

1. The basic goals, methods, and processes of any group experience should be purposefully designed, and they communicated to all participants and other interested members of the college community. It should always be made clear that group training experiences is not a substitute fro psychotherapy, unless that is in fact the purpose of the group.
2. Participation in a group experience should always be voluntary, even if it is part of an academic classroom structure.
3. Institutions which provide group experiences should assure through qualified and competent staff that such experiences are consistent with

the educational philosophy and purpose of the institution.

4. The educational community should establish criteria for evaluation of the special knowledge and skills needed by group facilitators and trainers.
5. There is an immediate need for the development of ethical standards to guide the practice of group trainers and facilitators.
6. Well-designed research is needed to fully assess the potential for group experience as an educational method in its own right, and in conjunction with other educational methods.

The subsequently adopted ACPA guidelines for group facilitators, addressed the following points.

1. Professional competence is the responsibility of the group leader. That leader will only offer services and use techniques in which he is appropriately qualified, openly and accurately reveal his qualifications and purposes, and maintain sensitivity to community expectations so as to avoid undue controversy.
2. Opportunities for group experiences should be clearly publicized in a professional manner.
3. Procedures for screening and selecting group members in accordance with the nature and purposes of the group, should include appropriate consideration of possible physical and mental health

conditions, and consultation with any other professionals helping group members.

4. No person should be required to participate in either a group, or a specific group activity which is against the individual's better judgement, and the facilitator should protect each individual's right to freedom of choice to withdraw without undue pressure from other group members.

5. It is the leader's responsibility to protect the physical and emotional welfare of all group participants.

6. The facilitator will strive to maintain a group climate in which the values, principles, and beliefs of individual members are respected.

7. The facilitator will respect the confidentiality of information pertaining to individual group members.

8. The leader will remain available to group members for necessary follow-up consultation after the conclusion of group activities, or else arrange and make known competent referral sources.

9. Group facilitators should actively work to discourage unethical group practices, and take appropriate informal actions to rectify known unethical practices by others.

10. Leaders should conduct, assist, or support quality-designed and carefully considered research concerning group experiences.

Whereas the ACPA position statement and guidelines summarized above are relevant to both student service professionals and other college educators, the ACPA facilitator training guidelines were specifically intended for professional group facilitators, and hence do not directly bear on small group instructional practice.

APPENDIX C

CHOICE OF TEACHING STYLE QUESTIONNAIRE
Spring 1973

1. Have you attended all three classes in the experiment? Yes _____ No _____ (If no do not fill out this questionnaire any further, but see your instructor.)

Please respond to each of the following three questions by indicating your order of preference. (1 indicates 1st preference, 2 indicates 2nd preference, and 3 indicates 3rd preference.) If you have no preference among two or more options, use the same number for those responses.

2. Which of the following sections do you want to attend?

Individual-(name[1]) _____ Lecture-(name) _____
Small Groups-(name) _____

HYPOTHETICAL QUESTIONS

3. If you were choosing a teaching style independent of instructor, would you choose:

Individual _____ Lecture _____ Small Groups _____

4. If you were choosing an instructor independent of teaching style, which would you choose?

(Ind name) _____ (Lec name) _____ (SG name) _____

Please answer these questions briefly but carefully.

5. Referring to question 3:
   a. What do you like best about your favorite teaching style?

   b. What do you like least about your favorite teaching style?

6. Referring to question 4:
   a. What do you like best about your favorite instructor?

   b. What do you like best about your least favorite instructor?

COMMENTS:

---

[1] This is the instructor's name.

APPENDIX D

CHOICE OF INSTRUCTOR/METHOD QUESTIONNAIRE
Fall 1973

1. In the space below, please write the name of the instructor whose class you want to attend this semester.

Name _____
(If you are not presently in this instructor's class, ask your present instructor for further instructions.)

2. The matrix below represents all of the possible combinations of teacher and teaching style which are available (theoretically) at this hour. Number sequentially as many blocks in the matrix as you like (at least one please) to indicate your order of preference. (i.e. You may choose not only an instructor, but also a teaching style independent of your choice of instructor.)

Method	Lec name[2]	SG name	Ind name
Lecture[3]	[4]		
Small Gp.			
Individ.			
Other			

3. Please explain as clearly as possible, why you chose the class you did. Feel free to say what you didn't like about the other choices.

---

[2] This is the instructor's name.

[3] This is a teaching style. If you choose "other" then please explain.

[4] Please number these blocks sequentially, where 1 indicates your highest preference, 2 indicates your next highest preference, etc.

APPENDIX E

POST-ORIENTATION LEARNING ENVIRONMENT PREFERENCE SHEET
Fall 1976

At this time we would like you to carefully consider each of the math classes you have attended over the past week, and we would like you to evaluate each class. Based upon your own evaluations, we would then like you to consider your preferences for studying the remainder of the course in one of those classes.

There are several factors which you should consider in forming your preferences:

method of instruction
instructor personality and standards
method of grading
personal considerations, etc.

All of these factors combine together to form a "learning environment" in which you can study the course material. Try to evaluate each class as a total package as you determine your preferences.

In addition to this preference sheet, please complete one of the attached evaluation forms for each class that you attended. If you complete the evaluations first, they may help you in determining your preferences.

LARGE GROUP INSTRUCTION - (name[5])

Have you attended one of these classes? ___yes ___no
(If no then you may do so before completing this preference sheet.)

Please write an "X" on the line below to indicate your preference for studying mathematics in this class.

LEAST PREFERRED MOST PREFERRED

0 1 2 3 4 5 6 7 8 9 10

SMALL GROUP INSTRUCTION - (name)

[identical instructions and preference scale]

INDIVIDUAL INSTRUCTION - (name)

[identical instructions and preference scale]

---

[5] This is the instructor's name.

POST-ORIENTATION LEARNING ENVIRONMENT EVALUATION SHEET
Fall 1976

METHOD OF INSTRUCTION: (Please check one.)

_____ Large group _____ Small group _____ Individual

INSTRUCTOR'S NAME _____

DATE OF CLASS ATTENDANCE _____

Please describe any previous experience that you have had with this method of instruction or this instructor.

Please describe your impressions of this method of instruction.

Please describe you impressions of this instructor.

Please describe your impressions of this grading method.

Please write an "X" on the line below to indicate your evaluation of this "learning environment" in comparison with all of the other mathematics classes which you have attended in high school or college.

LEAST PREFERRED MOST PREFERRED



COMMENTS:

[Each student received three of these forms.]

APPENDIX F

POST-INSTRUCTION LEARNING ENVIRONMENT PREFERENCE SHEET
Fall 1976

At this time we would like you to carefully consider the math class you have attended over the past five weeks, and we would like you to evaluate that class. Based upon your own evaluation, we would then like you to reconsider your preferences for the "learning environment" in which you would like to study the next course.

There are several factors which you should consider in forming your preferences:

method of instruction
instructor personality and standards
method of grading
personal considerations, etc.

All of these factors combine together to form a "learning environment" in which you can study the next course. Try to reevaluate each class as a total package as you determine your preferences.

In addition to this preference sheet, please complete the attached evaluation form for the class that you just finished. If you complete the evaluation first, it may help you in determining your preferences.

LARGE GROUP INSTRUCTION - (name[6])
Did you study the last course in this class? ___yes ___no

Please write an "X" on the line below to indicate your preference for studying the next course in this class.

LEAST PREFERRED MOST PREFERRED



SMALL GROUP INSTRUCTION - (name) [identical to above]

INDIVIDUAL INSTRUCTION - (name) [identical to above]

If your highest preference is for the class in which you studied your last course, then you will definitely be assigned to that class again. Otherwise reassignments will be made on a space available basis.

---

[6] This is the instructor's name.

POST-INSTRUCTION LEARNING ENVIRONMENT EVALUATION SHEET
Fall 1976

METHOD OF INSTRUCTION: (Please check one.)

_____ Large group _____ Small group _____ Individual

INSTRUCTOR'S NAME _____

Please describe your thoughts about having been able to choose this "learning environment."

Please describe your thoughts about the way you were introduced to the three "learning environments."

Please describe your thoughts about this method of instruction.

Please describe you thoughts about this instructor.

Please describe your thoughts about this grading method.

Please write an "X" on the line below which indicates your evaluation of this "learning environment" in comparison with all of the other mathematics classes which you have attended in high school or college.

LEAST PREFERRED MOST PREFERRED

0 1 2 3 4 5 6 7 8 9 10

Please write an "X" on the line below which indicates the importance of being able to choose a "learning environment."

LITTLE IMPORTANCE GREAT IMPORTANCE

0 1 2 3 4 5 6 7 8 9 10

APPENDIX G

STUDENT CHOICE OF LEARNING ENVIRONMENT
FIRST TAKE-HOME PACKET
Spring 1977

This is a take-home packet of questionnaires. Inside you will find several sheets of paper numbered sequentially. At the top of each instrument you will find directions for completing that questionnaire. Please read the directions carefully before you begin to make your responses. Please note that some instruments are printed on both sides of the sheet and some continue onto additional sheets.

You have now been briefly exposed to three learning environments; large group, small group, and individual study. There are several factors to consider in your choice of the learning environment in which you would like to study this course.

method of instruction
instructor personality and standards
method of grading
personal considerations

Based upon your responses to the first two questionnaires in this packet, you will be assigned to one of these learning environments.

The responses which you provide on the last four questionnaires will be used to identify important characteristics of those students who are successful in particular learning environments. This information will help us to offer better mathematics instruction to future students at Prince George's Community College.

Before you leave class today, please fill out the card which attached below, and return it to your instructor. Every sheet in this packet is labeled with the code number which appears on this card. Please do not write your name on any of the questionnaires - only on the card. Your responses to these questionnaires will remain anonymous. Your responses will in no way affect your grade in this course.

Thank you for your cooperation.

[Sample of attached card]

NAME _____

COURSE _____ SECTION _____

DATE _____ CODE _____

ORIENTATION COMMENT FORM
Spring 1977

DIRECTIONS: Please complete all three sections of this form.

LARGE GROUP I (___DID/___DID NOT) ATTEND CLASS ON THE DAY THAT THIS LEARNING ENVIRONMENT WAS INTRODUCED.

Please describe any previous experience that you have had with this method of instruction or this instructor.

Please describe your impressions of this method of instruction.

Please describe you impressions of this instructor.

Please describe your impressions of this grading method.

SMALL GROUP I (___DID/___DID NOT) ATTEND CLASS ON THE DAY THAT THIS LEARNING ENVIRONMENT WAS INTRODUCED.

[Identical descriptions were requested.]

INDIVIDUAL I (___DID/___DID NOT) ATTEND CLASS ON THE DAY THAT THIS LEARNING ENVIRONMENT WAS INTRODUCED.

[Identical descriptions were requested.]

COMMENTS:

LEARNING ENVIRONMENT PREFERENCE SCALE
Spring 1977

DIRECTIONS: Below are a series of statements about the three learning environments (large group, small group, and individual) to which you have been exposed this week. Please indicate the degree to which each statement reflects your feelings about the learning environment by circling whether you (1) strongly agree, (2) agree, (3) are undecided, (4) disagree, or (5) strongly disagree. There are no right or wrong answers and there is no time limit. Please read each statement carefully but mark your answer without debating too long over the item.

		SA	A	UN	D	SD
1.	I think that I will enjoy working with a small group to do mathematics.	1	2	3	4	5
2.	For the majority of students, I think that the large group approach is best.	1	2	3	4	5
3.	I don't think that I would use the individual method of I were a teacher.	1	2	3	4	5
4.	I don't think that I will learn much mathematics by the small group method.	1	2	3	4	5
5.	I think that the large group method is very inefficient for learning mathematics.	1	2	3	4	5
6.	I think that the individual method will help me to understand the theory behind the mathematics in this course.	1	2	3	4	5
7.	I don't think that I would use the large group method of I were a teacher.	1	2	3	4	5
8.	For the majority of students, I think that the small group approach is best.	1	2	3	4	5
9.	I think that the individual method is very inefficient for learning mathematics.	1	2	3	4	5
10.	I think that I will enjoy working with a large group to do mathematics.	1	2	3	4	5
11.	I don't think that I will learn much mathematics by the individual method.	1	2	3	4	5
12.	I think that the small group method will help me to understand the theory behind the mathematics in this course.	1	2	3	4	5
13.	For the majority of students, I think that the individual approach is best.	1	2	3	4	5
14.	I don't think that I will learn much mathematics by the large group method.	1	2	3	4	5
15.	I think that the large group method will help me to understand the theory behind the mathematics in this course.	1	2	3	4	5
16.	I think that I will enjoy working individually to do mathematics.	1	2	3	4	5

	SA	A	UN	D	SD
17. I don't think that I would use the small group method of I were a teacher.	1	2	3	4	5
18. I think that the small group method is very inefficient for learning mathematics.	1	2	3	4	5

MATHEMATICS ATTITUDE SCALE
[Aiken and Dreger, 1961]
Spring 1977

DIRECTIONS: Each of the statements on this opinionnaire expresses a feeling which a person might have toward mathematics. You are to express, on a five-point scale, the extent of agreement between the felling expressed in each statement and your own personal feeling. The five points are: Strongly Disagree (SD), Disagree (D), Undecided (U), Agree (A), and Strongly Agree (SA). You are to encircle the letter(s) which best indicate how closely you agree or disagree with the feeling expressed in each statement AS IT CONCERNS YOU.

1. I do not like mathematics. I am always under a terrible strain in a math class.	SD	D	U	A	SA
2. I do not like mathematics, and it scares me to have to take it.	SD	D	U	A	SA
3. Mathematics is very interesting to me. I enjoy math courses.	SD	D	U	A	SA
4. Mathematics is fascinating.	SD	D	U	A	SA
5. Mathematics makes me feel secure, and at the same time it is stimulating.	SD	D	U	A	SA
6. I do not like mathematics. My mind goes blank and I am unable to think clearly when working math.	SD	D	U	A	SA
7. I feel a sense of insecurity when attempting mathematics.	SD	D	U	A	SA
8. Mathematics makes me feel uncomfortable, restless, irritable, and impatient.	SD	D	U	A	SA
9. The feeling that I have toward mathematics is a good feeling.	SD	D	U	A	SA
10. Mathematics makes me feel as though I'm lost in a jungle of numbers and can't find my way out.	SD	D	U	A	SA
11. Mathematics is something which I enjoy a great deal.	SD	D	U	A	SA
12. When I hear the word "math", I have a feeling of dislike.	SD	D	U	A	SA
13. I approach math with a feeling of hesitation - hesitation resulting from fear of not being able to do math.	SD	D	U	A	SA
14. I really like mathematics.	SD	D	U	A	SA
15. Mathematics is a course in school which I have always liked and enjoyed studying.	SD	D	U	A	SA
16. I don't like mathematics. It makes me nervous to even think about having to do a math problem.	SD	D	U	A	SA

17. I have never liked math, and it is my most dreaded subject.	SD	D	U	A	SA
18. I love mathematics. I am happier in a math class than in any other class.	SD	D	U	A	SA
19. I feel at ease in mathematics, and I like it very much.	SD	D	U	A	SA
20. I feel a definite positive reaction to mathematics. I find it enjoyable.	SD	D	U	A	SA

SELF-CONCEPT AND SELF-IDEAL-CONCEPT SCALE
[Bledsoe and Garrison, 1962]
Spring 1977

DIRECTIONS: Each of us needs to know more about what we are like. This form is to help you describe yourself and to describe how you would like to be. There are no right or wrong answers; each person may have different ideas. Answer these according to your feelings. It is important for you to give your own honest answers. Think carefully and check the answer that tells if you are like the word says nearly always, about half the time, or just now and then. In the second column check the answer if you would like to be like the word says nearly always, about half the time, or just now and then.

nearly always	about half the time	just now and then		nearly always	about half the time	just now and then
_____	_____	_____	Friendly	_____	_____	_____
_____	_____	_____	Obedient	_____	_____	_____
_____	_____	_____	Honest	_____	_____	_____
_____	_____	_____	Thoughtful	_____	_____	_____
_____	_____	_____	Brave	_____	_____	_____
_____	_____	_____	Careful	_____	_____	_____
_____	_____	_____	Fair	_____	_____	_____
_____	_____	_____	Mean	_____	_____	_____
_____	_____	_____	Lazy	_____	_____	_____
_____	_____	_____	Truthful	_____	_____	_____
_____	_____	_____	Smart	_____	_____	_____
_____	_____	_____	Polite	_____	_____	_____
_____	_____	_____	Clean	_____	_____	_____
_____	_____	_____	Kind	_____	_____	_____
_____	_____	_____	Selfish	_____	_____	_____
_____	_____	_____	Helpful	_____	_____	_____
_____	_____	_____	Good	_____	_____	_____
_____	_____	_____	Cooperative	_____	_____	_____
_____	_____	_____	Cheerful	_____	_____	_____
_____	_____	_____	Jealous	_____	_____	_____
_____	_____	_____	Sincere	_____	_____	_____
_____	_____	_____	Studious	_____	_____	_____
_____	_____	_____	Loyal	_____	_____	_____
_____	_____	_____	Likeable	_____	_____	_____
_____	_____	_____	A good sport	_____	_____	_____

nearly always	about half the time	just now and then		nearly always	about half the time	just now and then
_____	_____	_____	Useful	_____	_____	_____
_____	_____	_____	Dependable	_____	_____	_____
_____	_____	_____	Bashful	_____	_____	_____
_____	_____	_____	Happy	_____	_____	_____
_____	_____	_____	Popular	_____	_____	_____

PERSONAL REPORT OF COMMUNICATION APPREHENSION
[McCroskey, 1975]
Spring 1977

DIRECTIONS: This instrument is composed of twenty-five statements concerning feelings about communicating with other people. Please indicate the degree to which each statement applies to you by marking whether you (1) strongly agree, (2) agree, (3) are undecided, (4) disagree, or (5) strongly disagree with each statement. Work quickly, just record your first impression:

		SA	A	UN	D	SD
1.	While participating in a conversation with a new acquaintance I feel very nervous.	1	2	3	4	5
2.	I have no fear of facing an audience.	1	2	3	4	5
3.	I talk less because I'm shy.	1	2	3	4	5
4.	I look forward to expressing my opinions at meetings.	1	2	3	4	5
5.	I am afraid to express myself in a group.	1	2	3	4	5
6.	I look forward to an opportunity speak in public.	1	2	3	4	5
7.	I find the prospect of speaking mildly pleasant.	1	2	3	4	5
8.	When communicating, my posture feels strained and nervous.	1	2	3	4	5
9.	I am tense and nervous while participating in group discussions.	1	2	3	4	5
10.	Although I talk fluently with friends I am at a loss for words on the platform.	1	2	3	4	5
11.	I have no fear about expressing myself in a group.	1	2	3	4	5
12.	My hands tremble when I try to handle objects on the platform.	1	2	3	4	5
13.	I always avoid speaking in public if possible.	1	2	3	4	5
14.	I feel that I am more fluent when talking to people than most other people are.	1	2	3	4	5
15.	I am fearful and tense all the while I am speaking before a group of people.	1	2	3	4	5
16.	My thoughts become confused and jumbled when I speak before an audience.	1	2	3	4	5
17.	I like to get involved in group discussions.	1	2	3	4	5

		SA	A	UN	D	SD
18.	Although I am nervous just before getting up, I soon forget my fears and enjoy the experience.	1	2	3	4	5
19.	Conversing with people who hold positions of authority causes me to be fearful and tense.	1	2	3	4	5
20.	I dislike to use my body and voice expressively.	1	2	3	4	5
21.	I feel relaxed and comfortable while speaking.	1	2	3	4	5
22.	I feel self-conscious when I am called upon to answer a question or give an opinion in class.	1	2	3	4	5
23.	I face the prospect of making a speech with complete confidence.	1	2	3	4	5
24.	I'm afraid to speak up in conversations.	1	2	3	4	5
25.	I would enjoy presenting a speech on a local television show.	1	2	3	4	5

FUNDAMENTAL INTERPERSONAL RELATIONS ORIENTATION - BEHAVIORAL
[Schultz, 1966]
Spring, 1977

DIRECTIONS: This questionnaire is designed to explore the typical ways you interact with people. There are, of course, no right or wrong answers; each person has his own ways of behaving. Sometimes people are tempted to answer questions like these in terms of what they think a person should do. This is not what is wanted here. We would like to know how you actually behave. Some items may seem similar to others. However, each item is different so please answer each one without regard to the others. There is no time limit, but do not debate long over any item.

For each statement below, decide which of the following answers best applies to you. Place the number in the space at the left of the statement. Please be as honest as you can.

1. usually 2. often 3. sometimes
4. occasionally 5. rarely 6. never

1. ___I try to be with people.
2. ___I let other people decide what to do.
3. ___I join social groups.
4. ___I try to have close relationships with people.
5. ___I tend to join social organizations when I have an opportunity.
6. ___I let other people strongly influence my actions.
7. ___I try to be included in informal social activities.
8. ___I try to have close, personal relationships with people.
9. ___I try to include other people in my plans.
10. ___I let other people control my actions.
11. ___I try to have people around me.
12. ___I try to get close and personal with people.
13. ___When people are doing things together I tend to join them.
14. ___I am easily led by people.
15. ___I try to avoid being alone.
16. ___I try to participate in group activities.

For each of the next group of statements, choose one of the following answers:

1. most people
2. many people
3. some people
4. a few people
5. one or two people
6. nobody

17.___I try to be friendly to people.
18.___I let other people decide what to do.
19.___My personal relations with people are cool and distant.
20.___I let other people take charge of things.
21.___I try to have close relationships with people.
22.___I let other people strongly influence my actions.
23.___I try to get close and personal with people.
24.___I let other people control my actions.
25.___I act cool and distant with people.
26.___I am easily led by people.
27.___I try to have close, personal relationships with people.

For each of the next group of statements, choose one of the following answers:

1. most people
2. many people
3. some people
4. a few people
5. one or two people
6. nobody

28. ___I like people to invite me to things.
29. ___I like people to act close and personal with me.
30. ___I try to influence strongly other people's actions.
31. ___I like people to invite me to join in their activities.
32. ___I like people to act close toward me.
33. ___I try to take charge of things when I am with people.
34. ___I like people to include me in their activities.
35. ___I like people to act cool and distant toward me.
36. ___I try to have other people do things the way I want them done.
37. ___I like people to ask me to participate in their discussions.
38. ___I like people to act friendly toward me.
39. ___I like people to invite me to participate in their activities.
40. ___I like people to act distant toward me.

For each of the next group of statements, choose one of the following answers:

1. usually 2. often 3. sometimes
4. occasionally 5. rarely 6. never

41. ___I try to be the dominant person when I am with people.
42. ___I like people to invite me to things.
43. ___I like people to act close toward me.
44. ___I try to have other people do things I want done.
45. ___I like people to invite me to join their activities.
46. ___I like people to act cool and distant toward me.
47. ___I try to influence strongly other people's actions.
48. ___I like people to include me in their activities.
49. ___I like people to act close and personal with me.
50. ___I try to take charge of things when I'm with people.
51. ___I like people to invite me to participate in their activities.
52. ___I like people to act distant toward me.
53. ___I try to have other people do things the way I want them done.
54. ___I take charge of things when I'm with people.

APPENDIX H

STUDENT CHOICE OF LEARNING ENVIRONMENT
SECOND TAKE-HOME PACKET
Spring 1977

This is your second take-home packet of questionnaires. Inside you will find five questionnaires; some of them are new, while others are repeats of questionnaires from the first packet. At the top of each questionnaire you will find directions for completing that instrument. Please read the directions carefully before you begin to make your responses. Please note that some instruments are printed on both sides of the sheet, and some continue onto additional sheets.

You have now completed a five-week mini-course, studying in the learning environment of your choice. You are asked to briefly describe your thoughts about that learning environment on the first questionnaire. You are also asked if you would like to change environments for the next mini-course. There are several factors to consider in your choice of a (1) large group, (2) small group, or (3) individual study environment for the next course.

method of instruction
instructor personality and standards
method of grading
personal considerations

Your learning environment will not be changed unless you specifically request a change. In that event you will be reassigned on the basis of your responses to the first two questionnaires.

The last three questionnaires will be used in part to measure how your experiences over the past five weeks have affected your responses, and in part to identify additional characteristics of both you and your instructor. This information will further contribute to our efforts to offer better mathematics instruction to future students at Prince George's Community College.

Please complete all portions of this packet as carefully as you can, and then return it to your instructor during the next class meeting. Please be sure to return the packet <u>even if you do not take the next mini-course</u>. Please do not write your name on any of the questionnaires; your responses will be identified only by the code number which appears on each sheet. Your responses will in no way affect your grade in this or any other mini-course.

Thank you for your cooperation.

Spring 1977

LEARNING ENVIRONMENT EVALUATION AND COMMENT FORM

LEARNING ENVIRONMENT: (Please check one.)

_____ Large group _____ Small group _____ Individual

INSTRUCTOR: _____

Please describe your thoughts about having been able to choose a learning environment.

Please describe your thoughts about the way you were introduced to the three environments.

Please describe your thoughts about this method of instruction.

Please describe you thoughts about this instructor.

Please describe your thoughts about this grading method.

Do you plan to take the next mini-course in the series at this time?

Do you want to change your choice of learning environment for the next mini-course?

Which learning environment would you prefer? Why?

LEARNING ENVIRONMENT PREFERENCE SCALE

[Repeated from first packet.]

MATHEMATICS ATTITUDE SCALE
[Aiken and Dreger, 1961]

[Repeated from first packet.]

PERSONAL REPORT OF COMMUNICATION APPREHENSION
[McCroskey, 1975]

[Repeated from first packet.]

INSTRUCTOR RECEPTIVITY SCALE
[Falcione, 1976]
Spring 1977

DIRECTIONS: Below are a series of statements about your instructor. There are no right or wrong answers to these statements. Please indicate the degree to which each statement applies to your instructor by circling whether you (1) strongly agree, (2) agree, (3) are undecided, (4) disagree, or (5) strongly disagree. While some of these statements may seem repetitious, take your time and try to be as honest as possible. Thank you for your cooperation in this matter.

		SA	A	UN	D	SD
1.	My instructor seems open to communication with me.	1	2	3	4	5
2.	My instructor wants to know how I feel.	1	2	3	4	5
3.	When I talk to my instructor, I get the feeling that (s)he is really listening to me.	1	2	3	4	5
4.	My instructor is skillful in observing student reactions.	1	2	3	4	5
5.	When I ask a question about class policy or procedure, it is carefully and thoroughly explained.	1	2	3	4	5
6.	My instructor explains reasons for her/his criticism of my work.	1	2	3	4	5
7.	I feel free to bring up important things about class with my instructor.	1	2	3	4	5
8.	I feel my instructor is not interested in me as a person.	1	2	3	4	5
9.	If I disagree with a decision my instructor makes, I do not feel free to question her/his decision.	1	2	3	4	5
10.	My ideas are given fair consideration in the classroom.	1	2	3	4	5
11.	When criticized, my instructor becomes hostile.	1	2	3	4	5
12.	I can argue with my instructor without hostility.	1	2	3	4	5
13.	I do not feel free to express my true opinions in this class.	1	2	3	4	5
14.	I get prompt answers to questions and suggestions I make to my instructor.	1	2	3	4	5
15.	I find it very easy to talk with my instructor.	1	2	3	4	5
16.	My instructor is open to suggestions from students.	1	2	3	4	5
17.	My instructor understands me when I talk to her/him.	1	2	3	4	5
18.	My instructor is open to feedback from the class.	1	2	3	4	5

	SA	A	UN	D	SD
19. My instructor often stifles student questions.	1	2	3	4	5
20. My instructor is not open to suggestions from the class.	1	2	3	4	5
21. My instructor is approachable.	1	2	3	4	5
22. My instructor is responsive to my communication.	1	2	3	4	5
23. My instructor is very supportive of my communication.	1	2	3	4	5
24. I find it difficult to talk to my instructor.	1	2	3	4	5
25. Out of class, I feel I can talk with my instructor.	1	2	3	4	5
26. My instructor makes her/himself available outside of class.	1	2	3	4	5
27. In his/her class, I feel free to express my opinions.	1	2	3	4	5
28. My instructor is always interested in hearing a student's idea.	1	2	3	4	5
29. My instructor seldom encourages student participation.	1	2	3	4	5
30. My instructor listens attentively to what class members have to say.	1	2	3	4	5
31. My instructor seldom asks the class's opinion concerning classroom decisions.	1	2	3	4	5
32. My instructor is not sensitive to student's desire to ask questions.	1	2	3	4	5
33. My instructor is sensitive to a student's desire to ask questions.	1	2	3	4	5
34. My instructor never allows interaction.	1	2	3	4	5
35. Instructions given in class are clear.	1	2	3	4	5
36. I easily comprehend what (s)he is talking about.	1	2	3	4	5
37. I enjoy participating in classroom discussion with my instructor.	1	2	3	4	5
38. My instructor gives me frank evaluations of my work.	1	2	3	4	5
39. By the way (s)he talks, my instructor indicates that (s)he is aware of my needs.	1	2	3	4	5
40. My instructor is honest and realistic about my situation when (s)he talks to me.	1	2	3	4	5
41. I feel I'm imposing on her/his time when I talk to my instructor.	1	2	3	4	5
42. I feel my instructor never has time for me.	1	2	3	4	5
43. I feel embarrassed talking to my instructor about my classroom performance.	1	2	3	4	5

APPENDIX I

SAMPLE OBJECTIVES AND MASTERY TEST
[Pohl, 1973, 1975]

UNIT PERMUTATIONS: PART I

OBJECTIVES Upon completion of this unit, the student should be able to:

- Identify a permutation and mutually exclusive events.
- Determine the number of ways to linearly permute n distinct objects.
- Determine the number of ways to linearly permute r of n distinct objects.
- Evaluate expressions involving factorials.
- Solve problems by applying the Multiplication Axiom.
- Solve problems by applying the Addition Axiom.

QUESTIONS

- The head of the Motor Vehicle Bureau anticipates that 800,000 cars will need new license plates next year. If the license is to consist of two letters followed by digits, then how many digit places should be ordered?

- $\frac{12!}{2!10!}$ is the same as:

  a) $6 \cdot 11$ b) $12 \cdot 11$

  c) $\frac{6!}{10!}$ d) 1

- An apartment building is soon to be opened. There are eight apartments per floor. Seven prospective tenants request apartments on the first floor. How many ways can they be assigned apartments?

- Mr. Bosche owns a fleet of fishing ships. At times the ships must communicate with each other, so Mr. Bosche has equipped each ship with a flag pole and three different colored signal flags. How many different messages can they convey if each message involves the use of at least one flag?

APPENDIX J

SAMPLE SMALL GROUP WORKSHEET

- Please turn-in a copy of your group solutions to this worksheet at the end of class.

- Remember to follow your small group guidelines.

1. Each of the following problems represents a permutation problem. Alternate turns among group members solving these problems, but do not compute numerical solutions yet. Express your solutions factorially and keep a list of your solutions.
   a) How many ways can you arrange the elements of the set { &, *, @, # } in a line?
   b) How many ways can you linearly arrange the digits of the number 21,354?
   c) Given the set of digits { 1, 3, 2, 0 } how many different numbers can you form which are greater than 500?
   d) How many ways can you linearly arrange the even digits between 1 and 9?
   e) How many even numbers can you form using the set of digits { 3, 1, 7, 6, 5, 9 }?
2. Now go back and evaluate each of your answers in problem 1. Take turns and write down your answers. Discuss the quickest way to compute these answers.
3. Each of the following questions represents a linear permutation of r of n objects ("n" objects taken "r" at a time). Follow the directions for problem 1.
   a) How many ways can you arrange 4 of the elements of the set { X, Y, Z, @, *, # } in a line?
   b) How many ways can you linearly arrange the digits of the number 531,476 to form numbers which have exactly 3 digits?
   c) How many numbers which are greater than 999 and less than 100,000 can be formed using the set of digits { 1, 2, 3, 4, 5, 6, 7, 8 }?
   d) How many numbers can you form from the set of digits { 5, 7, 2, 3 } which are either 2-digit even numbers or 3-digit even numbers?
   e) How many odd numbers can be formed using the digits of the number 321,465, which are less than 1000?
4. Go back now and and evaluate each of your answers in problem 3. Follow the directions for problem 2.

APPENDIX K

ENVIRONMENT DESCRIPTIONS

INDIVIDUAL MODE (IM)

GRADING

A students has two options to determine his/her grade:

1. A student can take each of the four mastery tests available in the Individualized Learning Lab until (s)he has an average of at least 80%. (S)he will then have a guaranteed grade of "C" without having to take any additional tests (specifically, without having to take either the mid-term or the final.) There is a test for each of the four chapters in the text.

   For each of the four tests in the Lab there are three forms available. If a student takes one of them and receives 80% or higher, (s)he can to on to the next chapter. If (s)he receives less than 80% on her/his first attempt, (s)he should discuss the test with either the proctor or the professor and retake it when (s)he feels ready. If the average of the two grades is 80% or better, (s)he can go on to the next chapter. If it is not, (s)he can make special arrangements with the proctor or professor for a fourth (and final) test, which will be very comprehensive but of no greater overall difficulty than the mastery tests. If (s)he does not achieve 80% or higher, his/her grade must be earned by the second method, described below.

2. A student can take the mid-term (in the third week) and the cumulative final (in the fifth week.) These tests, which will be given in the classroom at the assigned hour of the class, will be averaged, with the final counting twice as much as the mid-term (thus, the mid-term forming one-third of the grade and the final two-thirds of the grade.) The course grade will be based on this average as follows:

A	90% +
B	80% +
C	70% +
D	60% +
F	60% -

   A student choosing this option can, if (s)he wishes, also take any or all of the mastery tests in the Lab. (S)he can follow both plans, in which

case (s)he will receive the highest grade for which (s)he is eligible.

CLASS PROCEDURE

After January 24, attendance during the class hour is voluntary. During the class hour the professor will be available in the classroom to review problems associated with mastery tests and to answer any questions regarding the text and the handouts, including working sample problems. Mastery tests may be taken any time the Lab is open (8:00 am to 9:30 pm, Monday through Friday, and 9:00 am to 11:30 am, Saturday.) Mastery tests on chapters 1 and 2 must be completed by the end of the third week, and all work in the course must be completed by 11:00 A.M., February 18. A student may volunteer to take the mid-term and final, and for the grades of A or B must do so. If a student has earned the grade of C by satisfactorily completing the mastery test program as outlined under the first option above, (s)he can receive a grade no lower than C in the course, so that taking the mid-term and final can, in that case, only raise her/his grade.

SMALL GROUP MODE (SGM)

WHY WORK IN SMALL GROUPS?

In this course you will be doing much of your class work in small groups. The major reason for this is that I feel that many students learn mathematics better if they are allowed to work with a group of students at their own speed, than if they must sit still and listen to me talk most of the time at my speed. Group learning may sometimes seem slower than lecture-discussion, but group learning can be much more comprehensive. Many of you have not had much experience working in groups in the classroom, and you may tend to cover materials more slowly at first, until you learn the best way for your group to operate. You will have the opportunity to discuss problems at greater length than is normally done by an instructor, and this too takes time. The goal is more comprehensive understanding by the entire group.

HOW DO YOU LEARN TO WORK IN A GROUP?

Listed below is a set of guidelines which I want your group to follow. These guidelines have been carefully tested to maximize the opportunity for all members of the group to learn the material. If you wan, I can provide a list of things to look for in the way your group works. Careful study of this list will give you many ideas on how to help your group to function effectively. I also have a trouble shooting guide to help you resolve difficulties in your own group process. If you wish to learn more about group learning, the speech department offers two courses which you should find interesting and stimulating:

Group Discussion (3 credits)
Interpersonal Communication (3 credits)

SMALL GROUP GUIDELINES

1. The students in each group should work together cooperatively and achieve a group solution to each problem.
2. Everyone must understand the solution to one problem before the group tackles a new one.
3. Everyone must listen carefully and try, whenever possible, to build upon the ideas of others.
4. There is no specified leader for any group.
5. Everybody should participate, and no one may dominate the group discussion.
6. People should take turns writing solutions on the board.

WHAT WILL THE TEACHER DO?

I will present mini-lectures to introduce new materials and clear up areas of general difficulty. I will prepare worksheets for group work in class, and I will design individual assignments for you to complete at home. During class I will be your mathematics resource person to help resolve difficulties. In general I will monitor the progress of all groups, and participate or intervene when necessary. Outside of class time I will be available to assist both individuals and groups with all facets of the various class activities, including not only course materials but all facets of the various class activities, including not only course materials but all aspects of small group work as well.

GRADES

75% of your grade in this course will be based upon the daily effort you put forth during the next 5 weeks. The remaining 25% of your grade will be determined by a comprehensive final exam.

1. You will be required to complete 1 mastery test on each of the modules in this course. In addition you will receive 2 graded homework assignments during the course. Your grades on these assignments and tests will be averaged together as one course work grade.

2. Attendance is require of all students who work in small groups. Each unexcused absence will reduce the attendance portion of your grade by 10%.

3. Every student must take a comprehensive final exam in the course.

Example	Scores	Weight	Computation
Course work	Mastery tests (92, 87, 85, 90) Homework (80, 93) Average: 89	60%	89 · .6 = 53.4
Attendance	One Absence: 90	15%	90 · .15 = 13.5
Final Exam	89	25%	89 · .25 = 22.25
Total Score			89.15

Your final letter grade will be assigned according to your total numerical score and how your performance compares with that of the other students in the class. The following are maximum cutoff scores for letter grades, but I may decide to shift some of them downwards, if I feel that is warranted by the overall performance of the class.

Cutoff	Grade	Example
90	A	A total score of 89.15 means at least
80	B	a letter grade of B. If I were to
70	C	lower the A grade cutoff to 89, then
60	D	this and all other 89's would be
LOWER	F	assigned A's.

HOMEWORK

Homework assignments are open book but for your individual work only. They are not group assignments. If you have any questions pertaining to a homework assignment, then ask me. With homework assignments, I will specify a due date. It is essential that these assignments be turned in, in class, on the day they are due. Not only is it unfair for some people to take extra time, but it interferes with your group functioning if the group wants to discuss a homework problem which you haven't done yet. I will deduct 5% from the score you receive on a homework assignment, for each day (or fraction thereof) that the assignment is late, unless I specifically grant you an extension for a valid reason. Failure to attend class is not a valid excuse for failing to pickup or return a homework assignment.

Special homework assignments are available to students who are not satisfied with their initial homework grades. These special assignments will be graded, and these grades will be included in your course work grade, but they will not replace the original homework grades. In order to qualify for a special assignment, you must:

1. Correct your homework errors.
2. Discuss your corrections with me.

After I feel that you understand your previous errors, I will give you the special assignment.

MASTERY TESTS

You must take 1 mastery test corresponding to each module. These tests will be graded. All mastery tests are administered in the Individualized Learning Lab between the hours 8:00 am to 9:30 pm Monday through Friday, and 9:00 am to 11:30 am on Saturday. Mastery tests are designed to take no longer that 30 minutes. The last date to take each mastery test is specified on the mini-course calendar which I will distribute separately. I strongly urge you to take each

mastery test as soon as possible after completing your study of the module, rather than waiting for the deadline. The class will generally begin working on the next module, before the deadline for the previous module occurs.

The rules and procedures for taking all mastery tests are posted on the wall of the testing area. Please read and adhere to these rules. If the the test proctor reports to me that you have violated the rules, then I reserve the right to record a 0 for your grade on that test.

Retests are available on mastery tests, but you must have my written permission to take one. All retest grades will be included in your course work average, but they will not replace the original mastery test grade. In order to qualify for a retest, you must:

1. Correct your errors on the mastery test.
2. Discuss your corrections with me.

When you have convinced me that you understand your previous errors, I will give you written permission for a retest.

LARGE GROUP MODE (LGM)

CLASSROOM ACTIVITIES

My class is basically taught by the traditional lecture method, however, this does not mean that I do all the talking and thinking in class. Everyone is encouraged, but never pressured, to participate by asking and answering questions, working problems, and helping each other. Problems used for demonstration in class or for class work are related and are intended to lead the students to discover and understand as much mathematics as possible.

SCHEDULE

At the beginning of the course students will be given a tentative schedule of work to which I will attempt to adhere in order that all required topics are included in the course. Students are encouraged to keep up on a day to day basis. I will gladly help anyone during class or office hours.

GRADES

For this mini-course students must take 4 mastery tests in the Individualized Learning Lab which are worth 30 points each. I will drop the lowest mastery test grade. There will also be a cumulative final exam worth 60 points. Grades will be assigned on the basis of how many total points have been earned out of a possible 150 points.

A	90% +
B	80% +
C	70% +
D	60% +
F	60% -

There will be no retake of mastery tests for credit. Students should attend class regularly and to the assigned work on time.

APPENDIX L

POST-ORIENTATION MEASURED PREFERENCE DATA

ENV 1	SEX	AGE	PAC #	PREFERENCE 1 LGM	SGM	IM	ORIENTATION CLASS	LGM	SGM	IM	MEAN RESPONSE SCORES GEN	LGM	SGM	IM	TOTAL	
IM	F	20	67	-0.83	0.17	1.67	C	0	3	2		0.00	0.25	1.50	0.78	
IM	F	20	70	1.17	1.00	0.67	C	1	3	2	2.00	0.50	1.00	1.00	0.91	
IM	F	20	73	-1.83	1.17	1.00	C	1	3	2	2.00	-0.25	1.30	1.33	0.82	
	F	20		-0.50	0.78	1.11					2.00	0.08	0.85	1.28	0.84	MEAN
IM	M	44	5	0.00	0.67	0.83	B	2	1	3	0.00	0.67	0.67	1.67	0.90	
IM	M	20	17	1.17	-0.50	0.67	B	2	1	3		0.75	0.33	0.50	0.55	
IM	M	28	18	0.17	0.50	1.83	B	2	1	3	2.00	0.25	0.50	1.67	0.90	
IM	M	19	25	0.17	0.33	0.83	N	0	0	0						
IM	M	19	38	-1.17	-0.83	1.50	A	3	2	0	2.00	0.50	0.33	1.67	0.91	
IM	M	22	44	0.00	0.17	0.67	B	0	1	0			0.33	1.00	0.67	
IM	M	21	72	-0.83	0.83	1.50	C	1	3	2		-0.25	0.75	1.25	0.58	
IM	M	21	74	0.50	0.50	1.83	C	1	3	2		0.00	0.00	1.50	0.75	
IM	M	19	77	0.83	-1.33	0.67	C	1	3	2	0.00	0.50	-1.20	1.50	0.23	
IM	M	18	79	0.00	0.17	0.00	C	1	0	0		-0.67			-0.67	
	M	23		0.08	0.05	1.03					1.00	0.22	0.21	1.34	0.54	MEAN
IM		22		-0.05	0.22	1.05					1.33	0.18	0.39	1.33	0.61	MEAN
LGM	F	19	40	1.50	0.00	-0.50	A	3	2	1		1.75	0.33	0.67	1.00	
LGM	F	19	41	0.17	0.67	0.83	A	3	2	1		0.50	1.00	1.25	0.92	
LGM	F	24	43	0.67	0.33	-0.17	A	3	2	1		1.00	1.00	-0.25	0.58	
	F	21		0.78	0.33	0.05						1.08	0.78	0.56	0.83	MEAN
LGM	M	19	3	1.00	-0.83	-1.00	N	0	0	0						
LGM	M	22	6	0.50	0.33	0.33	B	2	1	3	2.00	1.75	1.00	1.00	1.31	
LGM	M	19	7	1.00	-1.00	-1.00	B	2	4	3		0.75	-0.75	-0.25	-0.08	
LGM	M	19	8	2.00	-2.00	-2.00	B	2	1	3		1.75	-1.25	-1.25	-0.25	
LGM	M	20	9	0.83	-0.33	0.00	B	2	1	3		1.33	0.50	0.33	0.70	
LGM	M	21	12	2.00	0.00	0.00	B	2	0	3		1.00		-0.25	0.38	
LGM	M	20	19	0.67	0.00	0.33	B	2	1	3	2.00	2.00	0.00	0.50	0.92	
LGM	M	31	21	0.33	0.83	0.17	B	2	0	3		0.67			0.67	
LGM	M	19	34	1.83	-1.33	-0.67	A	3	2	1	-2.00	1.00	0.33	0.00	0.20	
LGM	M	19	37	1.00	0.33	-0.83	A	3	2	0		0.75	0.75	0.00	0.67	
LGM	M	21	42	1.33	-0.83	-0.83	A	3	2	1	0.00	1.00	0.33	1.00	0.70	
LGM	M	20	49	1.33	-0.33	-0.17	N	0	0	0	1.00				1.00	
LGM	M	21	65	0.50	-0.83	0.33	N	0	0	0	2.00	1.33		0.33	1.00	
LGM	M	26	68	0.50	0.17	-1.00	C	1	3	2	2.00	0.00	0.50	0.50	0.46	
LGM	M	19	80	1.33	-0.17	0.83	A	3	2	0		1.00	0.30		0.67	
	M	21		1.08	-0.40	-0.37					1.00	1.10	0.17	0.17	0.60	MEAN
LGM		21		1.03	-0.28	-0.30					1.00	1.10	0.31	0.26	0.64	MEAN

ENV 1	SEX	AGE	PAC #	PREFERENCE 1 LGM	SGM	IM	ORIENTATION CLASS	LGM	SGM	IM	MEAN RESPONSE SCORES GEN	LGM	SGM	IM	TOTAL	
SGM	F	21	10	-0.17	0.83	-0.67	B	2	1	3		0.50	1.33	0.33	0.70	
SGM	F	19	11	0.33	1.17	0.33	B	0	1	0						
SGM	F	24	15	-0.33	1.17	0.83	B	2	1	3		-0.75	0.75	0.67	0.18	
SGM	F	22	20	0.17	1.00	-0.33	B	2	0	3		0.67	0.50	1.00	0.75	
SGM	F	33	24	-0.83	0.33	-0.33	B	2	0	0	0.00				0.00	
SGM	F	28	45	-0.33	1.33	0.17	B	0	1	0			0.75		0.75	
SGM	F	19	46	0.50	1.00	0.00	B	0	1	0			0.67		0.67	
SGM	F	23	47	0.17	0.50	-0.17	N	0	5	0						
SGM	F	19	50	0.17	0.33	-0.17	N	0	0	0						
SGM	F	19	66	-0.50	1.17	-0.17	N	0	0	0						
SGM	F	19	69	-0.17	1.67	0.00	C	1	3	2		0.50	1.00	0.75	0.75	
SGM	F	20	75	0.83	0.67	-0.83	C	1	3	2	2.00	0.50	1.00	-0.50	0.46	
SGM	F	21	76	-1.00	1.67	0.83	C	1	3	2	2.00	-0.50	0.60	0.00	0.18	
	F	22		-0.09	0.99	-0.04					1.33	0.15	0.82	0.38	0.49	MEAN
SGM	M	20	2	0.17	1.00	0.00	B	2	1	3	-1.00	0.00		0.75	0.22	
SGM	M	19	4	0.67	1.83	-0.33	B	2	1	3		0.50	1.33	1.00	0.90	
SGM	M	21	13	-0.17	0.17	0.67	B	2	1	3		0.00	-0.50	0.00	-0.13	
SGM	M	21	14	-0.83	1.00	0.17	N	0	4	0			0.67		0.67	
SGM	M	21	16	-0.67	0.67	-0.50	B	2	0	3		0.00		0.00	0.00	
SGM	M	45	23	0.50	0.67	0.17	B	2	1	0	0.00	1.00	1.50		1.11	
SGM	M	19	33	-0.33	1.00	-0.33	A	3	2	1		0.25	1.00	0.33	0.50	
SGM	M	21	36	0.33	1.50	0.33	A	3	2	0	2.00	1.25	0.75	1.25	1.15	
SGM	M	19	39	0.83	1.33	1.33	A	3	5	1	2.00	0.75	1.33	0.67	1.00	
SGM	M	18	71	-0.50	1.33	0.50	C	0	3	2			1.00	1.33	1.17	
SGM	M	20	78	-0.50	1.00	0.83	C	1	3	2	2.00	0.50	0.00	0.50	0.46	
	M	22		-0.05	1.05	0.26					1.00	0.47	0.79	0.65	0.64	MEAN
SGM		22		-0.07	1.01	0.10					1.13	0.34	0.80	0.54	0.57	MEAN
FULL SAMPLE		22		0.29	0.40	0.19					1.14	0.59	0.54	0.66	0.61	MEAN
SIZE		55														

APPENDIX M

POST-ORIENTATION MEASURED STUDENT CHARACTERISTICS

ENV 1	SEX	AGE	PAC #	FIRO-B 1 EI	WI	EC	WC	EA	WA	SELF-CONCEPT 1 SCS	SICS	DIFF	OTHER 1 MAS	PRCA	
IM	F	20	67	-0.67	0.67	-0.22	-0.67	-0.22	0.67	0.33	1.80	1.47	-0.95	0.72	
IM	F	20	70	-1.56	-2.00	-1.11	-1.11	-0.67	0.22	1.53	1.93	0.40	1.15	-0.12	
IM	F	20	73	0.67	-0.67	-1.11	-0.67	0.22	-0.22	1.33	1.53	0.20	-0.25	0.00	
	F	20		-0.52	-0.67	-0.81	-0.82	-0.22	0.22	1.06	1.75	0.69	-0.02	0.20	MEAN
IM	M	44	5	0.22	1.11	-0.22	-1.11	1.56	1.11	1.00	1.87	0.87	0.60	-1.16	
IM	M	20	17	-2.00	-2.00	-2.00	-0.67	-1.56	-2.00	1.60	1.60	0.00	0.95	-1.16	
IM	M	28	18	1.11	2.00	2.00	1.11	0.22	0.67	0.53	1.87	1.34	0.95	-0.56	
IM	M	19	25	-1.11	-2.00	0.22	-1.56	-1.56	-2.00	1.73	1.73	0.00	1.15	-0.23	
IM	M	19	38	0.22	0.67	-1.56	-1.11	-0.67	-0.22	0.33	1.80	1.47	0.65	-0.23	
IM	M	22	44	-0.22	-2.00	-0.67	-1.56	-0.67	-2.00	1.33	1.33	0.00	0.25	-0.64	
IM	M	21	72	-0.67	-2.00	-1.56	-1.56	-1.11	-0.67	1.27	1.67	0.40	0.55	-0.20	
IM	M	21	74	-0.67	-2.00	-1.56	0.67	-0.67	0.67	2.00	2.00	0.00	0.50	-0.60	
IM	M	19	77	0.22	-1.56	-1.11	-0.67	0.22	-1.11	0.60	0.60	0.00	0.25	-0.23	
IM	M	18	79	0.22	-1.56	1.11	-1.56	0.22	2.00	0.47	1.87	1.40	-0.40	-0.16	
	M	23		-0.27	-0.93	-0.54	-0.80	-0.40	-0.36	1.09	1.63	0.55	0.55	-0.52	MEAN
IM		22		-0.33	-0.87	-0.60	-0.81	-0.36	-0.22	1.08	1.66	0.58	0.42	-0.35	MEAN
LGM	F	19	40	-1.11	1.11	-0.22	-0.67	-0.67	0.22	0.53	1.73	1.20	-0.65	0.08	
LGM	F	19	41	-0.67	-0.67	-2.00	-0.22	0.22	-0.22	0.87	1.80	0.93	0.75	0.84	
LGM	F	24	43	1.56	2.00	-0.67	-0.22	0.22	1.11	0.93	1.93	1.00	-0.85	-0.68	
	F	21		-0.07	0.81	-0.96	-0.37	-0.08	0.37	0.78	1.82	1.04	-0.25	0.08	MEAN
LGM	M	19	3	-0.67	1.11	-1.56	-1.56	-1.11	1.11	1.40	2.00	0.60	-0.55	0.80	
LGM	M	22	6	-1.11	-2.00	-2.00	-1.11	-1.11	-0.22	1.60	2.00	0.40	0.45	-0.60	
LGM	M	19	7	1.11	-2.00	-0.67	-1.56	2.00	-2.00	0.47	1.93	1.46	0.35	0.28	
LGM	M	19	8	-1.11	-2.00	-1.11	-0.67	0.22	-2.00	0.40	0.40	0.00	1.15	0.88	
LGM	M	20	9	0.67	-1.56	-0.22	-1.56	-0.67	-0.22	1.80	1.80	0.00	-0.65	-0.40	
LGM	M	21	12	0.22	-1.11	-0.22	-1.56	-0.22	1.56	0.93	1.47	0.54	-0.60	-0.32	
LGM	M	20	19	-1.11	-2.00	-2.00	0.22	-1.56	-2.00	0.07	1.67	1.60	-0.80	0.20	
LGM	M	31	21	-1.11	-1.56	-0.22	-1.56	2.00	1.56	1.40	1.40	0.00	-1.80	-0.52	
LGM	M	19	34	-1.56	-2.00	-1.11	2.00	-1.56	-1.56	0.33	0.33	0.00	-0.75	-0.23	
LGM	M	19	37	-1.56	-2.00	-0.67	-0.22	-2.00	-2.00	0.53	1.67	1.14	0.85	0.12	
LGM	M	21	42	-1.11	-1.56	-1.11	-1.56	-0.22	0.67	1.33	1.67	0.34	0.25	-0.80	
LGM	M	20	49	0.22	-2.00	-0.67	-2.00	1.56	-2.00	1.60	1.93	0.33	0.50	-0.72	
LGM	M	21	65	-0.67	-2.00	-0.67	-1.56	-2.00	-2.00	1.07	1.63	0.56	0.30	-0.23	
LGM	M	26	68	-0.67	2.00	-0.22	-1.11	-1.11	1.56	1.07	1.40	0.33	-0.80	0.16	
LGM	M	19	80	0.67	-2.00	1.56	-1.56	-1.56	-1.56	0.80	2.00	1.20	1.20	0.76	
	M	21		-0.52	-1.38	-0.73	-1.02	-0.49	-0.61	0.99	1.55	0.57	-0.06	-0.04	MEAN
LGM		21		-0.45	-1.01	-0.77	-0.92	-0.42	-0.44	0.95	1.60	0.65	-0.09	-0.02	MEAN

ENV 1	SEX	AGE	PAC #	FIRO-B 1 EI	WI	EC	WC	EA	WA	SELF-CONCEPT 1 SCS	SICS	DIFF	OTHER 1 MAS	PRCA	
S6M	F	21	10	0.22	1.11	-1.56	-0.67	-0.67	0.22	1.13	1.87	0.74	0.15	-0.80	
S6M	F	19	11	-1.56	-2.00	-2.00	-1.56	-0.67	-1.11	1.67	1.93	0.26	0.40	-0.24	
S6M	F	24	15	-1.11	-2.00	-1.56	-1.11	-0.67	0.22	1.53	1.80	0.27	0.60	-0.24	
S6M	F	22	20	0.22	2.00	-2.00	-0.22	0.67	2.00	1.20	2.00	0.80	-0.85	0.08	
S6M	F	33	24	-1.11	1.11	-2.00	-2.00	-1.11	-1.56	1.40	1.80	0.40	0.25	0.28	
S6M	F	28	45	-0.22	-2.00	-0.67	-0.67	-1.56	-2.00	1.00	1.53	0.53	-0.80	0.00	
S6M	F	19	46	1.56	-2.00	-0.67	-0.67	1.11	-2.00	1.67	1.87	0.20	-0.70	-0.52	
S6M	F	23	47	0.22	-2.00	-1.56	-1.56	-2.00	-1.11	1.00	0.73	-0.27	1.45	-0.36	
S6M	F	19	50	1.56	-2.00	-2.00	-0.22	-1.11	0.22	1.67	1.67	0.00	1.40	-0.92	
S6M	F	19	66	-0.67	-1.56	-1.11	-1.11	-1.56	-1.56	0.93	1.67	0.74	0.25	-0.23	
S6M	F	19	69	1.11	-0.67	-1.56	-0.22	-0.67	2.00	0.73	1.53	0.80	-1.45	-0.24	
S6M	F	20	75	0.67	-0.67	-1.11	-1.11	-0.22	0.67	1.07	1.27	0.20	0.55	-0.44	
S6M	F	21	76	1.11	-1.56	0.22	-1.11	1.11	0.67	0.93	1.80	0.87	-0.65	-0.48	
	F	22		0.15	-0.94	-1.35	-0.94	-0.57	-0.26	1.23	1.65	0.43	0.05	-0.32	MEAN
S6M	M	20	2	1.11	1.56	-1.11	-1.11	-1.11	0.67	0.73	0.73	0.00	0.75	0.00	
S6M	M	19	4	0.22	2.00	-0.22	-1.11	2.00	1.11	1.40	1.80	0.40	0.45	-0.64	
S6M	M	21	13	-1.11	1.56	-2.00	-1.56	-1.11	2.00	0.93	1.53	0.60	-1.35	-0.08	
S6M	M	21	14	-1.56	-0.22	-2.00	-1.56	-1.56	-0.67	1.07	1.63	0.56	0.50	-0.23	
S6M	M	21	16	2.00	2.00	-0.67	-1.11	2.00	1.56	1.80	2.00	0.20	-0.95	-0.84	
S6M	M	45	23	-1.11	-1.56	-1.56	-0.22	-1.11	-1.56	0.33	1.73	1.40	1.00	0.00	
S6M	M	19	33	0.67	-0.22	-2.00	-0.67	-1.56	0.67	0.60	1.07	0.47	-0.80	0.08	
S6M	M	21	36	1.56	0.22	-0.67	-0.22	-1.11	-1.56	0.93	1.93	1.00	0.10	-0.20	
S6M	M	19	39	1.56	2.00	-0.67	-1.11	2.00	2.00	0.67	1.87	1.20	1.05	-1.52	
S6M	M	18	71	0.67	2.00	0.22	-0.22	-0.22	-0.22	1.40	1.60	0.20	0.35	-0.23	
S6M	M	20	78	-0.22	1.11	-1.11	-1.11	1.56	1.56	1.73	2.00	0.27	-1.20	-0.08	
	M	22		0.34	0.95	-1.07	-0.91	-0.02	0.51	1.05	1.63	0.57	-0.01	-0.34	MEAN
S6M		22		0.24	-0.07	-1.22	-0.93	-0.32	0.09	1.15	1.64	0.49	0.02	-0.33	MEAN
FULL SAMPLE		22		-0.12	-0.57	-0.93	-0.89	-0.36	-0.16	1.07	1.63	0.56	0.08	-0.23	MEAN
SIZE		55													

APPENDIX N

PRE-INSTRUCTION HIGH SCHOOL AND COLLEGE ARCHIVE DATA (HIGH SCHOOL AND COLLEGE)

ENV 1	SEX	AGE	PAC #	NAME	HIGH SCHOOL LOCATION	GRADES ALL	GRADES MATH	LAST SESSION	CGP ALG 1	CGP M INT	DEVEL MATH?	REPT CRS?	
IM	F	20	67	SURRATTSVILLE	PRINCE GEORGE'S	C	C	SPRING 75	43	10	NO	NO	
IM	F	20	70	POTOMAC	PRINCE GEORGE'S	C	C	SPRING 75	61	4	NO	NO	
IM	F	20	73	OXON HILL	PRINCE GEORGE'S	B	B	SPRING 75	46	4	NO	NO	
	F	20							50.0	6.0			MEAN
IM	M	44	5	GED	BALTIMORE	C	C		53	18	NO	NO	
IM	M	20	17	BOWIE	PRINCE GEORGE'S	C	C	SPRING 75	57		NO	NO	
IM	M	28	18	GED	BALTIMORE	C	C	SPRING 57		30	NO	NO	
IM	M	19	25	NORTHWESTERN	PRINCE GEORGE'S	C	C	SPRING 76	57	19	NO	NO	
IM	M	19	38	MC NAMARA	PRINCE GEORGE'S	C	B	SPRING 76			NO	NO	
IM	M	22	44	LAUREL	PRINCE GEORGE'S	C	C	SPRING 73	43	18	NO	YES	
IM	M	21	72	DE MATHA	PRINCE GEORGE'S	C	C	SPRING 75	47	4	NO	NO	
IM	M	21	74	OXON HILL	PRINCE GEORGE'S	C	C	SPRING 74	62	14	NO	NO	
IM	M	19	77	BOWIE	PRINCE GEORGE'S	C	C		67	11	NO	YES	
IM	M	18	79	NORTHWESTERN	PRINCE GEORGE'S						NO	NO	
	M	23							55.1	16.3			MEAN
IM		22							53.6	13.2			MEAN
LGM	F	19	40	DOUGLASS	PRINCE GEORGE'S	B	C	SUMMER 75	49	9	NO	NO	
LGM	F	19	41	LA REINE	PRINCE GEORGE'S	B	B	SPRING 76	61	23	NO	NO	
LGM	F	24	43	PENINSULA	VIRGINIA	C	C	SPRING 72	37	3	P	NO	
	F	21							49.0	11.7			MEAN
LGM	M	19	3	PARKDALE	PRINCE GEORGE'S			SPRING 76			NO	NO	
LGM	M	22	6	NORTHWESTERN	PRINCE GEORGE'S				45		F	NO	
LGM	M	19	7	POTOMAC	PRINCE GEORGE'S	C	C	SPRING 76	58	4	NO	NO	
LGM	M	19	8	POTOMAC	PRINCE GEORGE'S	A	A	SPRING 76	69	11	NO	NO	
LGM	M	20	9	BOWIE	PRINCE GEORGE'S	C	C		54	7	NO	NO	
LGM	M	21	12	POTOMAC	PRINCE GEORGE'S	B	C	SPRING 74			NO	NO	
LGM	M	20	19	DE MATHA	PRINCE GEORGE'S	C	C	SPRING 76	49	3	NO	NO	
LGM	M	31	21	BEAVER FALLS	PENNSYLVANIA						F	NO	
LGM	M	19	34	DE MATHA	PRINCE GEORGE'S	C	C	SPRING 76	53	12	NO	NO	
LGM	M	19	37	BLADENSBURG	PRINCE GEORGE'S	B	C	SPRING 76	65	16	NO	NO	
LGM	M	21	42	THOMPSON	GEORGIA	B	C	SPRING 74	46	9	NO	NO	
LGM	M	20	49	POTOMAC	PRINCE GEORGE'S						NO	NO	
LGM	M	21	65	LARGO	PRINCE GEORGE'S	C	C	SPRING 74	50	18	TP	YES	
LGM	M	26	68	HIGH POINT	PRINCE GEORGE'S	C	D	SPRING 69	59	4	P	NO	
LGM	M	19	80	SURRATTSVILLE	PRINCE GEORGE'S	B	D	SPRING 76	65		NO	NO	
	M	21							55.7	9.3			MEAN
LGM		21							54.3	9.9			MEAN

ENV 1	SEX	AGE	PAC #	NAME	HIGH SCHOOL LOCATION	GRADES ALL	GRADES MATH	LAST SESSION	CBP ALG 1	CBP M INT	DEVEL MATH?	REPT CRS?	
SGM	F	21	10	BOWIE	PRINCE GEORGE'S	C	C	SPRING 74	45	18	TP	NO	
SGM	F	19	11	ANACOSTIA	WASHINGTON DC	C	C	SPRING 75	38	16	TP	NO	
SGM	F	24	15	CROSSLAND	PRINCE GEORGE'S	B	C	SPRING 71			TP	YES	
SGM	F	22	20	LAUREL	PRINCE GEORGE'S	C	C		58	3	NO	NO	
SGM	F	33	24	GED							NO	NO	
SGM	F	28	45	ROOSEVELT	PRINCE GEORGE'S	C				17	NO	NO	
SGM	F	19	46	HIGH POINT	PRINCE GEORGE'S	C	D		54	3	NO	NO	
SGM	F	23	47	KANYA	INDIA				50		NO	NO	
SGM	F	19	50	POTOMAC	PRINCE GEORGE'S	C	C	SPRING 75			NO	NO	
SGM	F	19	66	LARGO	PRINCE GEORGE'S	D	C	SPRING 75	37	12	NO	NO	
SGM	F	19	69	PALLOTTI	PRINCE GEORGE'S	B	C	SPRING 76	55	3	NO	NO	
SGM	F	20	75	HIGH POINT	PRINCE GEORGE'S	C	C		58	0	NO	NO	
SGM	F	21	76	HIGH POINT	PRINCE GEORGE'S			SPRING 74			NO	NO	
	F	22							49.4	9.0			MEAN
SGM	M	20	2	CROSSLAND	PRINCE GEORGE'S	C	B	FALL 76	50	25	NO	NO	
SGM	M	19	4	BOWIE	PRINCE GEORGE'S	C	B	SPRING 76	57	13	NO	YES	
SGM	M	21	13	SURRATTSVILLE	PRINCE GEORGE'S	C	C	SPRING 74	43	13	TP	YES	
SGM	M	21	14	DUVAL	PRINCE GEORGE'S	D	D	SPRING 75		17	P	NO	
SGM	M	21	16	SUITLAND	PRINCE GEORGE'S						NO	NO	
SGM	M	45	23	UPWARD BOUND							NO	NO	
SGM	M	19	33	BOWIE	PRINCE GEORGE'S	C	D	SPRING 75	59	14	NO	NO	
SGM	M	21	36	CARROLL	WASHINGTON DC	C	C	SPRING 75	55	13	NO	YES	
SGM	M	19	39	GWYNN PARK	PRINCE GEORGE'S	C	C	SUMMER 75	59	29	NO	NO	
SGM	M	18	71	HIGH POINT	PRINCE GEORGE'S	B	C	SPRING 76	45	18	NO	NO	
SGM	M	20	78	SOUTHERN	ANNE ARUNDEL	B	C	SPRING 75	54	2	NO	NO	
	M	22							52.8	16.0			MEAN
SGM		22							51.1	12.7			MEAN
FULL SAMPLE		22							52.8	12.0			MEAN
SIZE		55											

PRE-INSTRUCTION HIGH SCHOOL AND COLLEGE ARCHIVE DATA
(TRANSFER COLLEGE)

ENV 1	SEX	AGE	PAC #	TRANSFER COLLEGE NAME	TRANSFER COLLEGE LOCATION	FIRST SESSION	LAST SESSION	NUMBER OF TRANSFER SESS	CRED	QP	QPA	
IM	F	20	67									
IM	F	20	70	AMERICAN	WASHINGTON DC	FALL 75	SPRING 76	2	10	28	2.8	
IM	F	20	73									
	F	20						2.0	10	28	2.80	MEAN
IM	M	44	5									
IM	M	20	17									
IM	M	28	18									
IM	M	19	25	UMCP	MARYLAND	SPRING 79	SPRING 79	1	5	16	3.2	
IM	M	19	38									
IM	M	22	44									
IM	M	21	72									
IM	M	21	74									
IM	M	19	77									
IM	M	18	79	SALISBURY	MARYLAND	FALL 76	FALL 76	1	14	22	1.571	
	M	23						1.0	10	19	2.39	MEAN
IM		22						1.3	10	22	2.52	MEAN
LGM	F	19	40									
LGM	F	19	41									
LGM	F	24	43									
	F	21										MEAN
LGM	M	19	3	UMES	MARYLAND	FALL 76	FALL 76	1	12	30	2.5	
LGM	M	22	6									
LGM	M	19	7									
LGM	M	19	8									
LGM	M	20	9									
LGM	M	21	12	UMCP	MARYLAND	FALL 74	SPRING 75	2	20	12	0.6	
LGM	M	20	19									
LGM	M	31	21									
LGM	M	19	34									
LGM	M	19	37									
LGM	M	21	42	FRANKLIN	OHIO	FALL 74	SPRING 75	2	30	85	2.833	
LGM	M	20	49	SALISBURY	MARYLAND	FALL 76	FALL 76	0	0	0	0	
LGM	M	21	65									
LGM	M	26	68	MONTGOMERY CC	MARYLAND	SPRING 78	SPRING 78	1	6	12	2	
LGM	M	19	80									
	M	21						1.2	14	28	1.59	MEAN
LGM		21						1.2	14	28	1.59	MEAN

ENV 1	SEX	AGE	PAC #	TRANSFER NAME	COLLEGE LOCATION	FIRST SESSION	LAST SESSION	NUMBER OF TRANSFER SESS	CRED	QP	QPA	
SGM	F	21	10									
SGM	F	19	11									
SGM	F	24	15									
SGM	F	22	20									
SGM	F	33	24	ANTIOCH	BALTIMORE	FALL 73	FALL 74	4	25	0	0	
SGM	F	28	45	GEORGETOWN	WASHINGTON DC	FALL 74	SPRING 76	5	21	24	1.143	
SGM	F	19	46									
SGM	F	23	47									
SGM	F	19	50									
SGM	F	19	66									
SGM	F	19	69	UMCP	MARYLAND	FALL 77	FALL 77	1	12	30	2.5	
SGM	F	20	75									
SGM	F	21	76	SLIPPERY ROCK	PENNSYLVANIA	FALL 74	FALL 75	3	37	60	1.622	
								3.3	24	29	1.32	MEAN
	F	22										
SGM	M	20	2									
SGM	M	19	4									
SGM	M	21	13	UMCP	MARYLAND	SPRING 78	FALL 78	2	12	21	1.75	
SGM	M	21	14									
SGM	M	21	16	UMCP	MARYLAND	FALL 75	FALL 76	5	42	32	0.762	
SGM	M	45	23									
SGM	M	19	33									
SGM	M	21	36									
SGM	M	19	39									
SGM	M	18	71									
SGM	M	20	78									
								3.5	27	27	1.26	MEAN
	M	22										
								3.3	25	28	1.30	MEAN
SGM		22										
FULL SAMPLE		22						2.1	18	27	1.66	MEAN
SIZE		55										

PRE-INSTRUCTION HIGH SCHOOL AND COLLEGE ARCHIVE DATA
(PRINCE GEORGE'S COMMUNITY COLLEGE AND TRANSFER)

ENV 1	SEX	AGE	PAC #	PREFERENCE 1 LGM	SGM	IM	1ST PGCC SESSION	NUMBER OF PGCC SESS	CRED	QP	PGCC QPA	TOTAL COLLEGE SESS	CRED	QP	QPA	
IM	F	20	67	-0.83	0.17	1.67	FALL 75	3	47	149	3.17	3	47	149	3.17	
IM	F	20	70	1.17	1.00	0.67	FALL 76	1	15	51	3.40	3	25	79	3.16	
IM	F	20	73	-1.83	1.17	1.00	FALL 75	3	44	119	2.70	3	44	119	2.70	
	F	20		-0.50	0.78	1.11		2.3	35	106	3.09	3.0	39	116	3.01	MEAN
IM	M	44	5	0.00	0.67	0.83	SUMMER 75	5	48	180	3.75	5	48	180	3.75	
IM	M	20	17	1.17	-0.50	0.67	FALL 75	3	19	61	3.21	3	19	61	3.21	
IM	M	28	18	0.17	0.50	1.83	FALL 69	7	42	105	2.50	7	42	105	2.50	
IM	M	19	25	0.17	0.33	0.83	FALL 76	1	6	21	3.50	1	6	21	3.50	
IM	M	19	38	-1.17	-0.83	1.50	FALL 76	1	15	36	2.40	1	15	36	2.40	
IM	M	22	44	0.00	0.17	0.67	SPRING 75	4	45	134	2.98	4	45	134	2.98	
IM	M	21	72	-0.83	0.83	1.50	FALL 75	4	50	89	1.78	4	50	89	1.78	
IM	M	21	74	0.50	0.50	1.83	FALL 74	5	55	156	2.84	5	55	156	2.84	
IM	M	19	77	0.83	-1.33	0.67	SPRING 76	2	27	49	1.81	2	27	49	1.81	
IM	M	18	79	0.00	0.17	0.00	SPRING 77	0	0	0	0.00	1	14	22	1.57	
	M	23		0.08	0.05	1.03		3.2	31	83	2.48	3.3	32	85	2.63	MEAN
IM		22		-0.05	0.22	1.05		3.0	32	88	2.62	3.2	34	92	2.72	MEAN
LGM	F	19	40	1.50	0.00	-0.50	FALL 75	3	29	70	2.41	3	29	70	2.41	
LGM	F	19	41	0.17	0.67	0.83	FALL 76	1	16	55	3.44	1	16	55	3.44	
LGM	F	24	43	0.67	0.33	-0.17	FALL 75	4	27	80	2.96	4	27	80	2.96	
	F	21		0.78	0.33	0.05		2.7	24	68	2.94	2.7	24	68	2.94	MEAN
LGM	M	19	3	1.00	-0.83	-1.00	SPRING 77	0	0	0	0.00	1	12	30	2.50	
LGM	M	22	6	0.50	0.33	0.33	FALL 74	4	15	30	2.00	4	15	30	2.00	
LGM	M	19	7	1.00	-1.00	-1.00	FALL 76	1	8	12	1.50	1	8	12	1.50	
LGM	M	19	8	2.00	-2.00	-2.00	FALL 76	1	15	57	3.80	1	15	57	3.80	
LGM	M	20	9	0.83	-0.33	0.00	FALL 75	3	47	155	3.30	3	47	155	3.30	
LGM	M	21	12	2.00	0.00	0.00	FALL 74	3	45	114	2.53	5	65	126	1.94	
LGM	M	20	19	0.67	0.00	0.33	FALL 76	1	13	40	3.08	1	13	40	3.08	
LGM	M	31	21	0.33	0.83	0.17	FALL 75	5	30	87	2.90	5	30	87	2.90	
LGM	M	19	34	1.83	-1.33	-0.67	FALL 76	1	13	31	2.38	1	13	31	2.38	
LGM	M	19	37	1.00	0.33	-0.83	SPRING 77	0	0	0	0.00	0	0	0	0.00	
LGM	M	21	42	1.33	-0.83	-0.83	SPRING 77	0	0	0	0.00	2	30	85	2.83	
LGM	M	20	49	1.33	-0.33	-0.17	SUMMER 76	1	3	12	4.00	1	3	12	4.00	
LGM	M	21	65	0.50	-0.83	0.33	SPRING 75	7	28	48	1.71	7	28	48	1.71	
LGM	M	26	68	0.50	0.17	-1.00	FALL 69	6	39	99	2.54	6	39	99	2.54	
LGM	M	19	80	1.33	-0.17	0.83	FALL 76	1	9	24	2.67	1	9	24	2.67	
	M	21		1.08	-0.40	-0.37		2.3	18	47	2.16	2.6	22	56	2.48	MEAN
LGM		21		1.03	-0.28	-0.30		2.3	19	51	2.29	2.6	22	58	2.55	MEAN

ENV 1	SEX	AGE	PAC #	PREFERENCE 1 LGM	SGM	IM	1ST PGCC SESSION	NUMBER OF PGCC SESS	CRED	QP	PGCC QPA	TOTAL COLLEGE SESS	CRED	QP	QPA	
SGM	F	21	10	-0.17	0.83	-0.67	FALL 74	3	35	101	2.89	3	35	101	2.89	
SGM	F	19	11	0.33	1.17	0.33	FALL 75	3	16	32	2.00	3	16	32	2.00	
SGM	F	24	15	-0.33	1.17	0.83	FALL 73	9	47	168	3.57	9	47	168	3.57	
SGM	F	22	20	0.17	1.00	-0.33	FALL 72	4	41	98	2.39	4	41	98	2.39	
SGM	F	33	24	-0.83	0.33	-0.33	SPRING 76	3	12	18	1.50	7	37	18	0.49	
SGM	F	28	45	-0.33	1.33	0.17	SPRING 77	0	0	0	0.00	5	21	24	1.14	
SGM	F	19	46	0.50	1.00	0.00	FALL 76	1	15	36	2.40	1	15	36	2.40	
SGM	F	23	47	0.17	0.50	-0.17	FALL 76	1	3	6	2.00	1	3	6	2.00	
SGM	F	19	50	0.17	0.33	-0.17	SPRING 77	0	0	0	0.00	0	0	0	0.00	
SGM	F	19	66	-0.50	1.17	-0.17	SUMMER 75	3	9	3	0.33	3	9	3	0.33	
SGM	F	19	69	-0.17	1.67	0.00	FALL 76	1	16	51	3.19	1	16	51	3.19	
SGM	F	20	75	0.83	0.67	-0.83	FALL 74	4	57	174	3.05	4	57	174	3.05	
SGM	F	21	76	-1.00	1.67	0.83	SPRING 76	2	23	52	2.26	2	23	52	2.26	
	F	22		-0.09	0.99	-0.04		2.6	21	57	1.97	3.3	25	59	1.98	MEAN
SGM	M	20	2	0.17	1.00	0.00	FALL 76	1	3	6	2.00	1	3	6	2.00	
SGM	M	19	4	0.67	1.83	-0.33	FALL 76	1	12	39	3.25	1	12	39	3.25	
SGM	M	21	13	-0.17	0.17	0.67	FALL 74	7	43	96	2.23	7	43	96	2.23	
SGM	M	21	14	-0.83	1.00	0.17	FALL 75	3	19	38	2.00	3	19	38	2.00	
SGM	M	21	16	-0.67	0.67	-0.50	SPRING 77	0	0	0	0.00	5	42	32	0.76	
SGM	M	45	23	0.50	0.67	0.17	SPRING 77	0	0	0	0.00	0	0	0	0.00	
SGM	M	19	33	-0.33	1.00	-0.33	SPRING 77	0	0	0	0.00	0	0	0	0.00	
SGM	M	21	36	0.33	1.50	0.33	FALL 75	3	30	41	1.37	3	30	41	1.37	
SGM	M	19	39	0.83	1.33	1.33	FALL 75	3	26	84	3.23	3	26	84	3.23	
SGM	M	18	71	-0.50	1.33	0.50	FALL 76	1	10	23	2.30	1	10	23	2.30	
SGM	M	20	78	-0.50	1.00	0.83	FALL 75	2	26	79	3.04	2	26	79	3.04	
	M	22		-0.05	1.05	0.26		1.9	15	37	1.77	2.4	19	40	1.83	MEAN
SGM		22		-0.07	1.01	0.10		2.3	18	48	1.88	2.9	22	50	1.91	MEAN
FULL SAMPLE		22		0.29	0.40	0.19		2.5	22	58	2.19	2.9	25	63	2.31	MEAN
SIZE		55														

APPENDIX O

POST-INSTRUCTION GRADES

ENV 1	SEX	AGE	PAC #	GRADE CSE 1	GRADE CSE 2	GRADE CSE 3	SUCCESS CSE 1	SUCCESS CSE 2	SUCCESS CSE 3	PRE-INSTRUCTION HS	MG	MAS 1	PRCA 1	
IM	F	20	67	B	B	B	HIGH	HIGH	HIGH	C		-0.95	0.72	
IM	F	20	70	B	C	A	HIGH	LOW	HIGH	C		1.15	-0.12	
IM	F	20	73	C	C	C	LOW	LOW	LOW	B		-0.25	0.00	
	F	20										-0.02	0.20	MEAN
IM	M	44	5	C	C	B	LOW	LOW	HIGH	C		0.60	-1.16	
IM	M	20	17	B	C	C	HIGH	LOW	LOW	C		0.95	-1.16	
IM	M	28	18	F	F	W	NO	NO	NO	C		0.95	-0.56	
IM	M	19	25	A	B	C	HIGH	HIGH	HIGH	C		1.15	-0.23	
IM	M	19	38	C	F	C	LOW	NO	LOW	B		0.65	-0.23	
IM	M	22	44	C	W	W	LOW	NO	NO	C		0.25	-0.64	
IM	M	21	72	C	D	W	LOW	LOW	NO	C		0.55	-0.20	
IM	M	21	74	F	W	W	NO	NO	NO	C		0.50	-0.60	
IM	M	19	77	A	B	B	HIGH	HIGH	HIGH	C		0.25	-0.23	
IM	M	18	79	C	F	W	LOW	NO	NO			-0.40	-0.16	
	M	23										0.55	-0.52	MEAN
IM		22										0.42	-0.35	MEAN
LGM	F	19	40	B	C	B	HIGH	LOW	HIGH	C		-0.65	0.08	
LGM	F	19	41	B	B	B	HIGH	HIGH	HIGH	B		0.75	0.84	
LGM	F	24	43	F	W	W	NO	NO	NO	C		-0.85	-0.68	
	F	21										-0.25	0.08	MEAN
LGM	M	19	3	F	F	F	NO	NO	NO			-0.55	0.80	
LGM	M	22	6	F	W	W	NO	NO	NO			0.45	-0.60	
LGM	M	19	7	B	B	B	HIGH	HIGH	HIGH	C		0.35	0.28	
LGM	M	19	8	A	A	A	HIGH	HIGH	HIGH	A		1.15	0.88	
LGM	M	20	9	B	C	A	HIGH	LOW	HIGH	C		-0.65	-0.40	
LGM	M	21	12	B	C	C	HIGH	LOW	LOW	C		-0.60	-0.32	
LGM	M	20	19	C	C	D	LOW	LOW	LOW	C		-0.80	0.20	
LGM	M	31	21	F	F	W	NO	NO	NO			-1.80	-0.52	
LGM	M	19	34	C	C	C	LOW	LOW	LOW	C		-0.75	-0.23	
LGM	M	19	37	B	A	B	HIGH	HIGH	HIGH	C		0.85	0.12	
LGM	M	21	42	C	D	B	LOW	LOW	HIGH	C		0.25	-0.80	
LGM	M	20	49	D	C	F	LOW	LOW	NO			0.50	-0.72	
LGM	M	21	65	F	F	W	NO	NO	NO	C		0.30	-0.23	
LGM	M	26	68	A	B	B	HIGH	HIGH	HIGH	D		-0.80	0.16	
LGM	M	19	80	C	F	W	LOW	NO	NO	D		1.20	0.76	
	M	21										-0.06	-0.04	MEAN
LGM		21										-0.09	-0.02	MEAN

ENV 1	SEX	AGE	PAC #	GRADE CSE 1	GRADE CSE 2	GRADE CSE 3	SUCCESS CSE 1	SUCCESS CSE 2	SUCCESS CSE 3	PRE-INSTRUCTION HS	PRE-INSTRUCTION MG	PRE-INSTRUCTION MAS 1	PRE-INSTRUCTION PRCA 1	
SGM	F	21	10	A	A	A	HIGH	HIGH	HIGH	C	0.15	-0.80		
SGM	F	19	11	W	W	W	NO	NO	NO	C	0.40	-0.24		
SGM	F	24	15	A	A	A	HIGH	HIGH	HIGH	C	0.60	-0.24		
SGM	F	22	20	C	C	C	LOW	LOW	LOW	C	-0.85	0.08		
SGM	F	33	24	F	F	F	NO	NO	NO		0.25	0.28		
SGM	F	28	45	F	W	W	NO	NO	NO		-0.80	0.00		
SGM	F	19	46	D	W	F	LOW	NO	NO	D	-0.70	-0.52		
SGM	F	23	47	C	C	B	LOW	LOW	HIGH		1.45	-0.36		
SGM	F	19	50	C	D	C	LOW	LOW	LOW	C	1.40	-0.92		
SGM	F	19	66	W	W	F	NO	NO	NO	C	0.25	-0.23		
SGM	F	19	69	C	C	C	LOW	LOW	LOW	C	-1.45	-0.24		
SGM	F	20	75	B	C	B	HIGH	LOW	HIGH	C	0.55	-0.44		
SGM	F	21	76	C	D	B	LOW	LOW	HIGH		-0.65	-0.48		
											0.05	-0.32	MEAN	
	F	22												
SGM	M	20	2	C	C	C	LOW	LOW	LOW	B	0.75	0.00		
SGM	M	19	4	B	C	B	HIGH	LOW	HIGH	B	0.45	-0.64		
SGM	M	21	13	W	W	W	NO	NO	NO	C	-1.35	-0.08		
SGM	M	21	14	W	W	W	NO	NO	NO	D	0.50	-0.23		
SGM	M	21	16	B	C	B	HIGH	LOW	HIGH		-0.95	-0.84		
SGM	M	45	23	C	C	B	LOW	LOW	HIGH		1.00	0.00		
SGM	M	19	33	F	W	W	NO	NO	NO	D	-0.80	0.08		
SGM	M	21	36	W	W	W	NO	NO	NO	C	0.10	-0.20		
SGM	M	19	39	B	B	B	HIGH	HIGH	HIGH	C	1.05	-1.52		
SGM	M	18	71	D	F	W	LOW	NO	NO	C	0.35	-0.23		
SGM	M	20	78	B	W	C	HIGH	NO	LOW	C	-1.20	-0.08		
											-0.01	-0.34	MEAN	
	M	22												
											0.02	-0.33	MEAN	
SGM		22												
FULL SAMPLE		22									0.08	-0.23	MEAN	
SIZE		55												

APPENDIX P

POST-INSTRUCTION MEASURED DATA

ENV 1	SEX	AGE	PAC #	PAC 2	ENV 2	ENV 3	PREFERENCE 2 LGM	SGM	IM	MAS 2	OTHER PRCA 2	INS R	
IM	F	20	67	YES	IM	IM	0.83	0.50	1.33	-0.85	0.56	1.07	
IM	F	20	70	YES	IM	IM	0.67	0.67	0.83	0.05	-0.04	1.17	
IM	F	20	73	NO	IM	IM							
	F	20					0.75	0.59	1.08	-0.40	0.26	1.12	MEAN
IM	M	44	5	YES	IM	IM	-0.17	0.67	0.67	0.55	-1.08	1.20	
IM	M	20	17	NO	IM	IM							
IM	M	28	18	NO									
IM	M	19	25	YES	IM	IM	0.33	-0.17	1.67	1.15	-0.40	1.28	
IM	M	19	38	YES	IM	IM	-1.00	-1.17	1.67	0.70	0.00	0.95	
IM	M	22	44	NO									
IM	M	21	72	YES	IM		0.83	-0.17	0.50	-0.55	-0.48	0.42	
IM	M	21	74	NO									
IM	M	19	77	YES	IM	IM	0.43	0.12	0.21	0.05	0.00	1.02	
IM	M	18	79	YES	IM		-2.00	-2.00	2.00	-0.50	-0.26	1.13	
	M	23					-0.26	-0.45	1.12	0.23	-0.37	1.00	MEAN
IM		22					-0.01	-0.19	1.11	0.08	-0.21	1.03	MEAN
LGM	F	19	40	YES	LGM	LGM	1.50	0.67	0.33	0.75	0.64	1.44	
LGM	F	19	41	NO	LGM	LGM							
LGM	F	24	43	NO									
	F	21					1.50	0.67	0.33	0.75	0.64	1.44	MEAN
LGM	M	19	3	NO									
LGM	M	22	6	NO									
LGM	M	19	7	NO	LGM	LGM							
LGM	M	19	8	NO	LGM	LGM							
LGM	M	20	9	YES	LGM	LGM	0.50	0.00	0.00	-0.15	-0.28	1.40	
LGM	M	21	12	YES	LGM	LGM	1.67	-0.83	-0.83	-0.80	-0.68	1.09	
LGM	M	20	19	YES	LGM	LGM	1.17	-0.33	-0.67	-0.85	0.68	1.06	
LGM	M	31	21	NO									
LGM	M	19	34	YES	LGM	LGM	0.43	0.12	0.21	0.20	0.00	-0.07	
LGM	M	19	37	YES	LGM	LGM	0.00	0.33	0.50	0.15	0.08	0.05	
LGM	M	21	42	YES	LGM	LGM	2.00	-1.33	-1.50	-0.30	-0.84	1.41	
LGM	M	20	49	YES	LGM	LGM	1.33	-0.17	-0.17	0.40	-0.96	1.45	
LGM	M	21	65	NO									
LGM	M	26	68	YES	LGM	LGM	1.00	-0.83	-1.00	-0.05	-0.12	1.91	
LGM	M	19	80	NO	LGM								
	M	21					1.01	-0.38	-0.43	-0.18	-0.27	1.04	MEAN
LGM		21					1.07	-0.26	-0.35	-0.07	-0.16	1.08	MEAN

ENV 1	SEX	AGE	PAC #	PAC 2	ENV 2	ENV 3	PREFERENCE 2 LGM	SGM	IM	MAS 2	OTHER PRCA 2	INS R	
SGM	F	21	10	YES	SGM	SGM	-0.17	0.67	-0.17	0.25	-0.52	0.75	
SGM	F	19	11	NO									
SGM	F	24	15	YES	SGM	SGM	-0.33	0.83	0.50	0.35	-0.52	0.88	
SGM	F	22	20	YES	SGM	SGM	0.00	0.50	0.17	-0.65	-0.08	1.02	
SGM	F	33	24	NO									
SGM	F	28	45	YES			0.33	0.83	0.00	-0.50	-0.32	0.81	
SGM	F	19	46	NO									
SGM	F	23	47	YES	SGM	SGM	0.50	0.50	0.33	1.60	-0.60	0.67	
SGM	F	19	50	NO	SGM	SGM							
SGM	F	19	66	NO									
SGM	F	19	69	YES	SGM	SGM	0.33	1.00	-0.50	-0.90	-0.24	0.72	
SGM	F	20	75	YES	SGM	SGM	0.83	0.83	-0.33	0.00	-0.20	0.07	
SGM	F	21	76	YES	SGM	SGM	0.50	0.17	0.00	-0.20	-0.16	-0.12	
	F	22					0.25	0.67	0.00	-0.01	-0.33	0.60	MEAN
SGM	M	20	2	NO	SGM	SGM							
SGM	M	19	4	YES	SGM	SGM	0.43	0.12	0.21	0.50	-0.52	0.91	
SGM	M	21	13	NO									
SGM	M	21	14	NO									
SGM	M	21	16	YES	SGM	SGM	0.33	1.50	-0.50	0.05	-0.80	1.94	
SGM	M	45	23	YES	IM	IM	0.43	0.12	0.21	0.00	-0.26	0.95	
SGM	M	19	33	NO									
SGM	M	21	36	NO									
SGM	M	19	39	NO	SGM	SGM							
SGM	M	18	71	YES	IM		-0.33	0.17	0.33	-0.45	0.00	0.87	
SGM	M	20	78	NO	SGM	SGM							
	M	22					0.22	0.48	0.06	0.03	-0.40	1.17	MEAN
SGM		22					0.24	0.60	0.02	0.00	-0.35	0.79	MEAN
FULL SAMPLE		22					0.43	0.11	0.21	0.00	-0.26	0.95	MEAN
SIZE		55											

APPENDIX Q

COMPARISON OF PRE- AND POST-INSTRUCTION PREFERENCE SCORES

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	LGM 1	LGM 2	LGM CHG	SGM 1	SGM 2	SGM CHG	IM 1	IM 2	IM CHG	
IM	F	20	67	IM	IM	-0.83	0.83	1.66	0.17	0.50	0.33	1.67	1.33	-0.34	
IM	F	20	70	IM	IM	1.17	0.67	-0.50	1.00	0.67	-0.33	0.67	0.83	0.16	
	F	20				0.17	0.75	0.58	0.59	0.59	0.00	1.17	1.08	-0.09	MEAN
IM	M	44	5	IM	IM	0.00	-0.17	-0.17	0.67	0.67	0.00	0.83	0.67	-0.16	
IM	M	19	25	IM	IM	0.17	0.33	0.16	0.33	-0.17	-0.50	0.83	1.67	0.84	
IM	M	19	38	IM	IM	-1.17	-1.00	0.17	-0.83	-1.17	-0.34	1.50	1.67	0.17	
IM	M	21	72	IM		-0.83	0.83	1.66	0.83	-0.17	-1.00	1.50	0.50	-1.00	
IM	M	19	77	IM	IM	0.83	0.43	-0.40	-1.33	0.12	1.45	0.67	0.21	-0.46	
IM	M	18	79	IM		0.00	-2.00	-2.00	0.17	-2.00	-2.17	0.00	2.00	2.00	
	M	23				-0.17	-0.26	-0.10	-0.03	-0.45	-0.43	0.89	1.12	0.23	MEAN
IM		23				-0.08	-0.01	0.07	0.13	-0.19	-0.32	0.96	1.11	0.15	MEAN
LGM	F	19	40	LGM	LGM	1.50	1.50	0.00	0.00	0.67	0.67	-0.50	0.33	0.83	
	F	19				1.50	1.50	0.00	0.00	0.67	0.67	-0.50	0.33	0.83	MEAN
LGM	M	20	9	LGM	LGM	0.83	0.50	-0.33	-0.33	0.00	0.33	0.00	0.00	0.00	
LGM	M	21	12	LGM	LGM	2.00	1.67	-0.33	0.00	-0.83	-0.83	0.00	-0.83	-0.83	
LGM	M	20	19	LGM	LGM	0.67	1.17	0.50	0.00	-0.33	-0.33	0.33	-0.67	-1.00	
LGM	M	19	34	LGM	LGM	1.83	0.43	-1.40	-1.33	0.12	1.45	-0.67	0.21	0.88	
LGM	M	19	37	LGM	LGM	1.00	0.00	-1.00	0.33	0.33	0.00	-0.83	0.50	1.33	
LGM	M	21	42	LGM	LGM	1.33	2.00	0.67	-0.83	-1.33	-0.50	-0.83	-1.50	-0.67	
LGM	M	20	49	LGM	LGM	1.33	1.33	0.00	-0.33	-0.17	0.16	-0.17	-0.17	0.00	
LGM	M	26	68	LGM	LGM	0.50	1.00	0.50	0.17	-0.83	-1.00	-1.00	-1.00	0.00	
	M	21				1.19	1.01	-0.17	-0.29	-0.38	-0.09	-0.40	-0.43	-0.04	MEAN
LGM		21				1.22	1.07	-0.15	-0.26	-0.26	-0.01	-0.41	-0.35	0.06	MEAN
SGM	F	21	10	SGM	SGM	-0.17	-0.17	0.00	0.83	0.67	-0.16	-0.67	-0.17	0.50	
SGM	F	24	15	SGM	SGM	-0.33	-0.33	0.00	1.17	0.83	-0.34	0.83	0.50	-0.33	
SGM	F	22	20	SGM	SGM	0.17	0.00	-0.17	1.00	0.50	-0.50	-0.33	0.17	0.50	
SGM	F	28	45			-0.33	0.33	0.66	1.33	0.83	-0.50	0.17	0.00	-0.17	
SGM	F	23	47	SGM	SGM	0.17	0.50	0.33	0.50	0.50	0.00	-0.17	0.33	0.50	
SGM	F	19	69	SGM	SGM	-0.17	0.33	0.50	1.67	1.00	-0.67	0.00	-0.50	-0.50	
SGM	F	20	75	SGM	SGM	0.83	0.83	0.00	0.67	0.83	0.16	-0.83	-0.33	0.50	
SGM	F	21	76	SGM	SGM	-1.00	0.50	1.50	1.67	0.17	-1.50	0.83	0.00	-0.83	
	F	22				-0.10	0.25	0.35	1.11	0.67	-0.44	-0.02	0.00	0.02	MEAN

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	LGM 1	LGM 2	LGM CHG	SGM 1	SGM 2	SGM CHG	IM 1	IM 2	IM CHG	
SGM	M	19	4	SGM	SGM	0.67	0.43	-0.24	1.83	0.12	-1.71	-0.33	0.21	0.54	
SGM	M	21	16	SGM	SGM	-0.67	0.33	1.00	0.67	1.50	0.83	-0.50	-0.50	0.00	
SGM	M	45	23	IM	IM	0.50	0.43	-0.07	0.67	0.12	-0.55	0.17	0.21	0.04	
SGM	M	18	71	IM		-0.50	-0.33	0.17	1.33	0.17	-1.16	0.50	0.33	-0.17	
	M	26				0.00	0.22	0.22	1.13	0.48	-0.65	-0.04	0.06	0.10	MEAN
SGM		23				-0.07	0.24	0.31	1.11	0.60	-0.51	-0.03	0.02	0.05	MEAN
REDUCED SAMPLE		22				0.33	0.43	0.10	0.41	0.11	-0.30	0.13	0.21	0.08	MEAN
SIZE		29													

APPENDIX R

COMPARISON OF PRE- AND POST-INSTRUCTION MEASURED CHARACTERISTICS

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	MAS 1	MAS 2	MAS CHG	PRCA 1	PRCA 2	PRCA CHG	
IM	F	20	67	IM	IM	-0.95	-0.85	0.10	0.72	0.56	-0.16	
IM	F	20	70	IM	IM	1.15	0.05	-1.10	-0.12	-0.04	0.08	
	F	20				0.10	-0.40	-0.50	0.30	0.26	-0.04	MEAN
IM	M	44	5	IM	IM	0.60	0.55	-0.05	-1.16	-1.08	0.08	
IM	M	19	25	IM	IM	1.15	1.15	0.00	-0.23	-0.40	-0.17	
IM	M	19	38	IM	IM	0.65	0.70	0.05	-0.23	0.00	0.23	
IM	M	21	72	IM		0.55	-0.55	-1.10	-0.20	-0.48	-0.28	
IM	M	19	77	IM	IM	0.25	0.05	-0.20	-0.23	0.00	0.23	
IM	M	18	79	IM		-0.40	-0.50	-0.10	-0.16	-0.26	-0.10	
	M	23				0.47	0.23	-0.23	-0.37	-0.37	-0.00	MEAN
IM		23				0.38	0.08	-0.30	-0.20	-0.21	-0.01	MEAN
LGM	F	19	40	LGM	LGM	-0.65	0.75	1.40	0.08	0.64	0.56	
	F	19				-0.65	0.75	1.40	0.08	0.64	0.56	MEAN
LGM	M	20	9	LGM	LGM	-0.65	-0.15	0.50	-0.40	-0.28	0.12	
LGM	M	21	12	LGM	LGM	-0.60	-0.80	-0.20	-0.32	-0.68	-0.36	
LGM	M	20	19	LGM	LGM	-0.80	-0.85	-0.05	0.20	0.68	0.48	
LGM	M	19	34	LGM	LGM	-0.75	0.20	0.95	-0.23	0.00	0.23	
LGM	M	19	37	LGM	LGM	0.85	0.15	-0.70	0.12	0.08	-0.04	
LGM	M	21	42	LGM	LGM	0.25	-0.30	-0.55	-0.80	-0.84	-0.04	
LGM	M	20	49	LGM	LGM	0.50	0.40	-0.10	-0.72	-0.96	-0.24	
LGM	M	26	68	LGM	LGM	-0.80	-0.05	0.75	0.16	-0.12	-0.28	
	M	21				-0.25	-0.18	0.08	-0.25	-0.27	-0.02	MEAN
LGM		21				-0.29	-0.07	0.22	-0.21	-0.16	0.05	MEAN
SGM	F	21	10	SGM	SGM	0.15	0.25	0.10	-0.80	-0.52	0.28	
SGM	F	24	15	SGM	SGM	0.60	0.35	-0.25	-0.24	-0.52	-0.28	
SGM	F	22	20	SGM	SGM	-0.85	-0.65	0.20	0.08	-0.08	-0.16	
SGM	F	28	45			-0.80	-0.50	0.30	0.00	-0.32	-0.32	
SGM	F	23	47	SGM	SGM	1.45	1.60	0.15	-0.36	-0.60	-0.24	
SGM	F	19	69	SGM	SGM	-1.45	-0.90	0.55	-0.24	-0.24	0.00	
SGM	F	20	75	SGM	SGM	0.55	0.00	-0.55	-0.44	-0.20	0.24	
SGM	F	21	76	SGM	SGM	-0.65	-0.20	0.45	-0.48	-0.16	0.32	
	F	22				-0.13	-0.01	0.12	-0.31	-0.33	-0.02	MEAN

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	MAS 1	MAS 2	MAS CHG	PRCA 1	PRCA 2	PRCA CHG	
SGM	M	19	4	SGM	SGM	0.45	0.50	0.05	-0.64	-0.52	0.12	
SGM	M	21	16	SGM	SGM	-0.95	0.05	1.00	-0.84	-0.80	0.04	
SGM	M	45	23	IM	IM	1.00	0.00	-1.00	0.00	-0.26	-0.26	
SGM	M	18	71	IM		0.35	-0.45	-0.80	-0.23	0.00	0.23	
	M	26				0.21	0.03	-0.19	-0.43	-0.40	0.03	MEAN
SGM		23				-0.01	0.00	0.02	-0.35	-0.35	-0.00	MEAN
REDUCED SAMPLE		22				0.01	0.00	-0.01	-0.27	-0.26	0.01	MEAN
SIZE		29										

APPENDIX S

POST-INSTRUCTION EVALUATION

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	MODEL EVALUATION CHOICE	ORIENT	MEAN	ENVIRONMENT EVALUATION METHOD	TEACH	GRADE	MEAN	TEACHER RECEP	
IM	F	20	67	IM	IM	2	1	1.50	2	1	1	1.30	1.07	
IM	F	20	70	IM	IM	1	2	1.50	2	2	2	2.00	1.17	
	F	20				1.50	1.50	1.50	2.00	1.50	1.50	1.65	1.12	MEAN
IM	M	44	5	IM	IM	0	0	0.00	1	2	1	1.30	1.20	
IM	M	19	25	IM	IM	2	2	2.00	2	2	2	2.00	1.28	
IM	M	19	38	IM	IM	1	1	1.00	1	1	1	1.00	0.95	
IM	M	21	72	IM		1	2	1.50	1	1	0	0.70	0.42	
IM	M	19	77	IM	IM	1	1	1.00	1	1	1	1.00	1.02	
IM	M	18	79	IM		2	2	2.00	2	2	2	2.00	1.13	
	M	23				1.17	1.33	1.25	1.33	1.50	1.17	1.33	1.00	MEAN
IM		23				1.25	1.38	1.31	1.50	1.50	1.25	1.41	1.03	MEAN
LGM	F	19	40	LGM	LGM	1	-1	0.00	2	2	0	1.30	1.44	
	F	19				1.00	-1.00	0.00	2.00	2.00	0.00	1.30	1.44	MEAN
LGM	M	20	9	LGM	LGM	1	1	1.00	2	2	1	1.70	1.40	
LGM	M	21	12	LGM	LGM	1	1	1.00	1	2	1	1.30	1.09	
LGM	M	20	19	LGM	LGM	2	1	1.50	1	1	1	1.00	1.06	
LGM	M	19	34	LGM	LGM	2	-2	0.00	0	1	1	0.70	-0.07	
LGM	M	19	37	LGM	LGM	1	1	1.00	1	1	1	1.00	0.05	
LGM	M	21	42	LGM	LGM	1	0	0.50	2	2	1	1.70	1.41	
LGM	M	20	49	LGM	LGM	2	0	1.00	2	1	1	1.30	1.45	
LGM	M	26	68	LGM	LGM	1	2	1.50	2	2	0	1.30	1.91	
	M	21				1.38	0.50	0.94	1.38	1.50	0.88	1.25	1.04	MEAN
LGM		21				1.33	0.33	0.83	1.44	1.56	0.78	1.26	1.08	MEAN
SGM	F	21	10	SGM	SGM	1	1	1.00	2	2	2	2.00	0.75	
SGM	F	24	15	SGM	SGM	0	0	0.00	1	1	1	1.00	0.88	
SGM	F	22	20	SGM	SGM	1		1.00	2	2	1	1.70	1.02	
SGM	F	28	45			2	0	1.00	2	1	1	1.30	0.81	
SGM	F	23	47	SGM	SGM	0		0.00	1	1	1	1.00	0.67	
SGM	F	19	69	SGM	SGM	1	1	1.00	0	1	1	0.70	0.72	
SGM	F	20	75	SGM	SGM	1	1	1.00	1	0	0	0.30	0.07	
SGM	F	21	76	SGM	SGM	1	1	1.00	1	-1	1	0.30	-0.12	
	F	22				0.88	0.67	0.75	1.25	0.88	1.00	1.04	0.60	MEAN

ENV 1	SEX	AGE	PAC #	ENV 2	ENV 3	MODEL CHOICE	EVALUATION ORIENT	EVALUATION MEAN	ENVIRONMENT METHOD	ENVIRONMENT TEACH	ENVIRONMENT GRADE	ENVIRONMENT MEAN	TEACHER RECEP	
SGM	M	19	4	SGM	SGM	1	2	1.50	1	1	1	1.00	0.91	
SGM	M	21	16	SGM	SGM	1	1	1.00	2	2	2	2.00	1.94	
SGM	M	45	23	IM	IM	2	2	2.00	0	0	0	0.00	0.95	
SGM	M	18	71	IM									0.87	
	M	26				1.33	1.67	1.50	1.00	1.00	1.00	1.00	1.17	MEAN
SGM		23				1.00	1.00	0.95	1.18	0.91	1.00	1.03	0.79	MEAN
REDUCED SAMPLE		22				1.18	0.88	1.02	1.36	1.29	1.00	1.21	0.95	MEAN
SIZE		29												

APPENDIX T

POST-STUDY ARCHIVE DATA

ENV 1	SEX	AGE	PAC #	NUMBER OF SESS	PGCC CRED	PGCC QP	PGCC QPA	TOTAL SESS	NUMBER OF CRED	TOTAL QP	TOTAL QPA	
IM	F	20	67	4	65	214	3.29	4	65	214	3.29	
IM	F	20	70	3	44	155	3.52	5	54	183	3.39	
IM	F	20	73	4	62	164	2.65	4	62	164	2.65	
	F	20		3.7	57	178	3.15	4.3	60	187	3.11	MEAN
IM	M	44	5	9	66	247	3.74	9	66	247	3.74	
IM	M	20	17	6	50	149	2.98	6	50	149	2.98	
IM	M	28	18	8	47	105	2.23	8	47	105	2.23	
IM	M	19	25	6	62	151	2.44	7	67	167	2.49	
IM	M	19	38	4	64	130	2.03	4	64	130	2.03	
IM	M	22	44	6	53	160	3.02	6	53	160	3.02	
IM	M	21	72	9	75	161	2.15	9	75	161	2.15	
IM	M	21	74	6	66	187	2.83	6	66	187	2.83	
IM	M	19	77	6	67	147	2.19	6	67	147	2.19	
IM	M	18	79	4	39	65	1.67	5	53	87	1.64	
	M	23		6.4	59	150	2.53	6.6	61	154	2.53	MEAN
IM		22		5.8	58	157	2.67	6.1	61	162	2.66	MEAN
LGM	F	19	40	11	62	155	2.50	11	62	155	2.50	
LGM	F	19	41	5	67	227	3.39	5	67	227	3.39	
LGM	F	24	43	5	31	86	2.77	5	31	86	2.77	
	F	21		7.0	53	156	2.89	7.0	53	156	2.89	MEAN
LGM	M	19	3	1	11	0	0.00	2	23	30	1.30	
LGM	M	22	6	16	72	146	2.03	16	72	146	2.03	
LGM	M	19	7	8	71	180	2.54	8	71	180	2.54	
LGM	M	19	8	4	62	218	3.52	4	62	218	3.52	
LGM	M	20	9	4	65	214	3.29	4	65	214	3.29	
LGM	M	21	12	4	57	145	2.54	6	77	157	2.04	
LGM	M	20	19	4	56	175	3.13	4	56	175	3.13	
LGM	M	31	21	12	47	114	2.43	12	47	114	2.43	
LGM	M	19	34	4	57	164	2.88	4	57	164	2.88	
LGM	M	19	37	7	82	260	3.17	7	82	260	3.17	
LGM	M	21	42	6	28	81	2.89	8	58	166	2.86	
LGM	M	20	49	5	30	37	1.23	5	30	37	1.23	
LGM	M	21	65	20	103	163	1.58	20	103	163	1.58	
LGM	M	26	68	9	55	146	2.65	10	61	158	2.59	
LGM	M	19	80	10	76	173	2.28	10	76	173	2.28	
	M	21		7.6	58	148	2.41	8.0	63	157	2.46	MEAN
LGM		21		7.5	57	149	2.49	7.8	61	157	2.53	MEAN

ENV 1	SEX	AGE	PAC #	NUMBER OF SESS	PGCC CRED	PGCC QP	PGCC QPA	TOTAL SESS	NUMBER OF CRED	TOTAL QP	TOTAL QPA	
S6M	F	21	10	6	64	206	3.22	6	64	206	3.22	
S6M	F	19	11	10	53	101	1.91	10	53	101	1.91	
S6M	F	24	15	10	63	230	3.65	10	63	230	3.65	
S6M	F	22	20	7	61	147	2.41	7	61	147	2.41	
S6M	F	33	24	9	43	62	1.44	13	68	62	0.91	
S6M	F	28	45	8	64	180	2.81	13	85	204	2.40	
S6M	F	19	46	5	41	61	1.49	5	41	61	1.49	
S6M	F	23	47	5	34	70	2.06	5	34	70	2.06	
S6M	F	19	50	2	5	7	1.40	2	5	7	1.40	
S6M	F	19	66	14	74	115	1.55	14	74	115	1.55	
S6M	F	19	69	6	71	238	3.35	7	83	268	3.23	
S6M	F	20	75	6	74	226	3.05	6	74	226	3.05	
S6M	F	21	76	6	51	103	2.02	9	88	163	1.85	
	F	22		7.2	54	134	2.34	8.2	61	143	2.24	MEAN
S6M	M	20	2	6	34	59	1.74	6	34	59	1.74	
S6M	M	19	4	11	106	349	3.29	11	106	349	3.29	
S6M	M	21	13	9	61	144	2.36	11	73	165	2.26	
S6M	M	21	14	7	37	81	2.19	7	37	81	2.19	
S6M	M	21	16	8	55	109	1.98	13	97	141	1.45	
S6M	M	45	23	7	59	165	2.80	7	59	165	2.80	
S6M	M	19	33	2	16	9	0.56	2	16	9	0.56	
S6M	M	21	36	4	36	53	1.47	4	36	53	1.47	
S6M	M	19	39	5	47	159	3.38	5	47	159	3.38	
S6M	M	18	71	8	64	156	2.44	8	64	156	2.44	
S6M	M	20	78	5	62	191	3.08	5	62	191	3.08	
	M	22		6.5	52	134	2.30	7.2	57	139	2.24	MEAN
S6M		22		6.9	53	134	2.32	7.8	59	141	2.24	MEAN
FULL SAMPLE		22		6.8	56	144	2.46	7.4	60	151	2.44	MEAN
SIZE		55										

BIBLIOGRAPHY

Adams, S., and Von Brock, R. C. "The Development of the A-V Scale of Attitudes Toward mathematics." Journal of Educational Measurement. 4: 247-248, 1967.

Adorno, T. W., Frenkel-Brunswik, E., Levinson, D. J., and Sanford, N. The Authoritarian Personality. New York: Harper, 1950.

Aiken, L. R. "Personality Correlates of Attitude Toward Mathematics." Journal of Educational Research. 56: 476-480, 1963.

Aiken, L. R. "Attitudes Toward Mathematics." Review of Educational Research. 40: 551-596, 1970.

Aiken, L. R. "Affective Variables and Sex Differences in Mathematical Abilities." Paper presented at the annual meeting of the American Educational Research Association, Chicago, April, 1974.

Aiken, L. R., and Dreger, R. M. "The Effect of Attitudes on Performance in Mathematics." Journal of Educational Psychology. 52: 19-24, 1961.

Allen, J. E., Jr. "Does Anybody Hear?" Address given at commencement exercises. University of Notre Dame, 1970.

Allendoerfer, C. B. "The Second Revolution in Mathematics." The Mathematics Teacher. 58: 690-695, December 1965.

Alpert, R., Stellwagon, G., and Becker, D. "Psychological Factors in Mathematics Education." Newsletter. No. 15, School Mathematics Study Group, Stanford University, 1963.

Altman, I., and Haythorn, W. W. "The Ecology of Isolated Groups." Behavioral Science. 12: 169-182, 1967.

American College Personnel Association. "A Proposed Statement For American College Personnel Association Regarding the Use of Group Experiences in Higher Education." Journal of College Student Personnel. 13: 90-96, 1972.

American College Personnel Association. "Addendum I: Guidelines for Group Facilitators in Higher Education." Journal of College Student Personnel. 15: 157-159, 1974.

American College Personnel Association. "Addendum II: Guidelines for the Preparation of Group Facilitators." Journal of College Student Personnel. 16: 342, 1975

Anttonen, R. G. An Examination into the Stability of mathematics Attitude and its Relationship to Mathematics Achievement from Elementary to Secondary School Level. Doctoral Dissertation. University of Minnesota. Ann Arbor: University Microfilms, No. 68-1521, 1968.

Arbuckle, D. W. "Self Ratings and Test Scores on Two Standardized Personality Inventories." Personnel and Guidance Journal. 37: 292-293, 1958.

Argyle, M., and Dean, J. "Eye Contact, Distance, and Affiliation." Sociometry. 28: 289-304, 1965.

Atkinson, J. W. "The Mainsprings of Achievement-Oriented Activity." Learning and the Educational Process. Krumboltz, J. D., Editor. Chicago: Rand McNally, 1965.

Axen, R. "Faculty Response to Student Dissent." Stress and Campus Response. Smith, G. K., Editor. San Francisco: Jossey-Bass Publishers, 1968.

Bales, R. F. Interaction Process Analysis. Cambridge: Addison-Wesley, 1950.

Bales, R. F., and Borgotta, E. F. "Size of Group as a Factor in the Interaction Profile." Small Groups. Hare, P., et al., Editors. New York: Knopf, 1955.

Bardeen, J. P. "Interpersonal Perception through the Tactile, Verbal, and Visual Modes. Paper presented at the International Communication Association annual convention. Phoenix, Arizona, April 1971.

Bashore, D. N. "Relationships among Speech Anxiety, IQ, and High School Achievement." M.S. Thesis. Illinois State University, 1971.

Bass, B. M. "An Analysis of the Leaderless Group Discussion." Journal of Applied Psychology. 33: 527-533, 1949.

Bass, B. M., and Klubeck, S. "Effects of Seating Arrangement on Leaderless Group Discussions." Journal of Abnormal and Social Psychology. 47: 724-727, 1952.

Bavelas, A. "Communication Patterns in Task-Oriented Groups." Group Dynamics. Cartwright, D., and Zanda, A., Editors. Evanston: Row, Peterson, and Company, 1962.

Beach, L. R. "Learning and Student Interaction in Small Self-Directed College Groups." Final Report. Washington: U. S. Department of Health, Education, and Welfare, 1970. (ED 026 027)

Becker, J. R. "A Proposal to Study the Treatment of Females and Males in Mathematics Classes." Unpublished paper. University of Maryland Mathematics Project, 1978.

Begle, E. G. "Some Lessons Learned by SMSG." The Mathematics Teacher. 66: 207-214, 1973.

Belmont, L., and Marolla, F. A. "Birth Order, Family Size, and Intelligence." Science. 182: 1096-1101, 1973.

Biddle, B. J., and Ellena, W. J., Editors. Contemporary Research on Teacher Effectiveness. New York: Holt, Rinehart, and Winston, 1964.

Bills, R. E., Vance, E. L., and McLean, O. S. "An Index of Adjustment and Values." Journal of Consulting Psychology. 15: 257-261, 1951.

Bills, R. E. "Dimensions of the Dilemma." Self-Concept, Advances in Theory and Research. Lynch, M. D., Norem-Hebeisen, A. A., and Gergen, K. J., Editors. Cambridge: Ballinger Publishing Company, 1981.

Blake, R. R., and Mouton, J. S. "Comprehension of Own and Out-Group Positions Under Intergroup Competition." Journal of Conflict Resolution. 5: 304-310, 1961.

Blanchard, F. A., Adelman, L., and Cook, S. W. "The Effect of Group Success and Failure upon Interpersonal Attraction in Cooperating Interracial Groups." Journal of Personality and Social Psychology. 1974.

Blau, P. M. "Cooperation and Competition in a Bureaucracy." American Journal of Sociology. 59: 530-535, 1954.

Bledsoe, J. C., and Garrison, K. C. Self Concepts of Elementary School Children in Relation to Their Academic Achievement, Intelligence, Interests, and Manifest Anxiety. United States Office of Education Cooperative Research Project 1008. The University of Georgia, College of Education, 1962.

Blocker, C. E. "Are Our Faculties Competent?" Junior College Journal. 36: 12-17, 1965-1966.

Bloom, B. S. "Thought-Processes in Lectures and Discussions." Journal of General Education. 7: 160-169, 1953.

Bogue, J. P. The Community College. First Edition. New York: McGraw-Hill Book Company, 1950.

Bonney, M. E. "Sociometric Study of Agreement Between Teacher Judgements and Student Choices: In Regard to the Number of Friends Possessed by High School Students." Sociometry. 10: 133-146, 1947.

Bonoma, T. V., Tedeschi, J. T., and Helm, B. "Some Effects of Target Cooperation and Reciprocated Promises on Conflict Resolution." Sociometry. 37: 251-261, 1974.

Boocock, S. S. An Introduction to the Sociology of Learning. Boston: Houghton Mifflin Company, 1972.

Born, D. G. "Student Withdrawals in Personalized Instruction Courses and in Lecture Courses." "Personalized Instruction: A National Trend Moves into the Rocky Mountain Region". Newman, F., Chairperson. Symposium presented a meeting of Rocky Mountain Psychological Association, Denver, May 1971.

Born, D. G., Gledhill, S. M., and Davis, M. L. "Examination Performance in Lecture-Discussion and Personalized Instruction Courses." Personalized System of Instruction. Sherman, J. G., Editor. Menlo Park: W. A. Benjamin, Inc., 1974.

Brechting, M. C., and Hirsch, C. R. "The Effects of Small-Group Discovery Learning on Student Achievement and Attitudes in Calculus." MATYC Journal. 2: 77-82, 1977.

Breland, H. M. "Birth Order, Family Configuration, and Verbal Achievement." Paper presented to the Midwestern Psychological Association Annual Meeting. Chicago: 1973.

Brinkley, S. G. "Mental Activity in College Classes: Student Estimate of Relative Value in Ten Learning Situations." Journal of Experimental Education. 20: 373-378, 1952.

Brookover, W. B., et al. Self-Concept of Ability and School Achievement II: Improving Academic Achievement Through Students' Self-Concept Enhancement. U. S. Office of Education, Cooperative Research Project No. 1636. East Lansing: Office of Research and Publications, Michigan State University, 1965.

Brophy, J. E., and Good, T. L. "Teachers' Communication of Differential Expectations for Children's Classroom Performance: Some Behavioral Data." Journal of Educational Psychology. 61: 365-374, 1970.

Bruner, J. S. Toward a Theory of Instruction. New York: W. W. Norton & Company, Inc., 1968.

Burgess, R. L. "Communication Networks: An Experimental Re-evaluation." Journal of Experimental Social Psychology. 4: 338-349, 1968.

Burgoon, J. K. "The Unwillingness-to-Communicate Scale: Development and Validation." Communication Monographs. 43: 60-69, 1976.

Burgoon, J. K., and Burgoon, M. "Unwillingness to Communicate, Anomia-Alienation and Communication Apprehension as Predictors of Small Group Communication." Journal of Psychology. 88: 31-38, 1974.

Buss, A. R., and Poley, W. Individual Differences: Traits and Factors. New York: Gardner Press, Inc., 1976.

Buswell, M. M. "The Relationship Between the Social Structure of the Classroom and the Academic Success of the Pupils." Journal of Experimental Education. 22: 37-52, 1953.

Campbell, D. T., Kruskal, W. H., and Wallace, W. P. "Seating Agregation as an Index of Attitude." Sociometry. 29: 1-15, 1966.

Canada, M. L. "Sex Differences in Mathematics Achievement." Unpublished paper. University of Maryland Mathematics Project, 1979.

Carnegie Commission on Higher Education. The Open-Door Colleges: Policies for Community Colleges. New York: McGraw-Hill Book Company, 1970.

Carroll, L. Alice's Adventures in Wonderland and Through the Looking-glass. New York: Lancer Books, Inc., 1968.

Center for the Study of Community Colleges. "Report of Instructor Surveys, 1977-1978." Unpublished report, 1978(A).

Center for the Study of Community Colleges. "Science and Humanities Instruction in Two-Year Colleges." Unpublished report, 1978(B).

Chickering, D. S. Education and Identity. San Francisco: Jossey-Bass Publishers, 1969.

Clark, B. R. The Open Door College: A Case Study. New York: McGraw-Hill Book Company, 1960.

Cohen, A. M. "Changing Small Group Communication Networks." Journal of Communication. 11: 116-124, 128, 1961.

Cohen, A. M. "Changing Small-Group Communication Networks." Administrative Science Quarterly. 6: 443-462, 1962.

Cohen, A. M. and Brawer, F. B. Confronting Identity: The Community College Instructor. Englewood Cliffs: Prentice-Hall, Inc., 1972.

Cohen, A. M. Work Satisfaction Among Junior College Faculty Members. Los Angeles: University of California and ERIC Clearinghouse for Junior Colleges, 1973. (ED 081 426)

Cohen, A. M., and Brawer, F. B. "Adaptive Potential and First-Year Teaching Success." Journal of Teacher Education. 43: 179-185, 1967.

Cohen, A. M., and Brawer, F. B. The Two-Year College Instructor Today. New York: Praeger Publishers, 1977.

Cohen, A. M., and Brawer, F. B. The American Community College. San Francisco: Jossey-Bass Publishers, 1982.

Cohen, A. M., Rose, C., and Trent, J. W. "Teaching Technology and Methods." Second Handbook of Research on Teaching. Travers, R. M. W., Editor. Chicago: Rand McNally College Publishing Company, 1973.

Coleman, J. S. "Reward Structure and Allocation of Effort." Mathematical Methods in Small Group Processes. Stanford: Stanford University Press, 1962.

Coller, A. R. The Assessment of Self Concept in Early Childhood Education. Urbana: ERIC Clearinghouse on Early Childhood Education, University of Illinois, 1971.

Combs, A. W. "Some Observations on Self-Concept Research and Theory." Self-Concept, Advances in Theory and Research. Lynch, M. D., Norem-Hebeisen, A. A., and Gergen, K. J., Editors. Cambridge: Ballinger Publishing Company, 1981.

Combs, A. W., Courson, C. S., and Soper, D. W. "The Measurement of Self Concept and Self Report." Educational and Psychological Measurement. 23: 439-500, 1963.

Combs, A. W., and Soper, D. W. "The Self, its Derivative Terms, and Research." Journal of Individual Psychology. 13: 134-145, 1957.

Connolly, J. J., and Sepe, T. D. Do Students Want Individualization? Los Angeles: University of California and ERIC Clearinghouse for Junior College Information, July 1972. (ED 063 931)

Coopersmith, S. The Antecedents of Self-Esteem. San Francisco: W. H. Freeman and Co., Publishers, 1967.

Crombag, H. F. "Cooperation and Competition in Independent Triads." Journal of Personality and Social Psychology. 4: 692-695, 1966.

Cronbach, L. J. "How Can Instruction be Adapted to Individual Differences?" Learning and Individual Differences. A Symposium of the Learning Research and Development Center. University of Pittsburg. Gagne, R. M., Editor. Columbus: Charles E. Merrill Books, Inc., 1967

Cross, K. P. The Junior College Student: A Research Description. Princeton: Educational Testing Service, 1968. (ED 024 354)

Cross, K. P., Editor. Years of Change for Community Colleges: 1970 to 1974. Princeton: Educational Testing Service, 1975. (ED 110 111)

Cross, K. Patricia. Accent on Learning. San Francisco: Jossey-Bass Publishers, 1976.

Cross, K. Patricia. Beyond the Open Door: New Students to Higher Education. San Francisco: Jossey-Bass Publishers, 1971.

Cummins, R. E. "Some Applications of "Q" Methodology to Teaching and Educational Research." Journal of Educational Research. 57: 94-98, 1963.

Daly, J. A., and McCroskey, M. D. "Occupational Choice and Desirability as a Function of Communication Apprehension." Journal of Counseling Psychology. 22: 309-313, 1975.

Daly, J. A., and Leth, S. "Communication Apprehension and the Personnel Selection Decision." Paper presented to the International Communication Association Convention. Portland: 1976.

Damrin, D. E. "The Russell Sage Social Relations Test: A Technique for Measuring Group Problem-Solving Skills in Elementary School Children." Journal of Experimental Education. 28: 85-99, 1959.

Darley, J. G., and McNamara, W. J. Minnesota Personality Scale. New York: Psychological Corporation, 1961.

Davidson, H. H., and Greenberg, J. W. School Achievers from a Deprived Background. United States Office of Education Project No. 2805, Contract No. OE-5-10-132. New York: The City College of the City University of New York, 1967.

Davidson, N. A. The Small-Group Discovery Method of Mathematics Instruction as Applied in Calculus. Doctoral Dissertation. University of Wisconsin, 1970. Technical Report No. 168. Madison: Wisconsin Research and Development Center for Cognitive Learning, 1971.

Davidson, N. A. "The Small-Group Discovery Method as Applied in Calculus Instruction." American Mathematical Monthly. pp.789-791, August-September 1971.

Davidson, N. A. "The Small-Group Discovery Method: 1967-1977." Problem Solving Studies in Mathematics. Harvey, J., and Romberg, T., Editors. Madison: The Wisconsin Research and Development Center for Individualized Schooling, University of Wisconsin, 1979.

Davidson, N. A. "Small-Group Learning and Teaching in Mathematics: A Selective Review of the Research." Learning to Cooperate, Cooperating to Learn. Slavin, R. et. al., Editors.

DeCoster, D. A., and Mable, P., Editors. Understanding Today's Students. New Directions for Student Services, Number 16. San Francisco: Jossey-Bass Publishers, 1981.

DeLoach, J. F. An Analysis of Cognitive Style Disparity as an Antecedent of Cognitive Dissonance in Instructional Evaluation: An Exploratory Study in the Educational Sciences. Dissertation. Wayne State University, 1969.

DeLoach, J. F. Cognitive Styles and Cognitive Dissonance. Bloomfield Hills: Oakland Community College, 1970.

DeLong, A. J. "Dominance - Territorial Relations in a Small Group." Environment and Behavior. 2: 170-191, 1970.

Dessart, D. J., and Frandsen, H. "Research of Teaching Secondary-School Mathematics." Second Handbook of Research on Teaching. Travers, R. M. W., Editor. Chicago: Rand McNally College Publishing Company, 1973.

Deutsch, M. "An Experimental Study of the Effects of Cooperation and Competition Upon Group Process." Human Relations. 2: 199-232, 1949.

Deutsch, M. "Trust and Suspicion." Journal of Conflict Resolution. 2: 265-279, 1958.

Deutsch, M. "The Effect of Motivational Orientation Upon Trust and Suspicion." Human Relations. 13: 123-139, 1960.

Deutsch, M. "Cooperation and Trust: Some Theoretical Notes." Nebraska Symposium on Motivation. Jones, M. R., Editor. Lincon: University of Nebraska Press, 1962.

Deutsch, M., and Krauss, R. "Studies of Interpersonal Bargaining." Journal of Conflict Resolution. 6: 52-76, 1962.

DeVries, D. L., and Edwards, K. J. "Cooperation in the Classroom: Towards a Theory of Alternative Reward-Task Classroom Structures." Paper presented at the annual meeting of the American Educational Research Association. Chicago: April, 1974.

DeVries, D. L., Edwards, K. J., and Wells, E. H. Teams-Games-Tournament in the Social Studies Classroom: Effect on Academic Achievement, Student Attitudes, Cognitive Beliefs, and Classroom Climate. Report 173. Johns Hopkins University, Center for Social Organization of Schools, 1974.

DeVries, D. L., and Mescon, I. "Using TGT at the Moses DeWitt Elementary School: A Preliminary Report." Mimeographed report. Johns Hopkins University, Center for Social Organization of Schools, 1974.

Divoky, D., and Schrag, P. The Myth of the Hyperactive Child and Other Means of Child Control. New York: Pantheon Books, 1975.

Dosey, M., and Meisels, M. "Personal Space and Self Projection." Journal of Personality and Social Psychology. 11: 93-97, 1969.

Doty, B. A. "Teaching Method Effectiveness in Relation to Certain Student Characteristics." Journal of Educational Research. 60: 363-365, 1967.

Dreger, R. M., and Aiken, L. R. "The Identification of Number Anxiety in a College Population." Journal of Educational Psychology. 48: 344-351, 1957.

Dressel, P. L. Improving Degree Programs: A Guide to Curriculum Development, Administration, and Review. San Francisco: Jossey-Bass Inc., Publishers, 1980.

Dressel, P. L., and Marcus, D. On Teaching and Learning in College. San Francisco: Jossey-Bass Inc., Publishers, 1982.

Driscoll, W. J. "Independent Study: A New Emphasis for the 1970's." Excellence in University Teaching: New Essays. Buxton, T. H., and Prichard, K. W., Editors. Columbia: University of South Carolina Press, 1975.

Dubin, R., and Taveggia, T. C. The Teaching-Learning Paradox: A Comparative Analysis of College Teaching Methods. Eugene: Center for the Advanced Study of Educational Administration, 1968.

DuBois, P. H., et al. Instructional Techniques for Teaching Adult College Credit Courses. Office of Education, Bureau of Research. Final report BR-6-1234, Contract OEC-3-7-061134-1531. Washington, D. C.: December, 1968. (ED 027 494)

Duffy, E. J. "Directions for Learning - We Have The Tools." The '80s: Where Will The Schools Be? Reston: National Association of Secondary School Principals, pp. 4-8, 1974.

Dutton, W. H. "Attitudes of Prospective Teachers Toward Arithmetic." Elementary School Journal. 52: 84-90, 1951.

Dutton, W. H. "Attitudes of Junior High School Pupils Toward Arithmetic." School Review. 64: 18-22, 1956.

Dutton, W. H., and Blum, M. P. "The Measurement of Attitudes Toward Arithmetic with a Likert-Type Test." Elementary School Journal. 68: 259-264, 1968.

Dysart, J. M. A Study of the Effects of Inservice Training in Sociometry and Sociodrama on Teacher-Pupil Rapport and Social Climate in the Classroom. Dissertation. New York University, 1952.

Edmiston, R. W., and Braddock, R. W. "The Study of the Effect of Various Teaching Procedures Upon Observed Group Attention in the Secondary School. Journal of Educational Psychology. 32: 665-672, 1941.

Edwards, K. J., and DeVries, D. L. "Learning Games and Student Teams: Their Effects on Student Attitudes and Achievement." Center for Social Organization of Schools, The Johns Hopkins University, Report No. 147, 1972.

Edwards, K. J., and DeVries, D. L. "The Effects of Teams-Games-Tournament and Two Structural Variations on Classroom Process, Student Attitudes, and Student Achievement. Center for Social Organization of Schools, The Johns Hopkins University, Report No. 172, 1974.

Edwards, K. J., DeVries, D. L., and Snyder, J. P. "Games and Teams: A Winning Combination." Simulation and Games. 3: 247-269, 1972.

Eells, W. C. The Junior College. Boston: Houghton Mifflin, 1931.

Eells, W. C. Present Status of Junior College Terminal Education. Washington, D. C.: American Association of Junior Colleges, 1941.

Entwistle, N. J. Styles of Learning and Teaching: An Integrated Outline of Educational Psychology for Students, Teachers, and Lecturers. Chichester: John Wiley and Sons, 1981.

Entwistle, N. J., and Wilson, J. D. Degrees of Excellence: the Academic Achievement Game. London: Hodder and Stoughton, 1977.

Erikson, E. H. "Identity and the Life Cycle." Psychological Issues Monograph. Vol I(1). New York: International Universities Press, 1959.

Erikson, E. H. Childhood and Society. Second Edition. New York: W. W. Norton and Co., 1963.

Erikson, E. H. Insight and Responsibility. New York: W. W. Norton and Co., 1964.

Erikson, E. H. Identity: Youth and Crisis. New York: W. W. Norton and Co., 1968.

Erikson, E. H. "A Healthy Personality for Every Child." Concepts in Psychology. Munson, P. Editor. Lexington: D. C. Heath and Company, 1974.

Experiment on Independent Study, 1957-58. Yellow Springs: Antioch College, 1958.

Falcione, R. L., McCroskey, J. C., and Daly, J. A. "Job Satisfaction as a Function of Employees' Communication Apprehension, Self-Esteem, and Perceptions of Their Immediate Supervisor." Monograph. University of Maryland, 1976.

Fiedler, F. E. "The Effect of Leadership and Cultural Heterogeneity on Group Performance: A Test of the Contingency Model." Journal of Experimental Social Psychology. 2: 237-264, 1966.

Fisher, J. Y., and Infante, D. A. "The Relation Between Communication Anxiety and Human Motivation Variables." Central States Speech Journal. 24: 246-252, 1973.

Fizzell, R. Reschooling Society. Dissertation. Northwestern University, 1975.

Foster, F. P. "The Human Relationships of Creative Individuals." Journal of Creative Behavior. 2: 111-118, 1968.

Fox, D. J. "Conclusions of the Center's MES Evaluation." The Urban Review. 2: 17, 1968.

Fox, R. et al. Diagnosing Classroom Learning Environments. Chicago: Science Research Associates, Inc., 1966.

Freimuth, V. S. "The Effects of Communication Apprehension on Communication Effectiveness." Human Communication Research. 2: 289-298, 1976.

Gall, M. D., and Gall, J. P. "Discussion Method." The National Society for the Study of Education Yearbook. Part I. 1971.

Gallicchio, A. The Effects of Brainstorming in Small Group Mathematics. Doctoral Dissertation. University of Maryland, 1976.

Garrison, K. R., and Garrison, J. P. "Measurement of Talking Apprehension in the Elementary School." Monograph. Department of Psychology, West Virginia University, 1976.

Garrison, R. H. Junior College Faculty: Issues and Problems. A Preliminary National Appraisal. Washington D. C.: American Association of Junior Colleges, 1967. (ED 012 177)

Getzels, J. W. "Images of the Classroom and Visions of the Learner." Learning Environments. David, T. G. and Wright, B. D., Editors. Chicago: The University of Chicago Press, 1975.

Getzels, J. W., and Thelen, H. A. "The Classroom Group as a Unique Social System." Social Interaction in Educational Settings. Yee, A. H., Editor. Englewood Cliffs: Prentice-Hall, Inc., 1971.

Gilchrist, J. C., Shaw, M. E., and Walker, L. C. "Some Effects of Unequal Distribution of Information in a Wheel Group Structure." Journal of Abnormal and Social Psychology. 49: 554-556, 1954.

Gleason, G. T., Editor. The Theory and Nature of Independent Learning. Scranton: International Textbook company, 1967.

Goals for School Mathematics, The Report of the Cambridge Conference on Mathematics. Boston: Houghton Mifflin Company, 1963.

Goldberg, M. L., et al. The Effects of Ability Grouping. New York: Columbia University-Teachers College Press, 1966.

Goldman, M. "A Comparison of Individual and Group Performance for Varying Combinations of Ability." Journal of Personality and Social Psychology. 1: 210-216, 1965.

Goldstein, K. M., and Blackman, S. Cognitive Style: Five Approaches and Relevant Research. New York: John Wiley and Sons, 1978.

Good, T. L., and Brophy, J. E. "Behavioral Expression of Teacher Attitudes." Journal of Educational Psychology. 63: 617-624, 1972.

Goodlad, J. I. School, Curriculum, and the Individual. Waltham: Blaisdell Publishing Company, 1966.

Gordon, I. J. A Test Manual for the How-I-See-Myself-Scale. Florida Educational Research and Development Council. Gainesville: University of Florida, 1968.

Grant, S. J. The Effects of Three Kinds of Group Formation Using FIRO-B Compatibility, Sociometric Choice with Group Dynamics Exercises, and In-Class Choice on Mathematics Classes Taught by the Small-Group Discovery Method. Doctoral Dissertation. University of Maryland, 1975.

Green, B. A. "Fifteen Reasons Not to Use the Keller Plan." Personalized System of Instruction. Sherman, J. G., Editor. Menlo Park: W. A. Benjamin, Inc., 1974.

Gronlund, N. E. Sociometry in the Classroom. New York: Harper, 1959.

Gruber, H. E., and Weitman, M. Self-Directed Study: Experiments in Higher Education. Boulder: University of Colorado, Behavior Research laboratory Report No. 19, 1962.

Guetzkow, H., and Dill, W. R. "Factors in the Organizational Development of Task-Oriented Groups." Sociometry. 20: 175-204, 1957.

Guetzkow, H., and Simon, H. A. "The Impact of Certain Communication Nets upon Organization and Performance in Task-Oriented Groups." Management Science. 1: 233-250, 1955.

Haines, D. B., and McKeachie, W. J. "Cooperative Versus Competitive Discussion Methods in Teaching Introductory Psychology." Journal of Education Psychology. 58: 386-390, 1967.

Hall, E. T. The Silent Language. Connecticut: Fawcett, 1959.

Hamblin, R. L., et al. "Changing the Game from 'Get the Teacher' to 'Learn.'" Transaction. 6: 20-31, 1969.

Hamilton, P. R. "The Effect of Risk Proneness of Small Group Interaction, Communication Apprehension, and Self-Disclosure." M. S. Thesis. Illinois State University, 1972.

Hardy, N. T. A Survey Designed to Refine an Inventory of Teaching Styles To Be Used by Individuals Preparing for College Teaching. Doctoral Dissertation. Michigan State University, 1976.

Hare, A. P. "Interaction and Consensus in Different Sized Groups." American Sociological Review. 17: 261-267, 1952.

Hare P., A., and Bales, R. F. "Seating Position and Small Group Interaction." Sociometry. 26: 480-486, 1963.

Hearn, G. "Leadership and the Spatial Factor in Small Groups." Journal of Abnormal and Social Psychology. 54: 269-272, 1957.

Heist, P. "Creative Students: College Transients." The Creative College Student: An Unmet Challenge. Heist, P., Editor. San Francisco: Jossey-Bass Inc., Publishers, 1968.

Heist, P., and Wilson, R. "Curricular Experience for the Creative." The Creative College Student, An Unmet Challenge. Heist, P., Editor. San Francisco: Jossey-Bass Publishers, 1968.

Hildenbrand, R. "Measuring Attitudes Toward Learning Mathematics in a Small Group." Unpublished Paper. College Park: University of Maryland, College of Education, Mathematics Project, 1976.

Hill, J. E. The Educational Sciences. Unpublished Manuscript. Bloomfield Hills: Oakland Community College, 1971(A).

Hill, J. E. Symbols and Their Meanings. Unpublished Manuscript. Bloomfield Hills: Oakland Community College, 1971(B).

Hill, J. E. Qualitative Symbols. Unpublished Manuscript. Bloomfield Hills: Oakland Community College, 1971(C).

Hinrichsen, K. A. Evaluative Comparison of Programmed System of Instruction and Traditional Lecture Approaches in a Basic Administration of Justice Class at Cerritos College. Practicum. Nova University, July 1975. (ED 114 143)

Hirota, K. "Group Problem Solving and Communication." Japanese Journal of Psychology. 24: 176-177, 1953.

Hoberock, L. L., Koen, B. V., Roth, C. H., and Wagner, G. R. "Theory of PSI Evaluated for Engineering Education." Personalized System of Instruction. Sherman, J. G., Editor. Menlo Park: W. A. Benjamin, Inc., 1974.

Hoffman, L. R. "Homogeneity of Member Personality and its Effect on Group Problem Solving." Journal of Abnormal and Social Psychology. 58: 27-32, 1959.

Hoffman, L. R., and Maier, N. R. F. "Quality and Acceptance of Problem Solutions by Members of Homogeneous and Heterogeneous Groups." Journal of Abnormal and Social Psychology. 62: 401-407, 1961.

Hoover, K. H. College Teaching Today: A Handbook for Postsecondary Teaching. Boston: Allyn and Bacon, Inc., 1980

Hoover, K. H., Baumann, V. H., and Shafer, S. M. "The Influence of Class-Size Variations on Cognitive and Affective Learning of College Freshmen." The Journal of Experimental Education. 38: 39-43, 1970.

Horowitz, M. J., Duff, D. F., and Stratton, L. O. "Body Buffer Zone." Archives of General Psychiatry. 11: 651-656, 1964.

Hovey, D. E., Gruber, H. E., and Terrell, G. "Effects of Self-Directed Study on Course Achievement, Retention, and Curiosity." Journal of Educational Research. 56: 346-351, 1963.

Howells, L. T., and Becker, S. W. "Seating Arrangement and Leadership Emergence." Journal of Abnormal and Social Psychology. 64: 148-150, 1962.

Hudson, L. Frames of Mind. London: Methuen, 1968.

Hunt, D. "Person-Environment Interaction: A Challenge Found Wanting Before It Was Tried." Review of Educational Research. 45(2): 209-230, Spring 1975.

Hulten, B. H. "Games and Teams: An Effective Combination in the Classroom." Paper presented at the Annual Meeting of the American Educational Research Association. Chicago: April, 1974.

Hulten, B. H., and DeVries, D. L. "Team Competition and Group Practice: Effects on Student Achievement and Attitudes." Center for Social Organization of Schools, The Johns Hopkins University, Report No. 212, 1976.

Husen, T., Editor. International Study of Achievement in Mathematics. Vols I and II. New York: Wiley, 1967.

Hurt, H. T., and Joseph, K. "The Impact of Communication Apprehension in the Process of Social Change." Paper presented to the Eastern Communication Association Convention. New York: 1975.

Hurt, H. T., Preiss, R., and Davis, B. "The Effects of Communication Apprehension of Middle-School Children on Sociometric Choice, Affective, and Cognitive Learning." Paper presented to the International Communication Association Convention. Portland: 1976.

Hurt, H. T., Scott, M. D., and McCroskey, J. C. Communication in the Classroom. Reading: Addison-Wesley Publishing Company, 1978.

Jackson, P. Life in Classrooms. New York: Holt, Rinehart, and Winston, 1968.

Jencks, C., et al. Inequality: A Reassessment of the Effect of Family and Schooling in America. New York: Basic Books, Inc., 1972.

Jensen, A. R. Individual Differences in Learning: Interference Factor. United States Office of Education Cooperative Research Project 1867. Berkley: University of California, 1964.

Jensen, A. R. "Varieties of Individual Differences in Learning." Learning and Individual Differences. A Symposium of the Learning Research and Development Center. University of Pittsburg. Gagne, R. M., Editor. Columbus: Charles E. Merrill Books, Inc., 1967

Jerome, J. "The American Academy 1970." Change. 1: 10-47, 1969.

Johnson, B. L. Islands of Innovation Expanding: Changes in the Community College. Beverly Hills: Glencoe Press, 1969.

Johnson, D. W. "Role Reversal: A Summary and Review of the Research." International Journal of Group Tensions. 1: 318-334, 1971.

Johnson, D. W. "Student Attitudes Toward Cooperation and Competition in a Midwestern School District." Unpublished report. University of Minnesota, 1973.

Johnson, D. W., and Johnson, R. T. Learning Together and Alone: Cooperation, Competition, and Individualization. Englewood Cliffs: Prentice-Hall, Inc., 1975

Johnson, D. W., Johnson, R. T., and Scott, L. "The Effects of Cooperative and Individualized Instruction on Student Attitudes and Achievement." Journal of Social Psychology. 104: 207-216, 1978.

Johnson, R. T. "Perceptions and Preferences Toward Cooperation and Competition in Elementary Science Classes." Mimeographed Report. University of Minnesota, 1974.

Johnson, R. T., Johnson, D. W. "The Effects of Other's Actions, Attitude, Similarity, and Race on Attraction Toward Others." Human Relations. 25: 121-130, 1972.

Johnson, R. T., Johnson, D. W., and Bryant, B. "Cooperation and Competition in the Classroom: Perceptions and Preferences as Related to Students' Feelings of Personal Control." Elementary School Journal. 73: 306-313, 1973.

Jones, S. E. "A Comparative Proxemics Analysis of Dyadic Interaction in Selected Subcultures of New York City." Journal of Social Psychology. 84: 35-44, 1971.

Jones, S. E., and Aiello, J. R. "The Acquisition of Proxemic Norms of Behavior: A Study of Lower-Class Black and Middle-Class White Children at Three Grade Levels." Unpublished paper. 1972.

Joyce, B., and Weil, M. Models of Teaching. Englewood Cliffs: Prentice-Hall, Inc., 1972.

Justice, M. T. Field Dependency, Intimacy of Topic and Interaction Distance. Dissertation. University of Florida, 1969.

Kahn, R. L. "The Prediction of Productivity." Journal of Social Issues. 12: 41-49, 1956.

Kahn, S. B., and Weiss, J. "The Teaching of Affective Responses." Second Handbook of Research on Teaching. Travers, R. M. W., Editor. Chicago: Rand McNally College Publishing Company, 1973.

Keller, F. S. "Good-Bye, Teacher...." Journal of Applied Behavior Analysis. 1: 78-89, 1968.

Keniston,K. Youth and Dissent. New York: Harcourt Brace Jovanovich, Inc., 1971.

Kleck, R. "Physical Stigma and Task-Oriented Interaction." Human Relations. 22: 51-60, 1969.

Knefelkamp, L., Wydick, C., Parker, C. A., Editors. Applying New Developmental Findings. New Directions for Student Services. Number 4. San Francisco: Jossey-Bass Publishers, 1978.

Kneller, G. F. The Art and Science of Creativity. New York: Holt, Rinehart, and Winston, 1965.

Knutson, P. K., and Lashbrook, W. B. "Communication Apprehension as an Antecedent to Social Style." Paper presented to the Speech Communication Association Convention. San Francisco: 1976.

Kolb, D. Learning Style Inventory. Boston: McBer and Company, 1976.

Koos, L. V. The Junior College. Vols. 1 and 2. Minneapolis: University of Minnesota Press, 1924.

Krasner, L., and Ullman, L. P., Editors. Case Studies in behavior Modification. New York: Holt, Rinehart, and Winston, 1965.

Laughlin, P. R., Branch, L. G., and Johnson, H. H. "Individual Versus Triadic Performance and Unidimensional Complementary Task as a Function of Initial Ability Level. Journal of Personality and Social Psychology. 12: 144-150, 1969.

Lawson, E. D. "Change in Communication Nets, Performance, and Morale." Human Relations. 18: 139-147, 1965.

Leavitt, H. J. "Some Effects of Certain Communication Patterns on Group Performance." Journal of Abnormal and Social Psychology. 46: 38-50, 1951.

Leavitt, H. J. "Some Effects of Certain Communications Patterns on Group Performance." Readings in Social Psychology. Third Edition. Maccoby, E. E. et al., Editors. New York: Holt, Rinehart, and Winston, 1958.

Lehman, G. "Family Composition and Its Influence on the Language Development of the 18-34 Month-Old Child in the American Lower and Middle Class Family." Journal of Behavioral Science. 1: 125-130, 1971.

Leith, G. O. M. "Individual Differences in Learning Interactions of Personality and Teaching Methods." Personality and Academic Progress. London: Association of Educational Psychologists, 1974.

Lipman, A. "Building Design and Social Interaction." The Architects Journal. 147: 23-30, 1968.

Lipsitt, L. P. "A Self Concept Scale for Children and its Relationship to the Children's Form of the Manifest Anxiety Scale." Child Development. 29: 463-472, 1958.

Little, K. B. "Personal Space." Journal of Experimental Social Psychology. 1: 237-247, 1965.

Loomer, N. J. A Multidimensional Exploratory Investigation of Small-Group Heuristic and Expository Learning in Calculus. Doctoral Dissertation. University of Wisconsin, 1976.

Lorge, I., and Soloman, H. "Individual Performance and Group Performance in Problem Solving Related to Group Size and Previous Exposure to the Problem." Journal of Psychology. 48: 107-114, 1959.

Lorge, I., and Soloman, H. "Group and Individual Performance in Problem Solving Related to Previous Exposure to the Problem, Level of Aspiration, and Group Size." Behavioral Science. 5: 28-39, 1960.

Lott, D. F., and Sommer, R. "Seating Arrangements and Status." Journal of Personality and Social Psychology. 7: 90-95, 1967.

Mack, R. W. "Ecological Patterns in an Industrial Shop. Social Forces. 32: 351-356, 1954

Macomber, F. G., Editor. Experimental Study in Instructional Procedures. Oxford: Miami University, 1957.

Macy, J., Christie, L. S., and Luce, R. D. "Coding Noise in a Task-Oriented Group." Journal of Abnormal Psychology. 48: 401-409, 1953.

Madden, N. A., and Slavin, R. E. "Cooperative Learning and Social Acceptance of Mainstreamed Academically Handicapped Students." Journal of Special Education. 17: 171-182, 1983.

Madsen, M. C. "Developmental and Cross-Cultural Differences in Cooperative and Competitive Behavior of Young Children." Journal of Cross-Cultural Psychology. 2: 365-371, 1971.

Madsen, M. C., and Connor, C. "Cooperative and Competitive Behavior of Retarded and Non-Retarded Children at Two Ages." Child Development. 44: 175-178, 1973.

Malone, W. H., and Freel, E. L. "A Preliminary Study of the Group Attitudes of Junior and Senior High School Students Toward Mathematics." Journal of Educational Research. 47: 599-608, 1954.

Marine, G. "I've Got Nothing Against the Colored, Understand." Ramparts. 5: 13-18, 1966.

Mayor, J. R., Henkelman, J. H., and Walbesser, H. H. "An Implication for Teacher Education of Recent Research in Mathematics Education." Journal of Teacher Education. 16: 483-490, 1965.

McBride, G., King, M. G., and James, J. W. "Social Proximity Effects on GSR in Adult Humans." Journal of Psychology. 61: 153-157, 1965.

McCroskey, J. C. "Measures of Communication-Bound Anxiety." Speech Monographs. 37: 269-277, 1970

McCroskey, J. C. "Validity of the PRCA as an Index of Oral Communication Apprehension." Paper presented to the Speech Communication Association Convention. Houston: 1975.

McCroskey, J. C. "Alternate Measures of Communication Apprehension." Monograph. West Virginia University, 1976 (A).

McCroskey, J. C. "Communication Apprehension in University and Community College Environments." Monograph. West Virginia University, 1976 (B).

McCroskey, J. C. "Normative Levels of Communication Apprehension among Elementary and Secondary School Students." Monograph. West Virginia University, 1976 (C).

McCroskey, J. C. "The Problems of Communication Apprehension in the Classroom." Paper presented to the Communication Association of the Pacific Convention. Kobe: 1976 (D).

McCroskey, J. C. "Classroom Consequences of Communication Apprehension." Communication Education. 1978 (A).

McCroskey, J. C. "Validity of the PRCA as an Index of Oral Communication Apprehension." Communication Monographs. 45: 192-203, 1978 (B).

McCroskey, J. C., and Andersen, J. F. "The Relationship between Communication Apprehension and Academic Achievement among College Students." Human Communication Research. 1978.

McCroskey, J. C., Daly, J. A., Richmond, V. P., and Cox, B. G. "The Effects of Communication Apprehension on Interpersonal Attraction." Human Communication Research. 2: 51-65, 1975.

McCroskey, J. C., Daly, J. A., and Sorensen, G. A. "Personality Correlates of Communication Apprehension." Human Communication Research. 1978.

McCroskey, J. C., and Richmond, V. P. "The Effects of Communication Apprehension on the Perception of Peers." Western Speech Communication. 40: 14-21, 1976.

McCroskey, J. C., and Richmond, V. P. "Communication Apprehension as a Predictor of Self-Disclosure." Communication Quarterly. 1978.

McCroskey, J. C., and Sheahan, M. E. "Communication Apprehension, Social Preference and Social Behavior in a College Environment." Monograph. Department of Speech Communication, West Virginia University, 1976.

McCroskey, J. C., and Sheahan, M. E. "Seating Position and Participation: An Alternative Theoretical Explanation." Paper presented to the International Communication Association Convention. Portland: 1976.

McCroskey, J. C., and Wheeless, L. R. Introduction to Human Communication. Boston: Allyn and Bacon, 1976.

McKeachie, W. L. "Procedures and Techniques of Teaching: A Survey of Experimental Studies." The American College. Sanford, N., Editor. New York: Wiley, 1962.

McKeachie, W. L. "Research on Teaching at the College and University Level." Handbook of Research on Teaching. Gage, N. L., Editor. Chicago: Rand McNally and Company, 1963.

McKeachie, W. L. Research on College Teaching: A Review. Washington: ERIC Clearing House on Higher Education, 1970.

McLelland, F. M., and Ratliff, J. A. "The Use of Sociometry as an Aid in Promoting Social Adjustment in the Ninth Grade Homeroom." Sociometry. 10: 147-153, 1947.

McMichael, J. S., and Corey, J. R. "Contingency Management in an Introductory Psychology Course Produces Better Learning." Journal of Applied Behavior Analysis. 2: 79-83, 1969.

Medsker, L. L., and Tillery, D. Breaking the Access Barriers: A Profile of Two-Year Colleges. New York: McGraw-Hill Book Company, 1971.

Miami-Dade Junior College. Learning Options and Student Achievement. Florida Department of Research, Inner College Report Number 2, June 1971. (ED 073 746)

Milliken, R. L., and Spilka, B. "Mathematical-Verbal Ability Differentials and Somatic Expressions of Situational Anxiety." Journal of Experimental Education. 31: 3-26, 1962.

Milton, O. Alternatives to the Traditional. London: Jossey-Bass, Inc., Publishers, 1972.

Monke, L. P. "Anxiety Toward Mathematics." Unpublished seminar paper, University of Maryland Mathematics Project, 1978.

Moos, R. H. Evaluating Educational Environments. San Francisco: Jossey-Bass Publishers, 1979.

Moreno, J. L. Who Shall Survive? Washington: Nervous and Mental Disorders Publishing Company, 1934.

Mulder, M. "Group Structure and Group Performance." Acta Psychologica. 16: 356-401, 1959.

Mulder, M. "Communication Structure, Decision Structure and Group Performance." Sociometry. 23: 1-14, 1960.

Myers, R. K. Some Effects of Seating Arrangements in Counseling. Dissertation. University of Florida, 1969.

Naught, G. M., and Newman, S. F. "The Effect of Anxiety on Motor Steadiness in Competitive and Non-Competitive Conditions." Psychonomic Science. 6: 519-520, 1966.

Nealeigh, T. R. Development and Validation of a Non-Verbal Attitude and Achievement Index for Mathematics. Doctoral Dissertation. Ohio State University. Ann Arbor: University Microfilms, No. 68-3039, 1968.

Nelson, L. L. The Development of Cooperation and Competition in Children from Ages Five to Ten Years Old: Effects of Sex, Situational Determinants, and Prior Experiences. Dissertation. Ann Arbor: University Microfilms, 71-669, 1970.

Nelson, L. L., and Kagan, S. "Competition: The Star-Spangled Scramble." Psychology Today. 6: 53, September 1972.

Nelson, T. F., and Scott, D. W. "Personalized Instruction in Educational Psychology." Personalized System of Instruction. Sherman, J. G., Editor. Menlo Park: W. A. Benjamin, Inc., 1974.

Nutthall, G., and Snook, I. "Contemporary Models of Teaching: Second Handbook of Research on Teaching. Travers, R. M. W., Editor. Chicago: Rand McNally College Publishing Company, 1973.

O'Banion, T. Teachers for Tomorrow: Staff Development in the Community College. Tuscon: University of Arizona Press, 1972.

Osgood, C. E., Suci, G. J., and Tannenbaum, P. H. The Measurement of Meaning. Urbana: University of Illinois Press, 1957.

Pask, G. "Conversational Techniques in the Study and Practice of Education." British Journal of Educational Psychology. 46: 12-25, 1976.

Pederson, D. J. Report to the Alameda County School District and Title III, Area J, of Pennsylvania of the Incidence of Reticence in Their Responsive School District. Alameda County, PACE Center, 1968.

Perlmutter, H. V., and Montmollin, G. "Group Learning of Nonsense Syllables." Journal of Abnormal and Social Psychology. 47: 762-769, 1952.

Phair, T. S. Staffing Patterns in Public California Community Colleges: A 1976-1977 Overview. Sacramento: California Community and Junior College Association, 1977. (ED 135 433)

Phillips, G. M. "Reticence: Pathology of the Normal Speaker." Speech Monographs. 35: 39-49, 1968.

Piers, E. V., and Harris, D. B. Piers-Harris Children's Self-Concept Scale. Nashville: Counselor Recordings and Tests, 1969.

Pinneau, S. R., and Milton, A. "The Ecological Veracity of the Self Report." Journal of Genetic Psychology. 93: 249-276, 1958.

Pohl, A. Principles of Counting. Upper Marlboro: J. W. Wills Publishing Co., 1977.

Pohl, A. Permutations and Combinations. Upper Marlboro: J. W. Wills Publishing Co., 1973.

Polanski, L. "Group Social Climate and the Teacher Supportiveness of Group Status Systems." Journal of Educational Sociology. 28: 115-123, 1954.

Postlethwait, S. N. "Students, Teachers, and Technology." Excellence in University Teaching. Buxton, T. H., and Prichard, K. W., Editors. Columbia: University of South Carolina Press, 1975.

Pressey, S. L. "A Simple Apparatus Which Gives Tests and Scores - and Teaches." School and Society. 23: 373-376, 1926.

Pressey, S. L. "A Third and Fourth Contribution Toward the Coming 'Industrial Revolution' in Education." School and Society. 36: 668-672, 1932.

Purkey, W. W. Self Concept and School Achievement. Englewood Cliffs: Prentice-Hall, Inc., 1970.

Quiggins, J. G. "The Effects of High and Low Communication Apprehension on Small Group Member Credibility, Interpersonal Attraction, and Interaction." Paper presented to the Speech Communication Association Convention. Chicago: 1972.

Randolph, F. L., and McCroskey, J. C. "Oral Communication Apprehension as a Function of Family Size: A Preliminary Investigation. Monograph. Department of Speech Communication, West Virginia University, 1976.

Rich, A. Lies, Secrets and Silences: Selected Prose 1966-1978. New York: W. W. Norton and Company, 1979.

Richer, S. "Issues in Reference to Group Theory, with Special Reference to Grouping Practices in Education." Dittoed Paper. Johns Hopkins University, Department of Social Relations, 1967.

Richmond, V. P. "Communication Apprehension and Success in the Job Application Screen Process." Monograph. West Virginia Northern Community College, 1976.

Richmond, V. P., and Robertson, D. "Communication Apprehension as a Function of Begin Raised in a Urban or Rural Environment." Monograph. West Virginia Northern Community College, 1976.

Robertson, L. Integrated Goal Structuring in the Elementary School: Cognitive Growth in Mathematics. Unpublished doctoral dissertation. Rutgers University, 1982.

Rosenfeld, H. M. "Effect of an Approval-Seeking Induction on Interpersonal Proximity." Psychological Reports. 17: 120-122, 1965.

Rosenfeld, L. B. Human Interaction in the Small Group Setting. Columbus: Charles E. Merrill Publishing Company, 1973.

Russo, N. F. "Connotations of Seating Arrangements." Cornell Journal of Social Relations. 2: 37-44, 1967.

Ryan, K., Editor. Don't Smile Until Christmas: Accounts of the First Year of Teaching. Chicago: University of Chicago Press, 1970.

Sanford, N. Self and Society. New York: Atherton Press, 1966.

Schein, E. H. The Development of Organization in Small Problem-Solving Groups. Final Report, Sloan Project No. 134. Massachusetts Institute of Technology, 1958.

Schutz, W. C. "What Makes Groups Productive?" Human Relations. 8: 429-465, 1955.

Schutz, W. C. The Interpersonal Underworld. A reprint of FIRO: A Three-Dimensional Theory of Interpersonal Behavior. Palo Alto: Science and Behavior Books, Inc., 1966.

Schutz, W. C. JOY: Expanding Human Awareness. New York: Grove Press, 1967.

Scott, M. D., McCroskey, J. C., and Sheahan, M. E. "The Development of a Self-Report Measure of Communication Apprehension in Organizational Settings." Journal of Communication. 1978.

Scott, M. D., and Wheeless, L. R. "An Exploratory Investigation of Three Types of Communication Apprehension on Student Achievement." Paper presented to the Speech Communication Association Convention. San Francisco: 1976.

Sears, P. S. The Effect of Classroom Conditions on the Strength of Achievement Motive and Work Output on Elementary School Children. Unites States Office of Education Cooperative Research Report: Project No. OE-873. Stanford: Stanford University, 1963.

Sepe, T. D., and Connolly, J. J. An Analysis of Student Attitudes toward Divergent Modes of Instruction: Implications for Individualized Instruction. Paper presented at the Annual Meeting of the American Education Research Association, February 1973. (ED 081 413)

Shaw, M. E. "A Comparison of Individuals and Small Groups in the Rational Solution of Complex Problems." American Journal of Psychology. 44: 491-504, 1932.

Shaw, M. E. "Some Effects of Problem Complexity Upon Problem Solution Efficiency in Different Communication Nets." Journal of Experimental Psychology. 48: 211-217, 1954.

Shaw, M. E. "Some Effects of Irrelevant Information Upon Problem-Solving by Small Groups." Journal of Social Psychology. 47: 33-37, 1958.

Shaw, M. E. "A Note Concerning Homogeneity of Membership and Group Problem Solving." Journal of Abnormal and Social Psychology. 60: 448-450, 1960.

Shaw, M. E. "Communication Networks." Advances in Experimental Social Psychology. Berkowitz, L., Editor. New York: Academic, 1964.

Shaw, M. E. Group Dynamics: The Psychology of Small Group Behavior. New York: McGraw-Hill Book Company, 1971.

Shaw, M. E., and Rothschild, G. H. "Some Effects of Prolonged Experience in Communication Nets." Journal of Applied Psychology. 40: 281-286, 1956.

Shellenberg, J. A. "Group Size as a Factor in Success of Academic Discussion Groups." Journal of Educational Psychology. 33: 73-79, 1959.

Sheppard, W. C., and MacDermot, H. G. "Design and Evaluation of a Programmed Course in Introductory Psychology." Journal of Applied Behavior Analysis. 3: 5-11, 1970.

Sherman, J. G. "PSI: Some Notable Failures." Personalized System of Instruction. Sherman, J. G., Editor. Menlo Park: W. A. Benjamin, Inc., 1974.

Sherman, S., Zuckerman, D., and Sostek, A. The Anti-achiever: Rebel Without a Future. Boston: The University Center, 1972.

Silvernail, D. L. Developing Positive Student Self-Concept. Washington, D. C.: National Education Association of the United States, 1981.

Skinner, B. F. "The Science of Learning and the Art of Teaching." Harvard Educational Review. 24: 86-97, 1954.

Skinner, B. F. The Technology of Teaching. New York: Appleton-Century-Crofts, 1968.

Slater, P. E. "Contrasting Correlates of Group Size." Sociometry. 21: 129-139, 21.

Slavin, R. E. Using Student Team Learning: Revised Edition. Baltimore: Center for Social Organization of Schools, The Johns Hopkins University, 1980.

Slavin, R. E. Cooperative Learning. New York: Longman, 1983.

Slavin, R. E. "When Does Cooperative Learning Increase Student Achievement?" Psychological Bulletin. 94: 429-445, 1983.

Slavin, R. E., and Karweit, N. L. "Cognitive and Affective Outcomes of an Intensive Student Team Learning Experience." Journal of Experimental Education. 50: 29-35, 1981.

Slavin, R. E., and Karweit, N. L. "Student Teams and Mastery Learning: An Experiment in Urban Math 9 Classes." Paper presented at the Annual Convention of the American Educational Research Association, New York, 1982.

Slavin, R. E., Leavey, M., and Madden, N. A. "Combining Student Teams and Individualized Instruction in Mathematics: An Extended Evaluation." Paper presented at the Annual Convention of the American Education Research Association, Montreal, 1983.

Slavin, R. E., Leavey, M., and Madden, N. A. "Combining Cooperative Learning and Individualized Instruction: Effects on Student mathematics Achievement, Attitudes, and Behaviors." Elementary School Journal. 84: 409-422, 1984.

Smith, V., Barr, R., and Burke, D. Alternatives in Education: Freedom to Choose. Bloomington: Phi Delta Kappa Educational Foundation, 1976.

Sommer, R. "Studies in personal space." Sociometry. 22: 247-260, 1959.

Sommer, R. Personal Space: The Behavioral Basis of Design. Englewood Cliffs: Prentice-Hall, Inc., 1969.

Sorensen, G. A. "The Use of Personality Traits and Communication Apprehension in Predicting Interaction Behavior in Small Groups." Unpublished Masters Thesis. Illinois State University, 1972.

Sorensen, G. A., and McCroskey, J. C. "The prediction of Interaction Behavior in Small Groups." Communication Monographs. 1978.

South, E. B. "Some Psychological Aspects of Committee Work." Journal of Applied Psychology. 11: 437-464, 1927.

Sprinthall, N. A., Whitely, J. M., and Mosher, R. L. "A Study of Teacher Effectiveness." The Journal of Teacher Education. 17, 1966.

Steinzor, B. "The Spatial Factor in Face-to-Face Discussion Groups." Journal of Abnormal and Social Psychology. 45: 552-555, 1950.

Stern, G. C. "Environments for Learning." The American College. Sanford, N., Editor. New York: John Wiley and Sons, 1962.

Stuab, E. "Helping a Person in Distress: The Influence of Implicit and Explicit 'Rules' of Conduct on Children and Adults." Journal of Personality and Social Psychology. 17: 137-144, 1971.

Strodtbeck, F. L., and Hook, L. H. "The Social Dimensions of a Twelve Man Jury Table." Sociometry. 24: 397-415, 1961.

Tallmadge, G. K., and Shearer, J. W. "Study of Training Equipment and Individual Differences." Technical Report NAVTRADEVCEN 66-C-0043-1. Orlando: Naval Training Device Center, March 1967.

Tallmadge, G. K., and Shearer, J. W. "Relationships Among Learning Styles, Instructional methods, and the Nature of Learning Experiences." Journal of Educational Psychology. 60: 222-230, 1969.

Taylor, D. W., and Faust, W. L. "Twenty Questions: Efficiency of Problem Solving as a Function of the Size of the Group." Journal of Experimental Psychology. 44: 360-363, 1952.

Thelen, H. A. "Classroom Grouping." Grouping in Education: A Report Sponsored by the UNESCO Institute for Education, Hamburg. Yates, A., Editor. Uppsala, Sweden: Almquist and Wiksells Boktryckeri AB, 1966.

Thomas, W. L. The Thomas Self-Concept Values Test. Detroit: Educational Services Co., 1969.

Thoreson, C. E. "Oral Non-Participation in College Students: A Survey of Characteristics." American Educational Research Journal. 8: 199, 1966.

Thornton, J. W. The Community Junior College. Second Edition. New York: Wiley, 1966.

Tobias, S. "Math Anxiety: Why is a Smart Girl Like You Counting on Your Fingers?" Ms. Magazine. 5: 56-59, September, 1976.

Travers, R. M. W., Editor. The Second Handbook of Research on Teaching. Chicago: Rand McNally College Publishing Company, 1973.

Ullrich, D.A. "Territoriality: A Review and Experiment." Unpublished term paper. 1971.

Walberg, H. J. "Teacher Personality and Classroom Climate." Psychology in the Schools. 5: 163-169, April 1969.

Walberg, H. J., and Anderson, G. J. "Classroom Climate and Individual Learning." Journal of Educational Psychology. 59: 414-419, 1968.

Wallen, N. E., and Travers, R. M. W. "Analysis and Investigation of Teaching Methods." Handbook of Research on Teaching. Gage, N. L., Editor. Chicago: Rand McNally and Company, 1963.

Ward, J. N. "Group vs. Lecture-Demonstration Methods in Physical Science Instruction for General Education College Students." Journal of Experimental Education. 24: 197-210, 1956.

Watson, F. G. Handbook of Research on Teaching. Gage, N. L., Editor. Chicago: Rand McNally, 1963.

Weick, K. E. The Social Psychology of Organizing. Reading: Addison-Wesley, 1969.

Weigel, R. H., Wisner, P. L., and Cook, S. W. "The Impact of Cooperative Learning Experiences on Cross-Ethnic Relations and Attitudes." Mimeographed report. University of Colorado, Institute of Behavioral Sciences, 1974.

Wesley, E. B., and Wronski, S. P. Teaching Social Studies in High School. Fifth Edition. Boston: D. C. Heath and Company, 1964.

Wheeless, L. R., Nesser, K., and McCroskey, J. C. "Relationships among Self-Disclosure, Disclosiveness, and Communication Apprehension." Monograph. West Virginia University, 1976.

White, R., and Lippitt, R. "Leader Behavior and Member Reaction in Three 'Social Climates.'" Group Dynamics. Cartwright, D., and Zasler, A., Editors. Evanston: Row, Peterson, and Company, 1962.

Whyte, W. F. Street Corner Society. Chicago: University of Chicago Press, 1943.

Whyte, W. F. "The Social Structure of the Restaurant." American Journal of Sociology. 54: 302-308, 1949.

Willis, F. N. "Initial Speaking Distance as a Function of the Speaker's Relationship." Psychonomic Science. 5: 221-222, 1966.

Withall, J. "An Objective Measurement of a Teacher's Classroom Interaction." Journal of Educational Psychology. 47: 203-212, 1956.

Withall, J., and Lewis, W. W. "Social Interaction in the Classroom." Social Interaction in Educational Settings. Yee, A. H., Editor. Englewood Cliffs: Prentice-Hall, Inc., 1971.

Witkin, H. A. "Cognitive Style in Academic Performance and in Teacher-Student Relations." Individualized Learning. Messick, S., Editor. San Francisco: Jossey-Bass Publishers, 1976.

Witkin, H. A., Moore, C. A., Goodenough, D. R., and Cox, P. W. "Field-Dependent and Field-Independent Cognitive Styles and their Educational Implications." Review of Educational Research. 1-64, 1977.

Witteman, H. R. "The Relationship of Communication Apprehension to Opinion Leadership and Innovativeness." M. A. Thesis. West Virginia University, 1976.

Wittmer, J., and Webster, G. B. "The Relationship between Teaching Experience and Counselor Trainee Dogmatism." Journal of Counseling Psychology. 16: 499-504, 1969.

Wodarski, J. S., Hamblin, R. L., Buckholdt, D., and Ferritor, D. E. "Individual Consequences Versus Different Shared Consequences Contingent on the Performance of Low-Achieving Group Members." Journal of Applied Social Psychology. 3: 276-290, 1973.

Worley, W. E. Independent-Individualized Instruction - Who Benefits? Research project. Nova University, April 1975. (ED 104 496)

Wygal, B. Personal Characteristics and Situational Perceptions of Junior College Instructors as Related to Innovativeness. Dissertation. University of Texas, 1966.

Young, L. L. "Sociometric and Related Techniques for Appraising Social Status in an Elementary School." Sociometry. 10: 168-177, 1947.

Ziller, R. C. "Group Size: A Determinant of the Quality and Stability of Group Decisions." Sociometry. 20: 165-173, 1957.

Zwerling, L. S. Second Best: The Crisis of the Community College. New York: McGraw-Hill Book Company, 1976.