

The Independent Learning Behaviors of Preadolescent  
Students Using the Problem Approach

by

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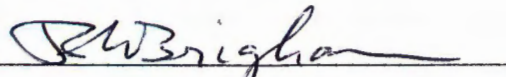
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## ABSTRACT

Title of Dissertation: The Independent Learning Behaviors of Preadolescent Students Using the Problem Approach

Virginia H. Pilato, Doctor of Philosophy, 1984

Dissertation directed by: Dr. Bruce W. Brigham, Associate Professor,  
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The purpose of this research was to observe the independent learning behaviors of preadolescent students who experienced the Problem Approach, an instructional approach intended to help students develop independent learning behaviors and improved thinking skills. A behavior observation checklist, divided into the categories of Questioning, Managing, Planning, and Evaluating, was used to record the frequency, the directionality (initiates versus responds), and the social contexts of independent learning behaviors.

A single case experimental design with four parallel applications was used. The subjects were four sixth grade students (boy and girl middle achievement level; boy and girl low achievement level). The research was conducted in the students' reading class where the subjects, along with all the other members of the class, participated in the Problem Approach. A team of trained observers collected focused observation data for ten weeks, which included pre-treatment, treatment, and post-treatment.

Upon completion of the observations, the data were analyzed. Visual inspection of graphed data, as well as the sign test and the binomial test, clearly revealed large increases of independent learning behavior during

treatment compared to pre-treatment and post-treatment. The high levels of independent learning behaviors during treatment, however, were not maintained during post-treatment. In Questioning, Managing, and Evaluating categories, most post-treatment frequencies were somewhat higher than they were during pre-treatment. Only the Planning category failed to achieve a post-treatment level higher than the pre-treatment level. All four subjects increased their proportion of initiating behaviors to responding behaviors during and after treatment compared to before treatment. The vast number of behaviors occurred when students spoke to one another, not to the teacher. Moreover, the highest frequency of independent learning behaviors occurred when students worked with one another in cooperative small groups.

This research has numerous implications. An implication for theory is that the psychological conditions of a setting may influence human change as much as direct instruction. Implications for research indicate the need for replication. Implications for practice indicate the need for using the Problem Approach in classrooms and in teacher education to assist students in becoming independent.

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## CHAPTER I

### INTRODUCTION

Assisting students in developing thinking skills is a high priority in American education for the 1980's. The Association of Supervision and Curriculum Development (ASCD) recently found that 82% of its members surveyed rated the teaching of thinking skills as their major concern for the next five years (ASCD Update, June 1983). The Joint Council on Economic Education (1982) urges educators to develop reasoning as the fourth R, saying that individual decision making requires reasoning skill together with skills in reading, writing, and calculating. The National Science Board (1983) also calls for expanding the "basics" to include higher level problem solving skills.

Developing thinking skills has been a commonly stated educational goal for many years. Gagné (1980) finds that educators and other investigators of human cognition currently accord high priority to rational thinking and problem solving as if it were a new thought. Gagné (1980) concurs with this high priority on developing thinking skills, even though the focus is not so new. In the 1980's, just as in 1910 when Dewey published How We Think, "the main office of education is the Training of the Mind" (Dewey, 1910, p. 28).

How to facilitate the development of thinking skills is the issue schools face. Research indicates the importance of students' active involvement in their learning (Barnes, 1979; Berman & Roderick, 1977; Berman, Roderick, Browner, & Lee, 1976; Bloom & Broder, 1950; Coleman,

1976; Combs, 1981; Gish, 1979; Kolb & Fry, 1975; Roderick, 1972, 1973; Wittrock, 1979). Educational literature also indicates the importance of educating students for independence (Hedin & Conrad, 1980; Herber, 1978; McCann, 1982; Niebuhr, Jr., 1981; Slavin, 1981; Treffinger, 1975). Current research on human cognition is providing an increasingly detailed understanding of thinking processes and characteristics (Anzai & Simon, 1979; Larkin, McDermott, Simon, & Simon, 1980; Lochhead, 1981; Newell & Simon, 1972; Papert, 1980; Piaget, 1974; Rothman & Potts, 1977; Scandura, 1977a, 1977b, 1980; Tuma & Reif, 1980). With increased knowledge of students' thinking abilities and learning needs, educators may better advance students' thinking abilities and more realistically promote their independence.

### Purpose

The purpose of this study was to observe the independent learning behaviors of sixth grade students. The researcher trained and used a sixth grade teacher to teach her reading class using an instructional procedure known as the Problem Approach. The researcher used a single case study design (Hersen & Barlow, 1978; Huck, Cormier, & Bounds, 1974) with four parallel applications to determine if the Problem Approach facilitates the development of independent learning behavior. Using this schedule enabled the researcher to compare students' learning behaviors during the treatment phase with their learning behaviors both before the treatment began and later when the treatment had been withdrawn. The specific independent learning behaviors studied in this investigation are grouped in these categories: Questioning, Planning,

Managing, and Evaluating. Data collected also provided information about the social contexts in which the independent learning behaviors occurred. Data generated and analyzed in this research have the additional purpose of extending the knowledge base of the Problem Approach and independent learning behavior as described by McCann (1982).

### Justification

With the expression "lifelong learning" now in popular usage, our language is reflecting the view that learning is indeed a lifelong activity. Lifelong learning, though, is not a new concept. Dewey (1916) explained that the result of the educative process is capacity for further education. Dewey's concern was lifelong learning.

Schubert (1981) points out that the learner is a participant in curricula both in school and out of school. He says that education is more pervasive than schooling; it permeates all of life, and life teaches the art of using knowledge. Using knowledge is a lifelong process involving all aspects of living, including schooling.

Our culture attempts to direct learning through the institution of school. Formal schooling enters the life of the child and becomes a major force. The influence may be productive and assist the child in being and becoming a self-fulfilled, independent person. The influence, on the other hand, may be damaging and limiting, a source of emotional and intellectual barriers. The responsibility of schooling is to facilitate learning during school years and to enhance the capacity for independent lifelong learning.

It is important for schools to use instructional methods which allow students to learn to perform independently. Beeler (1979) believes that schools do not encourage students to explore problems and to inquire into unknown areas. Children learn in the earliest grades that teachers set goals for them, direct their activities, and then tell them how well they have met these goals. Too often children do not recognize their personal relationship with goals, goal-setting, and goal-attainment. When training students to develop their independence as learners, schools are responsible for helping students learn through practice how to become self-directive and self-evaluative.

Treffinger (1975) notes a paradox of schooling. Schools talk about educating children for independence but provide forms of instruction which only reinforce dependence (Treffinger, 1975). He recommends a systematic approach to leading gifted children in becoming self-directed. Procedures useful with gifted students are usually appropriate for others as well.

Niebuhr, Jr., (1981) believes that schooling must provide an adequate basis for the development of a coherent and balanced way of life. He says schools must train students in using the tools necessary for handling freedom and choice, lest freedom and choice become onerous burdens. He urges that institutional processes in schools be adjusted to support self-directed development.

Helping students become better thinkers and problem solvers is a widely held and currently stressed educational goal. More than a decade ago educators articulated the goal of building thinking skills because of the impact of rapid social and technological change. Snygg (1972) has said we cannot teach our children answers to future problems because we

cannot even anticipate the problems. According to Snygg, we need instructional models which assist our children in becoming creative, adaptive citizens.

Gagné (1980) is concerned with the theme of educating students to think well and become better problem solvers. He explains that we have three kinds of human capabilities involved in problem solving--intellectual skills, verbal knowledge, and cognitive strategies. Intellectual skills are our capabilities for "knowing how" to perform operations. Verbal knowledge is our knowledge of the world; it is specific and general and organized in various ways. Cognitive strategies enable us to exercise control over our own learning and thinking processes. Cognitive strategies control such processes as attention, perceiving, encoding, and retrieval of prior knowledge. Gagné explains that cognitive strategies are task strategies concretely and specifically related to problems. Such methods are stored in memory. Gagné says problem solving methods may be taught directly. They may also be learned through discovery, but he is not an opponent of direct teaching of strategies.

He identifies another type of cognitive strategy, which he calls an "executive strategy." Executive strategies are thinking strategies which enable problem solvers to review the cognitive strategies they have, select and reject them appropriately, and persist in searching for the best means of solving the problem. Executive strategies facilitate rapid strategy shifting. Gagné is doubtful that such executive strategies can be taught, though they are essential for effective problem solving. Gagné says that executive strategies appear to result from problem solving experience and reflective thought. He stresses that education for improved thinking skills

must provide opportunities for gaining experience in problem solving which will lead to the development of executive problem solving strategies.

Bruner's theory (1973) about problem solving is related to Gagné's. Bruner also stresses the importance of practice. He says that it is through the exercise of problem solving that students learn to generalize what they have learned into a style of problem solving or inquiry that serves well in most situations. Bruner says that through practice students learn the working heuristic of discovery.

A curricular focus on developing independence in problem solving is particularly appropriate for preadolescents. During late childhood and preadolescence, children characteristically have strong interest in and curiosity about their physical and social world (Perkins, 1975). Their increased social activity facilitates the growth of their social cognition and their general cognitive development, including objective thinking (Sutton-Smith, 1973). They begin to experience sharp differences between peer and adult codes and values (Perkins, 1975). They begin to assert their independence from adults. When classrooms limit students' opportunities for becoming responsible and independent learners, preadolescents are often inadequately prepared for real world situations (Snyder, 1971).

The Problem Approach (Brigham, 1961, 1974, 1975, 1979; Brigham & Pilato, 1980, 1981, 1982; Dudley, Pilato, & Brigham, 1982; McCann, 1982) is an instructional approach which motivates students to become independent learners. Participation in the Problem Approach provides students with opportunities for problem solving practice, as called for by Gagné (1980) and Bruner (1973), and with opportunities for developing and reflecting upon the thinking skills called "executive strategies" by Gagné (1980).

Students set their own goals, determine how to achieve their goals, participate in activities related to their goals, present their outcomes, and evaluate their products and their processes. Problem Approach teachers assist students in focusing on and achieving their goals. Since the Problem Approach includes group as well as individual activities, it promotes social learning, which is critical for success in real world situations (Slavin, 1981; Snyder, 1971; Sutton-Smith, 1973).

### Problem

Will instruction using the Problem Approach with male and female, middle and low scholastic achievement level preadolescents, lead to a greater frequency of independent learning behaviors, observed in described social contexts, during and after the treatment phase, than during periods of instruction which are more teacher-directed?

### Rationale

Independent learning behavior should be an outcome of all educational programs. While it is important for students to acquire a wide breadth of knowledge, it is also important that they learn to function in accord with, but independently of, teacher direction. With appropriate student-centered class work, students can develop improved motivation for learning, as well as improved thinking skills. Independent reasoning needs to be viewed as a basic skill along with reading, writing, and calculating. Students need to know how to determine goals, how to initiate questioning, how to evaluate their processes and their outcomes and the processes and

outcomes of their peers. Research on the effects of instructional methods generally focuses on students' academic achievement. Research attention has generally not been given to the acquisition of independent learning behavior. The research of McCann (1982), however, is a descriptive study which had the purpose of observing independent learning behavior of a group of seventh grade academically able students before and after they experienced ten weeks of Problem Approach instruction. McCann "probed the significance" (Ericson & Ellett, Jr., 1982) of the Problem Approach in her study. The research task now is to supplement her interpretations (Ericson & Ellett, Jr., 1982) through systematic changes in research design and sample selection. Rather than study the outcomes of teaching with the Problem Approach as McCann did when she looked at post-treatment effects, the present study observed subjects' behaviors during the process of the treatment. Additionally, like McCann's research, this research observed pre- and post-treatment behaviors. Because McCann's study observed academically able preadolescents, this study focused on middle and lower achieving preadolescents and not high achieving preadolescents. To provide additional descriptive information about students manifesting independent learning behaviors, this research observed the direction of the behaviors, noting whether the student initiates independent learning behavior or responds with independent learning behavior. To further supplement McCann's study, this research observed and coded the social contexts in which independent learning behaviors occurred. It was generally hypothesized that the preadolescent students in this study would show increases in their independent

learning behaviors (observed in described social contexts) during and after the student-centered treatment known as the Problem Approach compared to before the use of the Problem Approach.

### Research Hypotheses

Specifically, it was hypothesized that the male and female, middle and low scholastic achievement preadolescents involved in the research would manifest a greater frequency of independent learning behaviors (observed in social contexts) during and after treatment using the Problem Approach compared to periods of instruction which did not use the Problem Approach. Hypotheses regarding four categories of independent learning behavior are as follows:

a. It was hypothesized that during and after participating in the Problem Approach subjects would manifest more questioning behavior than they did prior to treatment.

b. It was hypothesized that during and after participating in the Problem Approach subjects would manifest more managing behavior than they did prior to treatment.

c. It was hypothesized that during and after participating in the Problem Approach subjects would manifest more planning behavior than they did prior to treatment.

d. It was hypothesized that during and after participating in the Problem Approach subjects would manifest more evaluating behavior than they did prior to treatment.

### Delimitations

The following delimitations indicate the scope of this research. The assumptions pertain to the frame of reference of the researcher. The limitations pertain to the possible weaknesses or threats to generalizability inherent in the research design. The definitions are conceived as operational definitions necessary for assuring precise language in the exposition of the study.

### Assumptions

- a. Preadolescent students need to participate in an instructional program which improves independent learning.
- b. Preadolescent students should be actively involved in the instructional program.
- c. Cooperative small group learning activities facilitate social learning.
- d. The primary function of a teacher is to assist students in becoming independent learners.

### Limitations

Context. In addition to the treatment variable, other events occurring inside or outside of the classroom could have had effects on independent learning behavior. Frequently scheduled observation points occurring throughout both baseline and treatment phases were planned as a control. Moreover, data were collected daily over a ten-week period.

Maturation. Preadolescents characteristically are rapidly maturing individuals. The frequent observations for data collection during both baseline and treatment phases attempted to control for the threat of maturation. Moreover, data were collected over a ten-week period.

Instrumentation. Observers' interobserver reliability was high (between 0.79 and 1.00 using Pearson's Product Moment Correlation). To minimize the threat of instrumentation, observers were trained with the observation instrument. Reliability was computed during practice observations in the classroom and again during both baseline and treatment phases of the research. The original data collection instrument, which was expanded for this research, was field tested and validated through previous research which had treatment variable and dependent variables identical to this research (McCann, 1982). A limitation of the data collection instrument in its original form is that it permitted observation along only a set of twelve specified dimensions. To compensate for the limitation of the original form of the instrument, it was expanded to permit observations of the social contexts within which independent learning behaviors occur.

Population Validity. Generalizability of this study is limited to preadolescent elementary school students who have characteristics similar to the subjects of the research. To enhance generalizability, subjects were a boy and a girl in the middle achievement range and a boy and a girl in the low achievement range. Levels of achievement were determined by California Achievement Test scores obtained when students were in the fifth grade, by grades in school, and by reading group level. California Achievement Test scores for students in the middle achievement group ranged from the 57th to the 87th percentile. California Achievement Test scores for students in the low achievement group ranged from the 19th to the 54th percentile.

## Definitions

Behavior Observation Checklist--the instrument used to measure the dependent variable. It was developed, field-tested, validated, and used in research by McCann (1982) (see Appendix B). The checklist is divided into four independent learning behavior categories: Questioning, Planning, Managing, and Evaluating. Each category is divided into three specific, non-overlapping behaviors. The instrument was altered in two ways for this research. (1) Wording of several items was revised so that all items are expressed as observable behaviors. (2) Additional space, with directions for use, was added for collecting data on social contexts, on the dimensions of directionality (initiates independent learning behavior versus responds with independent learning behavior), and group size where independent learning behavior occurs. Two students may be observed at one time using the checklist adapted for this research. Data collected with this instrument were supplemented by daily notes recorded to give additional information about subjects' appearance and behavior and social contexts.

Dependent learner--one who relies on the teacher for processing information.

Evaluating--an independent learning behavior observed as appraisal of group and individual (including self) work. In evaluating, verifiable facts are used as evidence. Evaluating is of oral and/or written expression. Linguistically, evaluating remarks refer to events performed in the past.

Heterogeneous group--a group of students different from one another (along such dimensions as sex, race, ethnic background, age, birth order,

parents' occupations, school achievement, intelligence) assigned to the same small group or to the same class.

Independent learning behavior--action indicating that a learner is processing information on his or her own without direct assistance from the teacher. The specific dimensions of independent learning behaviors in the study are: questioning, planning, managing, and evaluating.

Involvement--behavior of a learner indicative of emotional and/or intellectual participation in learning activities. Involvement may be seen as active or passive with "actively involved" students demonstrating more involvement than passive students.

Managing--an independent learning behavior observed as time scheduling and use, meeting deadlines, personal and/or group record-keeping, participating in decision making. Managing is also seen as facilitating group discussions. Linguistically, this observation category relates only to events occurring in the present.

Problem Approach--an instructional strategy which places the student in the role of an active learner and the teacher in the role of an active resource. The process comprises sequential steps moving from goal-setting to presenting of final products. The process emphasizes students' experiences and interests. The learner participates in independent and small group activities. Learning processes include brainstorming, categorizing, labeling, prioritizing, planning, questioning, organizing, researching, specific skill development, compiling, evaluating, and presenting. All four elements of language--reading, writing, speaking, and listening--are included in the process (see Appendix A).

Planning--an independent learning behavior observed as long and short term goal-setting (verbalized) for collecting and presenting information. Planning is also seen as organizing and developing strategies (verbalized) for goal-attainment. Linguistically, planning verbalizations are expressed in the future tense.

Preadolescent--an eleven to thirteen-year-old child in the sixth grade.

Questioning--an independent learning behavior observed as student-initiated inquiry. The student is seeking to learn the "how" and "why" of events. In this study questioning may relate to subject content and to classroom procedures.

Social Context--the learning environment in which students and teacher interact with one another and with information, materials, and instruction.

Student-centered instruction--students set learning objectives and purposes, direct their learning activities, and evaluate their products and processes. Students' learning is assisted by the teacher who serves as the primary facilitator.

Teacher-centered instruction--teacher sets learning objectives and purposes, directs learning activities, and evaluates students' products and processes. The teacher is the ultimate source of information and the primary decision maker in the class.

## Methodology

### Sample and Sampling Procedures

Sixth grade students in a suburban public school had been distributed among three sixth grade classes for the 1983-1984 school year. Students in the class where the research was conducted were within a range of academic achievement, as determined by the California Achievement Test (reading vocabulary and comprehension), from high achievement to low achievement. The class range for reading vocabulary was from the 19th percentile to the 99th percentile. The class range for reading comprehension was from the 33rd percentile to the 99th percentile. The class was racially mixed. Eighteen students were white, eight students were black, and two students were Asian. The class was comprised of 17 boys and 11 girls.

Single case study research design provides for data collection and analysis for one subject with parallel applications. In this study four students were selected as subjects.

Prior to the first baseline phase of the research, subjects were selected. A boy and a girl in the middle achievement range on the California Achievement Test and in their sixth grade academic performance were selected. A boy and a girl in the low achievement range and in their fifth grade performance were selected. All four subjects were the same race, for the purpose of holding the variable of race constant. When more than one student was eligible to be included in the study, frequency counts of independent learning behavior collected during practice observations were

used to avoid selecting high independent learning behavior students. The purpose of this procedure was to control for a regression to the mean threat to validity. When more than one student was still eligible, random selection was used.

### Procedures

Staff Development. Two training programs were conducted by the researcher. Prior to data collection the researcher trained two other individuals to assist with classroom observations. The other observers assisted the researcher with the data collection on a schedule. One of the other observers had used the observation instrument in previous research. The training included one week in the classroom as practice and to allow students to become acclimated to the presence of observers. Interobserver reliability was assessed in the final two days of practice observations.

The second training program was conducted at the conclusion of the first baseline phase of the data collection and in preparation for the treatment phase. During this time the researcher trained the classroom teacher and a substitute teacher in the use of the Problem Approach. The training consisted of role playing, discussion, lecture, and a series of videotape presentations of the Problem Approach. The training phase also included planning for the teacher to meet with the researcher after school on a weekly basis so that the researcher could monitor the treatment.

Teacher-Centered Instructional Situation. Prior to baseline data collection, the researcher followed an observation schedule of six observations in the classroom for the purpose of being able to describe the teacher-centered instructional situation in her reading class. The

researcher also discussed with the teacher pertinent details about her teaching style. As a way of focusing the description of her teaching style, the researcher developed and used a two-part checklist which contrasts student-centered teaching (as prescribed by the Problem Approach) with teacher-centered teaching. The checklist and the written description provided an account of the teacher-centered instructional situation. This account is necessary for understanding students' behaviors in her class, during baseline and treatment phases. Students' classroom behaviors interact with teachers' behaviors.

Data Generation Procedures. Data were collected by classroom observation Monday, Wednesday, Thursday, and Friday each week during three phases of research. Data were also collected on Tuesdays many weeks, though the researcher usually did not know in advance if Tuesdays would be appropriate days to observe. Other sixth grade activities sometimes were held instead of reading class on Tuesdays. An  $A_1$ -B- $A_2$  data collection schedule was used. Two outside observers assisted the researcher in performing the classroom observations. Subjects were observed for 20-minute periods every day of data collection. Observers, including the researcher, arrived in the classroom on or before 9:20 each morning and remained for a minimum of 5 minutes following scheduled observations. The additional 20 minutes in the classroom before and after observing were used for recording relevant information about subjects' appearance and behavior and about the social context of the classroom that morning.

Two observation schedules were used. During all three phases of research, subjects participated in small group activities and in whole class activities. The following schedule was used when subjects were

working in small groups (five to six students per group) during the treatment phase. When students were in small groups during treatment, dummy observations were conducted of groups not having subjects. On Mondays and Thursdays the researcher used a co-observer to provide a reliability check on her data collection. On Wednesdays and Fridays the outside observers did not co-observe with the researcher; instead they performed dummy observations. The researcher also performed dummy observations. When observations were held on Tuesdays, the researcher alternated between the Monday and Wednesday observation schedules.

Table 1

Schedule for Observing Groups of Five to Six Students

Group	Monday	Wednesday	Thursday	Friday
Group A Ss 1 & 3	R + O <sub>1</sub> 9:35 - 9:55	R 9:55 - 10:15	R + O <sub>2</sub> 9:35 - 9:55	R 9:55 - 10:15
Group B Ss 2 & 4	R + O <sub>1</sub> 9:55 - 10:15	R 9:35 - 9:55	R + O <sub>2</sub> 9:55 - 10:15	R 9:35 - 9:55
Group C No Ss	E 9:35 - 9:55		R + O <sub>2</sub> 10:15 - 10:35	O <sub>1</sub> 9:55 - 10:15
Group D No Ss	E 9:55 - 10:15	O <sub>2</sub> 9:35 - 9:55	R + O <sub>2</sub> 10:35 - 10:50	R + O <sub>1</sub> (alt. weeks) 10:15 - 10:35
Group E No Ss		O <sub>2</sub> 9:55 - 10:15		O <sub>1</sub> 9:35 - 9:55  (alt. weeks) R + O <sub>1</sub> 10:35 - 10:50

R = Researcher

O<sub>2</sub> = Outside Observer #2

O<sub>1</sub> = Outside Observer #1

E = Person used only as dummy observer

The following schedule was used when subjects were not in small groups (five to six students per group) during the treatment. This schedule was used to observe whole class activities and to observe reading group instruction. (The teacher had three reading groups). With this schedule observers could observe students in groups and at their desks doing seat work. This schedule also was used during treatment at all times that students were not in small groups.

Table 2

Schedule for Observing Students Not Working in Small Groups

Students	Monday	Wednesday*	Thursday	Friday*
Ss 1 & 2	9:35 - 9:55	9:55 - 10:15	9:35 - 9:55	9:55 - 10:15
Ss 3 & 4	9:55 - 10:15	9:35 - 9:55	9:55 - 10:15	9:35 - 9:55
(High Reading Group)			(10:15 - 10:45)	(alternate weeks: 10:15 - 10:45)

\* Researcher + Co-Observer

During Phase I ( $A_1$ ) baseline data were collected indicating the frequency, the direction (initiates versus responds) and the social context (group size) of independent learning behavior prior to treatment. In Phase I the teacher used the teacher-centered instructional style, as described by the researcher prior to Phase I.

Phase I classwork consisted of instruction in reading and spelling. Reading instruction was in two areas: (1) comprehension and skill building exercises accompanying basal reader assignments and (2) work on students' outside reading unit, a five-week reading, writing, and project unit on the

literary theme of fantasy (including science fiction). The teacher worked with students in reading groups. When she taught a reading group, she sat in a rocking chair, while the students sat all around her on a carpet on the floor. She asked and they answered inferential and factual comprehension questions. They also went over skill building exercises completed as homework. She also assisted students in working on their fantasy unit. Some students worked informally in dyads or triads with their fantasy reading and project assignment.

There were some similarities and some differences between the fantasy project work and the project work during the treatment phase. The reading, writing, and project work that students participated in during the fantasy unit was similar to work they did during the treatment phase because they made decisions about the form and content of their work. Another similarity was that some students worked jointly on projects. Moreover, during both the project work of baseline and the project work of treatment, students had to manage their time well to complete their work.

Several major differences distinguished the treatment project work from the baseline project work. Among these differences were:

1. The project work during baseline could be a joint effort of several students; during treatment the work definitely was a joint effort of groups of students.

2. During baseline high achievement level students were given opportunities to work in the media center without supervision while other students remained with the teacher. During treatment, on the other hand, small groups were comprised of students from all three achievement levels, so that special privileges were not given to one achievement group over the others.

3. During baseline, students chose their project description from a teacher-prepared list. During treatment the teacher did not provide project description choices. Instead, the teacher elicited from students areas of interest related to the curriculum unit and assisted students in discovering for themselves how they would like to present information they collected.

4. The teacher used grades to motivate students during the fantasy unit of baseline. During the treatment phase the teacher did not use grades to motivate students. She, instead, helped students to use their own interests as motivation.

Phase I ( $A_1$ ) was comprised of eight observation points. The determination to move on to the treatment phase was made when subjects' behaviors had evolved into generally stable patterns. Behaviors which occurred in patterns during baseline facilitated the drawing of inferences when the data of Phases II and III had been collected.

Before entering Phase II, the treatment phase, the teacher was trained in the use of the Problem Approach. A volunteer substitute teacher was also trained so that she was prepared to teach using the Problem Approach if the regular teacher was absent during the treatment phase.

During Phase II (B) treatment data were collected indicating the frequency, the direction (initiates versus responds), and the social contexts of independent learning behavior while subjects are experiencing the Problem Approach. Phase II lasted six weeks, giving subjects sufficient time to experience all parts of the Problem Approach before it was withdrawn.

During Phase III ( $A_2$ ) baseline data again were collected for four to seven days. The Problem Approach was withdrawn during this phase to provide a second occasion for demonstrating the effects of treatment.

Display of Quantitative Data. Since the research design was a single case study with parallel applications, data were displayed separately for each subject. Each subject had graphs displaying frequency of behaviors along each of the following dimensions: Questioning, Planning, Managing, and Evaluating. Each subject also had a graph displaying the total of the four dimensions. This graph displayed the independent learning behaviors for the subject.

Interobserver Reliability. Assessments of observers' consistency in use of the data collection instrument were checked during practice prior to  $A_1$  and during  $A_1$  and B.

Analysis of Data. Analysis of the data for each subject focused on measuring the difference between the treatment and the first baseline (i.e., between B and  $A_1$ ) and between the two baselines (i.e.,  $A_2$  and  $A_1$ ). Visual inspection of graphed data is the primary method of evaluating single case data.

Performing statistical analysis in addition to visual inspection of graphic representation of data is controversial in the literature of single case experimental designs (Kazdin, 1978; Huck, Cromier, & Bounds, 1974). Kazdin (1978) states that the dominant position in single case research is against the use of statistics. Additionally, he points out that most of the available statistical procedures have not been widely used in single case studies. Kazdin (1982) explains that statistical tests are used only to supplement data evaluation by visual inspection.

Data collected in this research were evaluated in two ways. First, graphed data were inspected visually. Second, the sign test and the binomial test were used.

### Summary

The purpose of this research was to observe the independent learning behaviors of sixth grade students who experienced an instructional approach intended to help students develop independent learning behaviors and improved thinking skills. Justification has been provided to establish the curricular need for helping preadolescents develop independent learning behaviors and improved thinking skills. The Problem Approach has been identified as a teaching procedure which provides for this curricular need. It has been established that the present research will expand the knowledge base of the Problem Approach and independent learning behaviors as described in the earlier research of McCann (1982). A single case design was proposed as the methodology of this research. Four students (boy and girl middle achievement level; boy and girl low achievement level) became the subjects of the research, which was conducted in a sixth grade class with all 28 students participating. A team of trained observers collected focused observation data over a period of ten weeks. The sixth grade teacher taught using the Problem Approach during the intervention phase of the research. Delimitations of the research as well as a description of the methodology have been provided to explain in detail the scope of the research. A description of the Problem Approach and the observation instrument are among the documents in the Appendices.

## CHAPTER II

### REVIEW OF THE LITERATURE

In Western Civilization concern with thinking skills has its historical antecedents in ancient Greece. Indeed, an early philosophic saying was that of Anaxagoras: "All things were in chaos when Mind arose and made order" (Hamilton, 1964). The mind, then, was an active participant in the Greek world. For the ancient Greeks, awareness, or thinking about oneself, was the highest form of heroism (Beye, 1975), exemplified by Achilles whose actions in the Iliad "created meaning in a meaningless world" (Beye, 1975, p.69). Fifth century B. C. Sophists led pupils to think, to speak, to act, to participate in the spirit of free inquiry (Swain, 1950). Socrates sought to arouse men to become discoverers of truth (Hamilton, 1964; Swain, 1950).

In the area of thinking skills the line of descent has not been a direct one from the ancient Greeks to modern times. Throughout history numerous influences from philosophy and psychology have affected educational theory and practice. In the 17th century John Locke's tabula rasa (blank tablet) theory of the mind influenced education (Bigge, 1964). With this outlook the mind of the learner was seen as a passive receptacle (Bigge & Hunt, 1968). Moreover, teachers were thought of as "architects and builders" (Bigge & Hunt, 1968, p. 279) of children's minds. From the early 19th century until more recently in the 20th century, the psychology of learning developed by Johann Friedrich Herbart heavily influenced educational practices (Bigge, 1964). Herbart's view of the mind was

that it is neutrally passive, awaiting the storage of ideas (Bigge, 1964). His view of instruction was that it has the job of implanting knowledge and inner discipline in the mind of the student. In contrast with Socratic teaching, which draws information from students, Herbartian teaching did not allow teachers to enter into debate with students (Bigge, 1964). John Dewey (1916) criticized Herbartianism for giving students minimal opportunities for active participation, for independent thinking. John Goodlad (1983a; 1983b; 1984), a modern observer of educational practices, criticizes American education for failing to bring students into active, intellectual, creative involvement with learning activities.

The line of reasoning to be developed in this chapter is that educational literature points to the responsibility education has for assisting students in actively developing their thinking skills. Dewey (1910) points out that training the mind is the highest responsibility of education. Thelen (1960) says the task of education is to supervise natural inquiry and make it educative. This chapter will review literature in the areas of active involvement, problem solving, cooperative small group learning, and developing independence in learning. Finally, student-centered instruction will be discussed as a means of assisting students in becoming active, independent thinkers and learners.

### Active Involvement

The literature of active involvement in learning processes is full of action verbs. Polanyi says that educators rely on students' "intelligent co-operation for catching meaning" (1966, p. 5). He also says that learners "dwell" in things to understand them. Pears (1971) portrays

the confident and active learner as one so involved that his or her mind is like a recording instrument which applies itself again and again to its own results. Wittrock (1979) says that in the cognitive approach to instruction learners may construct their own realities. Gottshalk (1969) explains that awareness has a directional structure. He says there is movement toward a goal, which springs from an internal impulse and is directed toward an outcome. Both Royce (1964) and Frankl (1967) stress the importance of searching for meaning. The language, then, of active involvement literature is active. This section presents a brief review of educational literature which points to the need for having students actively involved in learning processes.

Hullfish and Smith (1961) write that meanings develop because people are active beings. They say that precision and consistency of meaning develop when individuals actively enter into transactions with initially puzzling environments. They say that individuals construct and continually reconstruct knowledge. Active, responsible thinkers develop networks of information, concepts, and values which are unique. Hullfish and Smith complain that too often schools put educational practices which would nurture thinking into competition with other needs and procedures. In the end, too many students have to learn to think after school (Hullfish & Smith, 1961).

Hart (1975), in his book about how the brain functions to make people learn and behave in certain ways, explains that the brain has to be active. He says that the brain aggressively explores the environment, asking questions and analyzing answers. He says the brain is an instrument for perceiving, evaluating, and dealing with whole events. "Humans in good

health vigorously probe for the information they need to live by" (Hart, 1975, p. 104).

Hart approves of learning by doing, which makes use of cross-modalities. Experiential learning also involves the discovery and use of patterns of meaning which help to make learning more "intricately textured" (1975, p. 160; 1983). More access channels of the brain are involved with complex learning experiences (Hart, 1975). Hart (1975; 1983) also insists upon supportive, non-threatening learning environments.

Barnes (1979), also favoring active involvement of students, explains that the curriculum is a form of communication. He identifies closed and open formats of communicating knowledge. In closed forms the teacher exercises tight control over content and has the attitude that knowledge must be imparted to the learner. In this form the learner is a passive recipient and has only limited interaction with content. In open forms of learning environments, the teacher is able to relinquish this type of tight control over content and allow learners to participate actively in the shaping of meaning.

Barnes recommends instructional procedures which allow students in small groups to informally explore meanings so that they actively interpret content. He recommends following the informal exploratory phase with a formalizing phase which tightens students' thinking. He sees that a process-orientation to acquiring knowledge assists students in translating school knowledge into "action knowledge." Action knowledge for Barnes is knowledge which takes on personal meaning because students have had active involvement in acquiring it. Content, then becomes a part of the student.

Involvement is an active engagement with content and with context. Coleman (1976) explains that emotional involvement in an interpersonal setting increases students' motivation to learn and provides "an associative structure of events in memory that helps insure that whatever has been learned is not lost" (1976, p. 60). Fletcher (1978) writes that we do not know much about the way experience is stored. He believes we need to explore how the pattern of emotional organization affects learning and recall. Johnson and Johnson (1978) say that students see themselves as actively involved in their learning environment when the environment uses a cooperative goal structure.

The literature suggests that learners need to become aware of the active nature of learning. Brown, Campione, and Day (1981) say that students must develop some of the same understanding psychologists have if they are to become expert learners. Students need to learn about their own cognitive characteristics, their own thinking skills, the demands of various learning tasks, and the structure of the material they use. Students must learn to adjust their activities to the demands of these forces which partly comprise the learning situation. They must develop sufficient rules and strategies for learning, and they must develop adequate background knowledge. They must actively learn how to learn (Brown, Campione, & Day, 1981).

Smith (1977) reports on the relationship he found between critical thinking and processes that occur in college classes. He says that student participation, faculty encouragement and use of students' ideas, and peer-to-peer interaction emerged as possibly related to change in critical

thinking and critical thinking behavior. Smith concludes that efforts at encouraging student involvement have cognitive, as well as affective benefits.

Berman and Roderick (1977) explain that knowledge resulting from personal involvement is individualized and is useful in helping a person feel in control of his or her life. They say that involvement leads to knowledge which is open, or still being developed, changed, or revised. Berman and Roderick stress the importance of making learners actively involved. They conclude that learning is minimal where involvement is minimal.

### Problem Solving

Theory and research on human cognition point out the relationship between thinking processes, in the form of problem solving, and learning. Barell (1983) recommends viewing students as thinkers, not just as information consumers, and helping them develop abstract thinking skills. Bode defines thinking as "the finding and testing of meanings" (1940, p. 251). Salomon (1983) explains that problem solving involving complex mental activity improves students' recall, comprehension, and inference-making. Hock (1958) says that the essence of learning is problem solving. Gagné (1964) says that problem solving, requiring prior learning, is itself a form of learning. This section reviews problem solving literature in the following areas: (1) steps of problem solving, (2) the importance of active involvement, and (3) the importance of the knowledge/skill base.

#### Steps of Problem Solving

Two problem solving sequences are given here. Gagné (1970) identifies the following, which he references to Dewey's How We Think (1910):

(1) presentation of the problem, (2) definition of the problem by ascertaining essential features of the problem situation, (3) formulation of hypotheses which may apply to a solution, and (4) verification of a hypothesis or of successive hypotheses until a solution is found.

Johnson (1955) provides a similar set of steps: (1) preparation, (2) production, (3) judgment. His discussion of the earliest phases of problem solving suggests the active level of involvement of the problem solver. Johnson says surveying a problem situation, in preparation for solving a problem, leads to the structuring of the problem. He says that when problem solvers respond to a problem by surveying and structuring they are in fact organizing the problem. They produce subproblems. Solving one subproblem leads to formulating the next subproblem. This discussion of problems within problems, all to be solved, suggests the importance for educators to provide opportunities for complex problem solving in schools.

#### The Importance of Active Involvement

Bigge and Hunt (1962) say that the psychological element of uncertainty provides the problematic aspect of the problem situation. Uncertainty is the initial point of the problem solver's active involvement. The next step of involvement is the individual's realization that he or she has a problem. Hullfish and Smith assert that a problem is always a personal affair, "as teachers would do well to remember" (1961, p. 107).

Bloom and Broder (1950), in a study of good and poor problem solvers, found that good problem solvers are more active than poor problem solvers. Good problem solvers bring more relevant information to bear on the problem. Bloom and Broder characterize poor problem solvers as passive receivers of information.

In research with 116 college students, Wicker, Weinstein, Yelich, and Brooks (1978) trained one group to solve insight problems (problems based on an assumption which has to be overcome) by reformulating their initial perception of the problem. They trained another group to form detailed visual images to achieve clarity of their comprehension of the problem. The results of their study indicated that the reformulation training was effective, while the visualization training was not. The writers suggest that subjects' set toward flexible thinking was more useful than a set toward detail and clarity. Another conclusion to be drawn from this research is that the elaborative thinking of reformulation may be superior to mental imaging because reformulation is a technique which more actively involves the problem solver.

Verbalization is a means by which problem solvers become actively involved in problem solving. When Gagné (1970) stresses the importance of acquiring organized intellectual skills, he says that verbal instructions, including verbalizing to oneself, is important. Lochhead and Clements (1979) also say that science learners must search for ways of putting formal descriptions of laws into their own words. Others concerned about using verbalization to intensify learners' involvement and self-awareness (Whimbey & Lochhead, 1980; Schoenfeld, 1979) use think-aloud protocols. With this verbal procedure students have to monitor their own thinking before taking action. Bartlett (1978) recommends using think-aloud protocol analysis to teach creative problem solving. He says this method is itself an expression of creative problem solving.

Webb (1982) studied peer interaction in cooperative small groups of seventh and eighth grade mathematics students. She found high achievement

test performance was related to the frequency with which students gave explanations to peers and to the frequency of receiving explanations in response to their questions and errors. Webb reasoned that giving explanations benefitted students because they were generating associations when they explained information to other students. Generating explanations, or elaborations, is a form of active involvement with information (Wittrock, 1979).

Bruner (1966) and Gagné (1966) both identify discovery learning as useful instruction for assisting students in becoming effective problem solvers. Bruner says that the ability to transfer new information and skills is increased when students have opportunities to learn new information and skills by discovery instead of by rote. For Gagné discovery learning is valuable because the learner is expected to generate new combinations of previously learned principles. Gagné says that problem solving requires discovery.

More recently Papert (1980) has advocated having children learn to program computers using LOGO, a computer language appropriate for young children. He says that children's awareness of their thinking or problem solving is heightened when they learn to "debug" their programs. He says children learn to think about thinking. They actively learn to examine and correct their own reasoning strategies.

#### The Importance of the Knowledge/Skill Base

A major point Gagné (1970) makes regarding problem solving is the requirement for learning to have occurred prior to the new problem. The literature provides various labels for elements of the knowledge/skill base. Gagné says that problem solving is a process by which a learner

discovers previously acquired rules and then uses them in new combinations appropriate to a problem situation. Others use the term "rules" similar to Gagné (Houtz & Speedie, 1978; Landa, 1976; Scandura, 1977a; 1977b; 1980). The term "representations" is used by other writers (Larkin, 1980; Lochhead, 1981; Newell & Simon, 1972). Larkin, McDermott, Simon, and Simon (1980) call mental patterns used in problem solving "pattern-indexed schmata." Reif and Heller (1982) present a model comprised of (1) small chunks of information in an overlapping network and (2) ancillary knowledge used to interpret concepts and relationships and to apply relationships in problem solving. All of these theorists and researchers agree on the importance of the knowledge/skill base represented in awareness of conceptual patterns, sets of relationships, and interactive processes in problem solving.

Concerned with the processes of problem solving and how they may be distinct from divergent thinking, Houtz and Speedie (1978) conducted factor analytic research. They found that among the 91 fifth grade students in their study a problem solving factor was distinguished as one involving the ability to identify and evaluate information or problem elements in terms of given rules and conditions for the purpose of reaching a goal.

Newell and Simon's research (1972) with expert and novice chess players produced findings regarding the importance of efficient representations. They say that experts group data with very efficient representations which help them focus on key features of the problem. Novices find these representations too complicated to learn with ease.

Larkin, McDermott, Simon and Simon (1980) have findings similar to Newell and Simon (1972). Larkin et al. have used think-aloud protocols and computer simulations to observe expert and novice problem solving in chess and physics. Their research indicates that experts have considerable knowledge stored as rich schemata. Novice problem solvers, on the other hand, have a notable lack of knowledge available to them.

Reif and Heller (1982) say that problem solving in physics depends on the content and structure of the knowledge about a particular domain. Reif and Heller say that experts in physics problem solving use sequential steps to (1) describe a problem, (2) break a problem into successive subproblems, (3) consider methods of solution, and then (4) apply their method and describe their results. They use these sequential steps repeatedly while pinpointing problems.

The literature states that having cognitive flexibility is a necessary feature of effective problem solving in addition to having an adequate knowledge/skill base. In discussing the difference between having understanding and having rote recall, Lochhead (1981) says that effective problem solvers are able to move flexibly among different representations. In discussing mathematical problem solving, Scandura (1977a; 1977b; 1980) says that learners switch goals when they fail to find rules to achieve problem solutions. Their goal-switching directs their search for higher order rules which produce other potential solution rules.

Flexibility is a useful attribute of young problem solvers. In research with young elementary school students, Resnick (1981) found that children may be able to apply addition and subtraction rules effectively,

but they do not necessarily understand connections between the two rule systems. Resnick says the key to understanding is being able to move flexibly between the two different representations.

In other research with children, Rothman and Potts (1977) used a picture comparison task with 90 children. They found that fourth graders used information that was presented for the purpose of testing multiple interpretations, while second graders showed surprise and confusion. A conclusion of this finding is that, at least in this situation, the older students showed greater flexibility, and flexibility was required for effectiveness.

For education to assist students in developing cognitive flexibility, as well as building a strong knowledge/skill base, opportunities for practicing problem solving are required. Gagné (1980) notes that schools can directly teach cognitive strategies. However, he explains that opportunities for developing and reflecting upon "executive strategies" are also important. He explains "executive strategies" as strategies which direct flexible shifting from rule to rule, in order to discover the appropriate combination for problem solving. Gagné does not believe that "executive strategies" can be taught directly. Practice in appropriate environments is essential.

In conclusion, this review of the literature on problem solving points to the need for schools to provide opportunities for students to practice problem solving. As indicated in this section, practice in problem solving in schools should assist students in becoming actively involved and in making use of their knowledge/skill base.

### Problem Solving in Cooperative Small Groups

Students are stimulated to think when they confront the thinking of their peers (Kamii, 1984). When they think, speak, and act with peers, students may have to coordinate their viewpoints and "mobilize their intelligence" (Kamii, 1984, p. 414). Problem solving in cooperative small group situations is used to bring peers together in classrooms. This section reviews the literature of small group instruction, focusing on processes and on outcomes.

#### Processes

Gorman (1974) distinguishes "aggregates" from "groups". He explains that people coming together for the first time are aggregates. Only when an aggregate has developed a process of communicating with one another and has begun to develop group norms does it become a group (Gorman, 1974). Gibb (1968) says that in groups patterns of influence, of talk, and of perception begin to occur, and role systems develop. He says that the group begins to develop as a group as members develop interdependencies. Thomas (1957) explains that groups high in interdependence commonly function effectively and offer mutual benefit to members.

Crockenberg and Bryant (1978) point out that school children may have initial difficulties in learning how to cooperate in group experiences. Many children are unfamiliar with the new roles they have in cooperative groups. These authors suggest that teachers develop skills for facilitating students' movement into cooperative functioning.

The literature on group problem solving suggests the importance of avoiding dominance of groups by authority figures or speakers of the

majority opinion. Gordon (1955) says that the dominance of a group leader inhibits the participation of other members. Hoffman, Harburg, and Maier (1962) say that a dominating member interferes with the free expression of differing opinions and reduces possible emergence of creative problem solutions. Maier and Solem (1952) explain that discussion leaders have the important function of protecting minority opinions from pressure from the majority. Hoffman et al. (1962) and Maier and Solem (1952) add that minority points of view often improve the quality of group thinking by introducing conflict.

Cooperative group functioning requires understanding of roles. Schmuck and Schmuck (1974) say that educational research usually assumes that the classroom is comprised of two-person units, with the teacher usually determining his or her interaction with each student. These writers say that classrooms experience much more complex interpersonal processes when teachers alter their roles and serve more as mediator and member than as controller of interactions with students. Lippitt (1968) says that teachers need to help students learn membership and leadership roles.

In her process-outcome analysis of learning in small groups and in individual settings, Webb (1980) explains that what goes on in a learning setting is critically important. She asserts that the specific learning experiences are more important than the type of learning setting. She says, for example, that in small groups where only a few students assume all the responsibility for completing the work, the situation is detrimental to the remaining students. Furthermore, she says that small group situations in which all members work on activities are beneficial to all

members. Johnson (1980) suggests the optimal size of small groups is four to six members. Webb remarks that teachers should encourage students in small groups to help one another and to participate fully.

When students confront one another with their ideas, they provide one another with opportunities to see another point of view (Johnson, 1980; Johnson & Johnson, 1978; Johnson, Johnson, Johnson, & Anderson, 1976). Inquiry within groups helps people find out who they are when they see themselves projected against the views of others (Thelen, 1960). Johnson (1980) maintains that providing students with opportunities for "perspective-taking" (taking another person's point of view) is one of the most valuable purposes of small group instruction. Johnson (1980) cites Piaget when he says that perspective-taking is one of the most important competencies for cognitive and social development. Johnson (1980) says that perspective-taking is related to effective presentation and comprehension of information, constructive resolution of conflicts, willingness to be open with others, effective group problem solving, cooperativeness, and intellectual, cognitive, and social development. Johnson (1980) says that cooperative small groups promote perspective-taking.

Tjosvold and Johnson (1977; 1978) used controversy and non-controversy intervention conditions to study perspective-taking among 30 college students who participated in decision-making during hypothetical moral dilemmas. Subjects were paired with confederates who had been trained to either take the same positions as subjects or to take different positions from subjects. Tjosvold and Johnson found that subjects in the controversy condition were more accurate in understanding their confederate's

reasoning than subjects in the non-controversy condition. They found, however, that subjects in the non-controversy condition rated that they believed they understood the confederate's reasoning more than subjects who were in the controversy condition. The researchers conclude that controversy leads to more accurate perspective-taking than does lack of controversy. They explain that the controversy condition motivated subjects to seek understanding. The researchers also conclude that people who share the same opinion may often have the illusion of understanding that which they do not truly understand. Small group problem solving provides students with opportunities to see issues from other students' points of view.

Falk and Johnson (1977) used perspective-taking and egocentrism as forms of group processes in their study of processes which affect problem solving. Their research used 90 college students. Perspective-taking subjects were requested to attempt to understand viewpoints of other group members by asking questions to explore their viewpoints, paraphrase their viewpoints, and then incorporate these new ideas into their own viewpoints. Egocentric-presentation subjects were told to present their own ideas forcefully and to evaluate openly the amount of agreement other members' viewpoints had with their own. The task was to rank 15 items which would be important for survival on the moon. Results indicated that perspective-takers, in comparison with egocentric-presenters, had better understanding of other members' information, more effective presentation of problem solutions, more cooperative groups, more creative solutions, better utilization of resources, greater commitment to group solutions, and greater trust in group members. Falk and Johnson conclude

that perspective-taking is an important aspect of cooperative problem solving. They also conclude that perspective-taking in groups is likely to promote positive information exchange and high quality outcomes for groups and individuals.

In summary, this section has examined some of the processes experienced by participants of small groups. Group formation, roles and role relationships, and the importance of perspective-taking have been discussed.

### Outcomes

Research on problem solving in cooperative small groups generally points to achievement gains for groups and/or group members (Webb, 1983). On another theme Wynne (1983) stresses the importance of cooperative group work for socializing students in preparation for their adult lives. Johnson (1980) lists numerous benefits of small group work which has a cooperative goal structure. This section reviews literature which indicates achievement as an outcome of small group work. It presents Johnson's list of benefits (1980). Finally, it suggests an area for further research.

Related to achievement is productivity. Deutsch (1949) found greater group productivity resulting from cooperative group interactions, compared to competitive interactions. Hudgins (1960) found greater productivity among fifth-grade mathematics students who had solved word problems in small groups compared to those who had worked alone.

Laughlin (1978) presents research conducted by Laughlin and others (Laughlin, Branch, & Johnson, 1969; Laughlin & Branch, 1972; Laughlin, Kerr, Davis, Halff, & Marciniak, 1975) which investigated the relationships

between 528 college students' ability and their group problem solving performance. A pretest-posttest design was used. Achievement was measured by performance on the Terman Concept Mastery Test. Problem solving groups were comprised of three, four, and five subjects. Findings indicate that general performance was proportional to the number of high ability group members. All subjects benefitted from working with one or more high ability subjects. Medium and low ability subjects did not benefit from working with comparable group members. With the three sizes of groups, high ability subjects increased their performance with increases in group size. This research suggests, for high achievement, the importance of heterogeneous composition of cooperative small groups.

Slavin and Karweit (1984) studied effects of four instructional conditions in elementary school mathematics classes. Team Assisted Individualized (TAI) Instruction rated highest on both achievement and effective measures when compared to results from instruction which did not place students in cooperative small groups. TAI consisted of (1) teachers teaching concepts, (2) students in four-member heterogeneous groups practicing application of concepts, (3) teachers providing direct instruction when groups needed help, (4) students managing the administration, scoring, and record-keeping of practice tests, and (5) teachers administering final tests. Both researchers and the teachers in the study saw the efficiency of delivery of instruction with TAI as a major plus. Slavin and Karweit conclude that the high structure associated with efficient student management produced high achievement effects for TAI Instruction.

Johnson, Johnson, and Scott (1978) studied the effects of cooperative and individualized instruction on student attitudes and achievement. Their subjects were 30 fifth and sixth grade mathematics students. Students in the cooperative condition were instructed to work together as a group with all students giving suggestions and ideas and seeking help from each other rather than from the teacher. The teacher praised and rewarded groups as a whole. Students in the individualized condition were told to work on their own, avoiding interaction with other students and seeking help from the teacher. The teacher gave praise and rewards individually. Students worked in committees of four. Achievement was defined as performance on computational and thinking skills materials. Johnson et al. report that the achievement level of cooperative group students was higher than the achievement level for students in the individualized condition in two of the three final tests and much higher on the retention test. Johnson et al. also report that the cooperative group members were faster and more accurate in their daily work than students in the individualized condition. Cooperative group students had higher self-esteem, more positive attitudes toward conflict, fellow group members, and the teacher than students in the individualized condition.

Johnson, Johnson, and Skon (1979) studied student achievement on different types of tasks under cooperative, competitive, and individualized conditions. Subjects were 64 children between five and seven years of age. Subjects in the three conditions were required to perform a variety of tasks in mathematics, reading, and spatial reasoning. The results show that cooperative groups performed higher on all tasks. Johnson et al.

explain that these findings indicate the usefulness of cooperative small groups for the performance of problem solving and conceptual learning.

Lucker, Rosenfield, Sikes, and Aronson (1976) studied the performance of fifth and sixth graders in cooperative learning groups. Students participated in problem solving activities in which group members each had information other members needed and did not have. Groups had to work together to accomplish tasks. Results show that high and low ability students benefitted. Minority students (black and Mexican-American) benefitted from heterogeneously organized groups which included "Anglos" who possessed superior "school skills".

Seeking information is a necessary behavior for high achievement in learning activities. Johnson (1980) says that students demonstrate information-search behavior when they participate in cooperative small groups. Research of Crawford and Haaland (1972) indicates that working toward a group goal is motivating to members of cooperative problem solving groups. Compared with information-seeking by subjects in a non-cooperative group condition, students in a cooperative group condition sought more information in predicting the outcome of their problem, whether a light would be on or off.

Johnson (1980) identifies interpersonal processes as outcomes of cooperative group conditions which affect learning. Among these he names high levels of the following: interaction, divergent thinking, trust, acceptance and assistance by peers, emotional involvement, and use of resources. Additionally, he includes effective communication, conflict management, and decreased fear of failure as outcomes of cooperative group conditions.

Independent learning behavior, as an outcome of cooperative small group instruction, is not commonly reported in the literature. McCann's research (1982), however, focuses on independent learning behavior as an effect of small group instruction using the Problem Approach. Her mixed findings, discussed more fully in the Student-Centered Instruction section of this chapter, suggest the need for further research.

In summary, achievement gains are a frequently discussed benefit of cooperative small group instructional conditions. The literature suggests numerous other outcomes. Further research is needed for greater understanding of independent learning behavior as an outcome.

### Developing Independence in Learning

With improved thinking abilities students may become more independent. This section reviews the literature on independent learning behaviors. The areas related to this topic and presented here are: the educational aim of autonomy, processes which facilitate independence, and categories of independent learning behavior.

#### The Educational Aim of Autonomy

Thelen asserts that the quest for autonomy is "the most fundamental human need" (1960, p. 27). On the same theme, Kagan says that one of the most valuable statements schools must teach children to believe about themselves is, "I am able to think autonomously" (1966, p. 159).

Kamii (1984) criticizes American education at all levels for under-emphasizing thinking. She says that university teacher education programs have failed to teach secondary teachers methods of teaching students to think logically. She concludes that if students do not succeed

in becoming logical thinkers they certainly cannot become critical or autonomous thinkers. Kamii defines autonomy as being governed by oneself.

In writing about autonomy, Kamii's objective was to "clarify Piaget's ideas about education" (1984, p. 410). Kamii says that autonomy should be the aim of education.

Kamii discusses adult practices which affect children's development toward autonomy. She says that rewards and punishments are symbols of adults' power over children. Rewards and punishments discourage autonomy. Kamii says that adults encourage autonomy when they exchange points of view with children and when they assist children in interacting with their environment. These practices enable children to construct their own knowledge and their own moral values. "According to Piaget, a child acquires knowledge just as he or she acquires moral values: by constructing it from within, not by internalizing it directly from the environment" (Kamii, 1984). Kamii stresses that social interaction is essential for constructivism to occur. She adds that honest exchanges of points of view are bound to lead eventually to autonomy.

#### Processes Which Facilitate Independence

The literature identifies group learning activities and cooperative multi-task classroom conditions as two situations which facilitate independence. Martin (1980) says that a sense of belonging to a group allows students to help one another and solve many of their own problems without reliance on the teacher. Similarly, Slavin (1981) says that cooperative learning structures promote independence because students become less dependent on the teacher. Implications of a two-year field study by Bossert (1979) indicate that cooperative multi-task classroom

conditions may lead to independence. Bossert says that multi-task activities may teach children to be cooperative and self-directed because they require children to work together and organize their own projects without constant supervision from the teacher. Thelen (1981) says the dominant purpose of the classroom teacher is to facilitate students' growth toward whatever self-realization and effectiveness for which they are ready.

The literature also identifies the development of self-confidence and self-reliance as factors leading to independent learning behavior. Sarason (1962) comments on the beginning of the movement toward independence. He says teachers should expect students to experience a struggle. He says that learning to think independently, particularly when previous instruction has placed students in a passive-receiver role, is never easy.

Gorman (1974) says that students need to gain increasing information on who they are and what they are worth and in the process develop greater self-confidence and self-reliance. Students need to see the relevance of schooling in their present lives. They will become more self-directing in the process.

Classroom climate is seen as nurturing independence. Bayles (1960) says that in a problem-solving atmosphere where students are thoughtfully carrying out their investigations, students progressively learn how to be self-reliant and independent. Gibb (1968) also says that autonomy develops in supportive climates where self-initiated activity occurs readily.

### Categories of Independent Learning Behavior

McCann (1982) investigated the relationship between independent learning behaviors and participation in a student-centered instructional approach known as the Problem Approach. She operationalized the construct of independent learning behavior by dividing it into four observable, discrete categories. In the research of McCann, then, independent learning behavior was observed as questioning, managing, planning, and evaluating behaviors which were manifested voluntarily by seventh grade subjects. McCann's research is reviewed in the next section.

Questioning is a behavior individuals manifest when they are engaged in the process of becoming informed. Dervin (1976) explains that most of the recent work in the field of communication views information as descriptions of reality which allow people to move through reality more effectively. She stresses, though, that people will make their own "personal sense" out of objective information. They will ask a large variety of questions (Dervin, 1976), the language of which reflects their efforts to make "sense". For Herber (1978) an objective of instruction is for students to reach a level of independence at which they demonstrate competence in asking questions.

Managing people and information is a behavior people exhibit when they are seeking goal-attainment. In explaining the rationale for Team Assisted Individualized (TAI) Instruction which has students manage the mathematics materials, practice tests, and record-keeping, Slavin (1984) says students' abilities to manage for themselves are being recognized. He says that children manage much better than adults give them credit for. In describing students working in cooperative small groups,

Johnson (1980) says that students working cooperatively manage information more effectively than students working competitively.

Planning is also a behavior people exhibit when they are seeking goal-attainment. Hock (1958) says that students' involvement is enhanced when they are placed in the active role of researcher. In this role students are planners of the large problem to be investigated as well as subtopics to be handled by committees. She recommends that all students share in the planning of the overall aims of their small group work. Whiteside (1978) points out that planning the scope of the problem solving often has more instructional value than finding the problem solution.

Evaluating is a behavior which requires that individuals review either processes or content and then make judgments based on either implicit or explicit criteria. In the factor analytic research of Houtz and Speedie (1978) which studied processes underlying divergent thinking and problem solving, evaluative reasoning was found to be an important dimension of the problem solving process. Festinger (1954) says that all people are motivated to evaluate themselves. He says people seek cues from their environment and they ask others for feedback. Festinger explains that evaluation is a natural need. Sharan (1980) recommends that students evaluate their own processes and products when they culminate group investigation learning activities.

Goodlad (1983a; 1983b; 1984) says that American schools do not provide students with sufficient opportunities to demonstrate effects of intellectual curiosity, initiative, planning, and evaluating. He complains that schools do not place a premium on democratic processes,

independent thinking, creativity, personal autonomy, and learning for the sake of learning. Although the literature contains abundant information on school achievement, there appears to be a paucity of information on independent learning behavior. Moreover, schools appear to provide insufficient nurturing of independent learning behavior. Research with implications for practice is needed in this area.

In conclusion, this review of the literature on developing independence in learning points to the need for autonomy to become the aim of education. Students may reflect on their developing autonomy as they become increasingly more self-confident and self-reliant. To observe the development of independent behavior, researchers and teachers can look for evidence of voluntary questioning, managing, planning, and evaluating behaviors among students.

### Student-Centered Instruction

This section reviews the literature of student-centered instruction. Historical origins and more recent developments are presented.

#### Historical Origins

Joyce and Weil (1980) trace student-centered approaches to Dewey, who was interested in using the democratic process in the classroom. Dewey made democratic, problem-solving processes central in his conception of education (Joyce & Weil, 1980).

Bayles (1960) gives further insight into Dewey's philosophy of education. He says that for Dewey individuals are neutral-interactive, meaning that they have neither complete self-determinancy nor complete outside-determinancy. For Dewey teachers and students should have an

interactive relationship during the "purposing," planning, executing, and evaluating activities of learning (Bayles, 1960).

Dewey (1938) explained that his focus was on learning through experience. He said it is the teacher's responsibility to see to it that experience is educative. Dewey said that rules and authority should derive from group needs and activities. The teacher should see to it that the structure and materials of the classroom do not impose too much on the students. The teacher should also see to it that the internal conditions, or inclinations and feelings, of students do not disrupt educative processes. Dewey said that students should plan methods of action. Teachers should guide intelligent interaction.

Kilpatrick, a follower of Dewey's (Bayles, 1960) developed the "project method" (1919). Kilpatrick said the unifying principle of his concept is purposeful activity in a social environment.

Alberty's explanation of Kilpatrick's project method is that it is based on the purposeful planning of children. He says the project method "bridges the gap between school and life" (1927, p. 15). It avoids imparting organized knowledge to the minds of children. Alberty says the project method is "a point of view in dealing with the child" (p. 16), not simply a teaching procedure. He says the child builds logical organizations of knowledge.

Alberty provides an explanation for the history of the project method. He says it dates back to 1908 when it was used in Massachusetts to help farmers learn about agriculture through concrete and practical instruction. The farmer had to become an intelligent worker and director of his own work. Alberty notes that the project method soon gained

acceptance outside of agriculture. Dewey became the notable advocate who stressed that children should be at the center of their learning (Alberty, 1927).

#### More Recent Forms of Student-Centered Instruction

Bayles (1960) became a follower of Dewey. In Democratic Educational Theory he presents his method of democratic instruction. In his method, "reflective teaching," learners are maneuvered into a problem situation. The first step of reflective teaching is problem raising. The second step is problem solving. The role of students is to actively think the problem through to its conclusion. The teacher's role is leader of a group of investigators. Bayles says that students and teachers cooperate as a team. Bigge and Hunt (1962) observe that reflective teaching is problem-centered. Additionally, Bigge and Hunt comment that problems students face in reflective teaching must really matter to them so that they are sufficiently motivated to seek information.

Thelen (1960) recommends the Group Investigation approach to inquiry teaching. Similar to reflective teaching, Group Investigation includes having students stimulated by confrontation with a problem. Thelen says knowledge results from inquiry. Moreover, the social process of group involvement enhances inquiry (Thelen, 1960). Students identify and formulate problems and pursue their solutions. In this approach the teacher is counselor, consultant, and friendly critic.

Joyce and Weil (1980) say that Group Investigation blends goals of academic inquiry, social interaction, and social process learning. Group Investigation "replicates the negotiation pattern of society" (Joyce & Weil, 1980).

Sharan and Sharan (1976; 1979; 1980) also recommend the Group Investigation instructional approach. Sharan (1980) says that this cooperative group approach emphasizes data gathering by students, interpretation of findings through group discussion, and synthesis of individual contributions into group products. He lists the following sequence of steps:

1. Selection by students of specific subtopics within a general problem area. Students then organize into small heterogeneous groups.
2. Cooperative planning by students and teacher of specific procedures, tasks, and goals appropriate to the subtopics of Step 1.
3. Students carry out the plans of Step 2. Learning should involve wide variety of activities and skills with resources both inside and outside of school being used. The teacher follows progress closely and assists when students require assistance.
4. Students analyze and evaluate data gathered in Step 3 and plan presentations to classmates.
5. Groups present to class to help class achieve broad perspective of topic.
6. Evaluation by students and teacher of each group's contribution to the work of the whole class.

Sharan and Sharan (1976) say that cooperation and communication among students is the primary vehicle of the educational process of Group Investigation. They assert that with this approach social contact is not treated as a peripheral phenomenon of school life, as it is in traditional education, but as a powerful tool fostering learning.

Sharan, Lazarowitz, and Ackerman (1979) used the Group Investigation approach to study learning in small groups and academic achievement of elementary school children. Their comparison group study used 217 subjects in grades two through six. Subjects were in five traditional teacher presentation-student recitation classes and five small-group classes using Group Investigation. Content matter was the same for both groups but different by grade level. The researchers measured achievement using achievement tests with high and low cognitive level categories. They also measured communication patterns as a function of classroom social organization using a classroom social organization category system. Results of the study indicate that in three out of five grade levels, students in Group Investigation classes received higher scores on the high cognitive level questions than the students from the presentation-recitation classes. On the lower cognitive levels there were no significant differences for most groups. At the second grade level presentation-recitation students scored higher at both cognitive levels. The authors point out that one of the Group Investigation teachers whose students did not score higher on higher level questions did not succeed in using the techniques of Group Investigation. Results on the social processes dimension indicate that social processes in the Group Investigation classes were more complex than in presentation-recitation classes.

Slavin (1980) remarks that Group Investigation emphasizes creativity, inquiry, and complex thinking. He finds the approach particularly appropriate for subjects requiring divergent thinking, especially social studies, literature, and related subjects. In comparison with other cooperative small group procedures, Slavin concurs with Sharan et al.

(1979) that Group Investigation produces higher achievement scores on high cognitive levels than other small group approaches.

The research of McCann (1982) used the Problem Approach to study independent learning behavior. The Problem Approach is similar to the Group Investigation approach, differing primarily in the provision of steps which increase structure and more fully define the teacher's responsibilities. For example, the Problem Approach specifies the manner in which the teacher facilitates students' generation and categorization of subtopics.

McCann used the Problem Approach in a pretest-posttest observation study using subjects as self-controls. Subjects were identified as academically able seventh graders. Because the treatment was administered during an extended day enrichment program, students were able to determine the overall content of their work. They chose the area of health. An observation instrument using the categories of Questioning, Managing, Planning, and Evaluating was used to record subjects' independent learning behaviors before and after treatment. Results indicate that subjects manifested more independent learning behaviors in Questioning and Planning categories but not in Managing and Evaluating categories. Results also indicate significant differences in independent learning behaviors by sex, age, and heterogeneous grouping in competitive and cooperative (use of the Problem Approach) groups. However, no distinct patterns emerged to indicate a relationship with treatment.

Further research using the Problem Approach to study independent learning behavior is indicated. Specifically, research should focus

upon the process by which students develop independent learning behaviors during participation in the Problem Approach. Furthermore, additional research with academically average and below average preadolescents is indicated to supplement McCann's research with academically able preadolescents.

In conclusion, the movement toward student-centered education originated with Dewey. Various forms of instruction have evolved this century following the general principles of Dewey. However, American education has been criticized recently for not making students have a more active part in their schooling and for not helping them develop higher level thinking skills. Instructional forms, such as Group Investigation and the Problem Approach, have been used to provide for these needs.

### Summary

This chapter reviewed literature in the areas of active involvement, problem solving, problem solving in cooperative small groups, developing independence in learning, and student-centered instruction. The literature points to the responsibility of education for helping students develop thinking skills so that they might become autonomous. It appears that research is needed in the areas of independent learning behavior and student-centered instruction.

## CHAPTER III

### METHODOLOGY

This chapter describes the general design, the sample and sampling procedures, the teacher-centered instructional situation, and the research procedures. The section on the research procedures includes descriptions of teacher training, treatment procedures, data collection procedures, and data analysis procedures.

#### General Design

The purpose of this study was to observe the independent learning behaviors of sixth grade students before, during, and after their participation in a student-centered instructional procedure known as the Problem Approach. The class used for the study was a sixth grade reading class of 28 students in a suburban public elementary school. The school draws its enrollment from several different neighborhoods of diverse ethnic, racial, and socio-economic composition. Though all 28 students participated in the Problem Approach and the class activities which the researcher observed before and after the Problem Approach, four students were selected to be subjects of the research. Only the researcher and the others on the research staff knew the identity of the subjects.

The researcher used a single case study design with four parallel applications to determine if the Problem Approach facilitated the development of independent learning behaviors. The Problem Approach was used for a period of six weeks and took the place of the teacher's usual

reading instruction. The specific independent learning behaviors which were studied in this investigation were grouped in the following categories: Questioning, Managing, Planning, and Evaluating. A Behavior Observation Checklist, developed by McCann (1982) and expanded by the investigator, was used to record the frequency of the four subjects' independent learning behaviors before treatment, during treatment, and after treatment. Visual inspection of graphed data supplemented by two statistical procedures, the sign test and the binomial test, were used to analyze the data.

#### Sample and Sampling Procedures

The sixth grade class from which the sample was selected was heterogeneously mixed along several traits of interest to the researcher. The class contained students whose academic achievement level, as determined by the California Achievement Test, ranged from the 1st to the 4th quartiles in reading vocabulary and comprehension. The students took the test in the fifth grade, just prior to this research. The students were in three reading groups with basal reader materials for reading levels 4-5 through 6-7. The class was racially mixed, with 18 white students, 8 black students, and 2 Asian students. There were 17 boys and 11 girls. Some students participated readily in class activities, and some participated in the class only when invited by the teacher.

Prior to the pre-treatment, or baseline, phase of the research, the researcher selected four subjects. The criteria were: parental permission (Appendix C), boy and girl of the middle achievement level, boy and girl of the low achievement level, and white, to hold the variable of race constant. Additionally, the researcher sought individuals whose

California Achievement Test scores and reading group were of a comparable level. The researcher also sought individuals whose amount and types of formal and informal interactions in the class appeared appropriate with the visible classroom norms, or standards of behavior. In other words, desirable subjects were students who were neither unusually disruptive nor unusually reticent. They appeared socially acceptable to other people in the classroom. They performed school work when others worked. They socialized when other people socialized.

Student	Sex	Achievement Level	Reading Group Level	California Achievement Test					
				Standard Score		Percentile		Stanine	
				Reading Vocabulary	Reading Comprehension	Reading Vocabulary	Reading Comprehension	Reading Vocabulary	Reading Comprehension
#1	M	Low	5	436	442	33	33	4	4
#2	F	Low	5	464	442	53	33	5	4
#3	M	Mid	6	486	478	69	54	6	5
#4	F	Mid	6	470	498	58	66	5	6

Figure 1. Sample Characteristics

#### Teacher-Centered Instructional Situation

Prior to data collection, the researcher followed an observation schedule of six observations in the classroom for the purpose of being able to describe the baseline teacher-centered instructional situation.

The researcher also discussed with the teacher pertinent details about her teaching style to clarify the observations. As a way of focusing the description of her teaching style, the researcher developed and used a two-part checklist which contrasts student-centered instruction (as prescribed by the Problem Approach) with teacher-centered instruction (Figure 2). No other measures were used at this time. The checklist and the following written description provide an account of baseline instruction. The account is necessary for understanding students' behaviors in her class.

The reading class met from 9:00 until 10:20 on mornings the students had physical education (Monday, Wednesday, and every other Friday). On other mornings the class met from 9:00 until 11:00.

The routine procedure for a reading period was for two reading groups to work on independent work at their desks while one reading group met with the teacher. Independent work was assigned on the blackboard, different work for different reading groups. Some activities were highly structured, such as fill-in-the-blank assignments. Other activities were not highly structured, such as story-writing. Though the teacher identified seat work as "independent," she allowed students to assist one another. To facilitate students' helping one another, the teacher used a seating arrangement which mixed students of the three reading groups.

When the teacher taught a reading group, she sat in a rocking chair with the students all around her on a carpet. She usually led the group in discussion of a classwork or homework assignment by asking questions from the teacher's manual which accompanies the reading text. The usual procedure was for the teacher to ask and the students to respond. Students

Figure 2. Teacher Observation Checklist

Teacher-Centered Teaching:

<u>check if appropriate:</u>	<u>behavior:</u>
<u>  X  </u>	1. Tells students what content they will cover.
<u>  X  </u>	2. Expresses judgment of students' behavior or performance, either verbally or with facial expressions.
<u>  X  </u>	3. Alters students' language by putting students' remarks into teacher's own language.
<u>  X  </u>	4. Tells students the order of their work.
<u>  X  </u>	5. Uses purposes and objectives which <u>do not</u> come directly from students' involvement.
<u>  X  </u>	6. Plans lessons without using students' input.
<u>  X  </u>	7. Analyzes topics for students.
<u>  X  </u>	8. Selects students to serve in group leadership and support roles.
<u>  X  </u>	9. Assigns all learning activities.
<u>  X  </u>	10. Performs all record-keeping responsibilities for class.
<u>  X  </u>	11. Teaches skills when teacher sees the need for skills instruction or when skills instruction is appropriate for administrative reasons.
<u>  X  </u>	12. Tells students what the form and content should be for project work.
<u>  X  </u>	13. Evaluates students' learning processes and products.

Remarks, including comments about teacher's efforts to make his/her teaching less teacher-centered:

Figure 2 (continued). Teacher Observation Checklist

Student-Centered Teaching (based on the Problem Approach):

check if  
appropriate:

behavior:

- |       |  |
|-------|--|
| _____ | 1. Asks students what they want to learn about in a particular unit.   |
| _____ | 2. Accepts every response without showing judgment.  |
| _____ | 3. Records responses in students' language.  |
| _____ | 4. Asks students to categorize topics.   |
| _____ | 5. Asks students to determine their own priorities for what topic or problem to study first, second, third.  |
| _____ | 6. Asks students to analyze (break down topic into questions and/or subtopics).  |
| _____ | 7. Asks students to evaluate their plans and decisions each session.   |
| _____ | 8. Assigns students to small heterogeneously organized committees.   |
| _____ | 9. Assigns each committee a subtopic.  |
| _____ | 10. Asks committees to select chairperson and recorder.  |
| _____ | 11. Facilitates* chairpersons in developing resource plan of how committees will explore their subtopic or problem.  |
| _____ | 12. Facilitates committees in making individual assignments of work to be done.  |
| _____ | 13. Provides group with materials necessary for group record-keeping (folders, record-keeping forms) and facilitates committees in doing their own record-keeping.   |
| _____ | 14. Facilitates committees in collecting the information they need and in experiencing the activities they plan. (Teacher facilitates when groups realize the need). |
| _____ | 15. Asks who, what, why, where, how questions to committees to help them see their need for careful and thorough work.   |
| _____ | 16. Asks committees to plan for final presentation (in a form and with content determined by committees).  |
| _____ | 17. Facilitates committees in meeting their objectives for their final presentations.  |
| _____ | 18. Asks committees to evaluate their own presentations and the presentations of the other committees.   |
| _____ | 19. Inductively leads students to see that evaluation includes the following questions:  |
|       | - What have we learned?  |
|       | - Was it worth learning?   |
|       | - How might we use it?   |
|       | - What additional questions do we have?  |
|       | - What was the best thing about the way the ideas were presented?  |

\*facilitates - an inductive process the teacher uses to stimulate responsible participation on the part of the students.

rarely spoke to one another. The teacher often departed from the teacher's manual to provide skill-building lessons based on her perception of students' needs. She often used questions intended to facilitate students' critical thinking about their reading lessons.

When the teacher taught the whole class, students often participated voluntarily by elaborating upon her points of discussion. The researcher observed that nearly all of this type of voluntary class participation was by boys in the class, boys from all three reading achievement levels. The only type of unsolicited responses from girls were procedural questions, such as "How long do we have to do the work?" "How many pages do we have to do?" "Will I get half credit for my answer?" During observed lessons, high achievement girls did not initiate any kind of interaction with the teacher prior to treatment. The researcher did not infer causes for what appeared to be a male dominated climate, which was the usual situation when the teacher interacted with the whole class prior to treatment. The researcher was able, however, to note differences in the climate regarding the sexual dominance during the treatment.

In spite of the fact that the teacher's reading program appeared to be highly structured, adaptability and sensitivity to students' needs were personal traits of the teacher which were evident each day of observation. She managed to find private time with boys and girls who needed her. She took time to help students discover their own errors and find more effective means of completing their work. Most importantly, she sought to participate in the research for the purpose of learning ways to be "less directive" with her students, she said. To participate in the research she agreed to discontinue her reading program for the duration of the treatment.

In summary, this section provided a description of the baseline teacher-centered instructional situation. The two-part checklist (Figure 2.) indicated that the style is teacher-centered, particularly as it is compared to the student-centered style of the Problem Approach. The written description depicted the teacher's style as responsive to students' needs but teacher-centered.

### Research Procedures

#### Teacher Training

The teacher training component had three phases. The first phase consisted of two meetings which included the school principal. These meetings were held prior to the researcher's entry into the teacher's sixth grade class. On these occasions the researcher provided a general overview of the research and began to establish a rapport with the teacher in whose class the research would be conducted. The researcher explained that during the pre-treatment observation period the teacher would use her usual teaching style and her usual materials and assignments. The teacher was requested not to try instructional innovations during this time.

The second phase consisted of a series of training sessions intended to prepare the teacher for her implementation of the Problem Approach during the treatment portion of the research. The training sessions occurred during the week preceding treatment. A research assistant was also trained in these sessions. Her presence helped provide a group atmosphere for the teacher to learn about the students' roles and her role in the Problem Approach. The research assistant in the teacher

training was also being prepared to teach using the Problem Approach if the teacher required a substitute during treatment. The training consisted of role playing, discussion, lecture, and two videotape presentations of the Problem Approach.

The third phase of the teacher training was the researcher's weekly monitoring of the treatment in after-school meetings with the teacher. In these weekly meetings, the researcher answered the teacher's questions, supported her in her new role as a Problem Approach teacher, and assisted her in making decisions about implementing the Problem Approach. As non-participant observation research, the design precluded interaction between the teacher and researcher during class time or in the presence of students. Moreover, the training program with the teacher prepared her to implement the Problem Approach with minimal assistance from the researcher. The final monitoring meeting with the teacher, held at the conclusion of the treatment, was an evaluation session. The teacher evaluated her use of the Problem Approach. Her evaluation is presented in Chapter Four.

#### Treatment Procedures

This section describes the treatment procedures. First, the Problem Approach is overviewed. Next, the Problem Approach is presented as it was implemented in the classroom. Minor deviations from the description of the Problem Approach in Appendix A were consistent with the purposes of the procedure. The treatment affected the diverse multicultural norms operating in the classroom and the familiar teacher-class authority structure and resulted in new role relationships and new behaviors. The treatment, therefore, was comprised of the twelve steps of the Problem Approach plus the behaviors of the class in response to the twelve steps.

For this reason, the following account of the treatment procedures includes each of the twelve steps plus the behavior of the class in response to each step. This use of descriptive data provides a view of the Problem Approach classroom within which the four subjects were observed.

The Problem Approach. The Problem Approach is an instructional strategy which places the student in the role of an active learner. The purpose of using this strategy is to assist students in developing independent learning behaviors so that ultimately they might become self-directed, independent learners. Throughout the procedure participating students have opportunities to question, to manage information and people, to plan, and to evaluate. These active behaviors are the behaviors of self-directed independent learners.

The instructional approach comprises sequential steps moving from goal-setting to the presenting and evaluating of final products. The steps fall into three phases: (1) identification of the problem or topic, (2) planning and carrying out the plan for solving the problem or studying the topic, and (3) presenting and evaluating findings. Learning processes include brainstorming, categorizing, labeling, prioritizing, planning, questioning, organizing, researching, specific skill development, compiling, presenting, and evaluating. All four language modes--listening, speaking, reading, and writing--are practiced throughout the procedure. In all of the processes here named, the students are actively involved.

The Problem Approach emphasizes students' experiences and interests. It involves them in the pursuit of knowledge and/or skills they say they would like to acquire. They work on independent tasks. They also

participate in small group problem solving which heightens their active involvement with instructional content and processes. These situations highlight student strengths, promoting positive self-concepts and peer instruction. At the same time, instrumental decision-making responsibility is practiced by the students.

The teacher's role is to direct students in following the basic steps of the Problem Approach (Appendix A). Throughout the procedure the teacher helps students focus on their learning objectives. The teacher is the primary facilitator.

Implementation of the Problem Approach. The researcher gave the teacher a choice regarding topic selection. The teacher could begin by leading her class to determine the content area they would study. She could, on the other hand, select the topic herself and then lead the class to decide on specific areas of the topic they wanted to study. She chose to give her class the broad topic of American Indians.

The day before beginning the Problem Approach, the teacher announced to her class that they would begin a research unit on American Indians. She asked them to tell what they already knew about American Indians. She wrote their responses on the board and said she wanted them to get used to thinking about the topic. The next day she began the Problem Approach. The students had no way of associating their study of American Indians with the researcher, who had observed in their class every morning for the previous four-and-a-half weeks.

The following is a step-by-step description of the Problem Approach as it was implemented in this research:

### Step One

The teacher asked the students, "What do you want to learn about American Indians?" She recorded students' responses exactly as she heard them. She continued writing responses until students had filled available space on blackboards. Step one required almost an hour of class time.

#### Behavior of Class:

Many students volunteered topics and questions. The first participants were all high achievement students. After five minutes, students from all three achievement levels began to participate. Several students whom the researcher had never seen participate in a class discussion voluntarily offered topics for the teacher to write on the board. Several students did not participate at all. Before step one ended several students were standing or were on their knees in their chairs. Their hands were in the air. When the 43rd topic was written on the board, the teacher told the class she was running out of board room and they would have to stop soon. A student said, "Don't stop now! We're on a roll!" At the 49th topic the teacher said, "That's all. There's no more room." A student who, by the teacher's account, had never volunteered in this class before this activity stood and said, "What sacrifices did Indians make?" He wanted one more topic to go on the board. He walked to the board and found a space where the teacher could write his question. His question was the last. The questions and topics the students generated are listed in Figure 3.

Figure 3. Student-Generated Questions and Topics

1. How about their religions--what gods they worshipped.
2. How many tribes were there and what were their names.
3. Where did certain tribes live?
4. Different types of weapons.
5. How they made their weapons.
6. What kind of food they planted.
7. What they ate.
8. How did the different tribes go about capturing animals?
9. What were their laws and rules?
10. How did they harvest their food?
11. How did they prepare it?
12. What were some of the names of famous Indian chiefs and what were their backgrounds?
13. What sort of structures did the different tribes build and live in?
14. What type of weapons did the Indians hunt with?
15. What did they build their tepees out of?
16. What were some of their clothes made out of?
17. How did they make their clothes?
18. What did they make their shoes out of?
19. How well did tribes get along with other tribes?
20. What were some of their holidays?
21. What kind of names did they have?
22. What kind of games did they play?
23. What were some of the names of the Indians who helped the early settlers?
24. What were their different forms of education?
25. What were the major reasons that the Indians had for either fighting against the white men or cooperating with them?
26. What was their transportation?
27. What kind of tools did they have and how did they make them?
28. How did they cook their food?
29. How did they punish law breakers?
30. What was their currency?
31. What pets did they have?
32. How did they go about picking a chief?
33. What were some of their leisure time activities? Hobbies?
34. What were some of the things that some tribes traded?
35. How did they get an education?
36. When they died, how were they treated?
37. Who were the great Indian war chiefs and how did they make themselves great?
38. How did the tribes communicate with each other?
39. What were the names of some important battles?
40. What were some of the medicines they used for treating sickness?

Figure 3 (continued). Student-Generated Questions and Topics

41. Where did they come from?
42. When the first settlers landed, were the Indians they met friendly?
43. How did the Indians treat the landscape?
44. What were some things that the Indians and the settlers traded?
45. What did the Indians drink and what did they drink out of?
46. What were some of the great inventions made by Indians?
47. What were some of the most famous art works?
48. How did the Indians get along with the wildlife?
49. What were some of the furnishings inside their houses?
50. What sacrifices did Indians make?

### Step Two

The teacher told the class to group their questions and topics in "categories." She told them to name each category and give a statement or question which best expressed the ideas in each category. Just as she had done in Step One, the teacher took students' exact dictation. Step Two required two class periods. When the class had to return to this step on the second day, the teacher began by having students review their work of the previous day. To help them review and evaluate their work, the teacher gave the students typed copies of their topics and categories. She asked, "Is this what you said? Do you want to make changes or additions?" The teacher recorded students' responses.

### Behavior of Class:

The behavior of the class was characterized by a sustained involvement in the activity of Step Two by all members. Some members were more active than others. Interestingly, several of the verbally and/or physically active participants were students whose typical behavior was more reticent. Several students moved spontaneously

to blackboards near their desks and took over responsibility for marking off topics as they were used in the categorizing. These volunteers, boys and girls, were from the high and low achievement groups. The categorizing step continued without interruption until, finally, a student noticed the class had gone overtime by five minutes, and they were late for physical education. The class more typically finished its work five minutes before physical education.

The 15 categories the students organized are listed in Figure 4. The numbers in parentheses correspond to the numbered topics from Step One.

Figure 4. Student-Organized Categories

I. Religion

In their religions, what did the gods do? What kinds of holidays, sacrifices, celebrations, and rituals did they have? (1, 50, 20, 36, 40)

II. Weapons and Tools

Describe the different types of tools, weapons, and inventions and tell what they were used for and how they were made. (4, 5, 14, 27, 46)

III. Clothes

How did the Indians make the things that they wore and out of what? (16, 17, 18)

IV. Food

Tell what the Indians ate, how they got it and how they prepared it. (6, 7, 8, 10, 11, 28, 45)

V. Housing

How and where did they build their houses and how did they furnish them? (13, 15, 49, 3)

Figure 4 (continued). Student-Organized Categories

VI. Education

How did the Indians get an education and what was their education like? (35, 24)

VII. Tribes

(2, 12, 21, 23, 3, 41)

VIII. Famous Indians

Who were the famous Indians and what did they do?  
(32, 12, 37, 23, 21)

IX. Trading and Foreign Relations

What did the Indians trade with other tribes and settlers?  
How did the Indians get along with other tribes and the  
early settlers and what were the reasons for their actions?  
(44, 34, 30, 19, 25, 23, 39)

X. Law

What were their rules and laws and how did they punish the  
law breakers? (9, 29)

XI. Communications

What kind of communications did they use? (38)

XII. Transportation

What kinds of transportation did they have? (26)

XIII. Leisure

What specific games, hobbies, and art work did they do in  
their leisure time? What pets did they keep, if any?  
(22, 33, 20, 31, 47, 46)

XIV. Environment

How did the Indians treat the landscape and get along with  
its wildlife? (43, 48)

XV. Occupations (46)

### Step Three

The teacher asked the class to examine all of their categories and vote on the categories they would like to study. She told the class she would place them in five committees and each committee would have a subtopic of American Indians. Step Three required about 45 minutes.

#### Behavior of Class:

Several students said they did not want to eliminate any categories. After several opinions had been expressed, a student led the class in voting. The vote was unanimously in favor of keeping all topics. A speaker from the group told the teacher they should organize the categories so that each committee would have three related categories. The class agreed. The grouping of categories was a continuation of the highly active student involvement begun in Step One. Differences of opinion were expressed, debated, and resolved. Resolution usually occurred through student-initiated voting. Many students who rarely participated verbally offered their points of view. Contributions to discussion came from all achievement groups. One student (not a subject) who had manifested far more independent learning behaviors than anyone else prior to treatment, a middle achievement boy, continued to manifest independent learning behaviors. He evaluated, hypothesized, suggested, planned, disagreed, agreed, questioned, categorized. He manifested more variety of independent learning behaviors than anyone else in the class. His participation stimulated discussion among members of all three achievement groups. Interestingly, this boy was thought of as troublesome by other teachers.

The class produced the following groups of categories, which would be assigned to the five committees:

<u>Group</u>	<u>Categories</u>
1	Clothes, Food, Housing
2	Religion, Education, Environment
3	Tribes, Law, Famous Indians
4	Weapons and Tools, Communications Trading and Foreign Relations
5	Leisure, Transportation, Occupations

Figure 5. Categories for Committee Investigation

#### Step Four

The teacher asked the class to name resources they could consult to learn about American Indians. Step Four lasted about half an hour.

#### Behavior of Class:

Naming resources stimulated verbal participation by some students who had not contributed during the previous steps. The new contributors showed the same high level of enthusiasm that other contributors had in previous steps. The class named the following resources:

Places to get information:

museums--Smithsonian and National Geographic  
 Archives  
 library: encyclopedia, dictionaries, books,  
           biographical dictionary, atlas,  
           filmstrips, films, records  
 maps  
 tapes  
 social studies book  
 newspapers  
National Geographic  
 addresses of people who know about Indians  
 pamphlets

People:

librarian  
 teacher  
 archaeologist  
 archaeological society  
 Ask an Indian  
 a student in the other sixth grade class who  
   is part Indian  
 Bureau of Indian Affairs

Figure 6. Student-Generated Resources

Step Five

The teacher assigned students and categories of topics to committees. Students were placed in heterogeneous small groups, according to the guidelines of the Problem Approach (see Appendix A). The Direct Classroom Observation section later in this chapter explains how these committees were organized. Before announcing students' names, however, she told them the procedures the groups would follow in their first meetings. She introduced three forms (Appendices E, F, G) they would complete. She told them they would elect chairpersons and recorders and that these positions would change each week. She

finally told them which students comprised each group and assigned categories to them.

#### Behavior of Class:

Students moved quickly into committees. The researcher did not observe students demonstrating negative reactions to group membership. They attended to committee business immediately. One group chose its officers through volunteering. One group chose through drawing names from a student's pocket. Three groups elected their officers through nominating and voting procedures.

#### Step Six

The teacher distributed record-keeping forms and folders to each group. Recorders would write their questions and suggested resources on the committee planning form (Appendix E). When they were ready to make individual assignments of questions, recorders would fill in the appropriate information on the individual sign-up sheet (Appendix F). Also on this sheet, individuals would initial their assignments when they were completed. Each day at meetings, the recorder would complete the information on the committee work form (Appendix G). This form was comprised of a checklist, which would be used to monitor each phase of a group meeting, and a section for writing the minutes. The teacher told the class that groups would begin each meeting by using the completed committee work form (Appendix G) from the previous day to review. The teacher gave each group a folder of a different color for keeping track of group work. Each group would be identified by the color of its folder. The teacher showed the class the file drawer where the folders and the extra forms would be kept and told

them that groups were responsible for taking care of their own materials. All folders and forms were to be kept in the drawer when not being used.

### Step Seven

The teacher told the class that chairpersons would lead their groups in developing their resource plans. A resource plan consisted of the categories with the questions and suggested resources that a group planned to investigate. The class met in the media center. Most groups required about 45 minutes.

### Behavior of Class:

At first the groups remained at media center tables. The recorder of each group wrote questions and suggested resources on the committee planning form (Appendix E). After they had copied questions and resources that had come from steps 1-4, they named a few other questions they had. When thinking of new questions, several students used media center materials.

### Step Eight

In a whole group meeting after the committee work of step seven, the teacher told the class their work would eventually lead to group presentations to the class. She said their presentations could cover their information in whatever way they felt most suitable. They would, she added, evaluate their own work and the work of their peers. She asked them to brainstorm again to generate a list of the kinds of presentations they might have. She said that many possibilities existed. They would choose the form best suited to their information, their skills, and their interests. This activity lasted 10 minutes.

### Behavior of Class:

The class generated the following list:

- reports
- projects
- time lines
- oral presentations
- plays or skits
- bring in an Indian
- field trip arranged by students
- take pictures
- videotape
- home movies

Figure 7. Student-Generated Presentation Forms

### Step Nine

The teacher provided sufficient time, support, and instruction for committees to investigate their topics. The teacher facilitated students' learning processes (1) by helping them locate and manage materials, (2) by reflecting their ideas back to them for further thought, (3) by challenging them to reconsider issues, (4) by asking questions (how, what, where, who, when, why) to help them be more concrete and focused, and (5) by providing specific skill development when instruction was sought by students. The students used a variety of resources. This step lasted for two weeks before the majority of students began to work on projects for final presentations. This two-week period was spent in the media center.

### Behavior of Class:

Committees assigned tables to themselves in the media center. They began meetings by reviewing the previous meeting and planning the

current meeting. They helped themselves to materials and equipment. Some group members worked at their committee table, while some worked in other parts of the media center. Group members worked independently, in dyads and triads, and sometimes as a whole committee. Students worked predominantly within their groups, though some out-of-group mixing occurred. They sought help from one another, and they gave help to one another. Giving and receiving assistance were thoroughly mixed by race, sex, and achievement level. Some committees had a high level of cooperation among members, while others did not.

Though some off-task behavior occurred, the two weeks of information gathering in the media center was characterized by sustained active involvement with the subject of American Indians. Many students spoke at once, but the volume was sufficiently subdued to allow non-class members to work in the media center without distraction. Students showed responsibility for media center equipment and materials by always returning what they had used at the end of each session. Students showed responsibility to their committees by returning to their tables at the end of each session to evaluate their meeting and plan for the next session.

Committee work benefited by the variety of learning activities students pursued. The language activities of listening, speaking, reading, and writing were practiced daily by most students. Students discovered that regional and tribal differences among Indians made their research far more complex than they had anticipated. They found that maps and charts and discussions with committee members helped them reorganize and increase their knowledge about Indians.

When a committee brought a guest speaker to school, the entire class followed him from classroom to schoolyard and back, listening intently and asking questions while he demonstrated the making of arrowheads and spoke about "reconstructive archaeology."

Groups and individuals monitored their own work. In many cases students monitored their meeting time without requiring reminders from the teacher. Self-monitoring also occurred in the way individuals pursued their work. For example, they used diverse resources without being directed, and they increased their work to catch up to other students without being told.

During this step students first experienced sustained group authority rather than teacher authority. Behavior that had appeared typical when the teacher exerted the authority did not remain typical. Students whose usual behavior was either highly active or highly passive no longer appeared to behave at such extremes. Students who were usually not well-accepted by their peers socially entered fully into group activities. Girls entered as fully into group activities as boys, in contrast to the girls' behavior observed prior to treatment when the class had appeared to be male dominant. (See Teacher-Centered Instructional Situation above).

When the teacher directed the class or spoke extensively (five minutes or more) to a committee, students stopped their independent or group activities and appeared to listen. Usually, they did not elaborate on the teacher's ideas or ask her questions. They resumed their individual or committee work when she stopped talking.

### Step Ten

The teacher provided sufficient time, support, and instruction for committees to prepare for their final presentations. The teacher's role remained that of a facilitator. Most of the committee preparation for final presentations occurred in the classroom. Some individual projects and some committee work were accomplished in students' homes. The majority of the class used two-and-a-half weeks to prepare for the presentations.

#### Behavior of Class:

Project work of many forms occupied all available space in the classroom and consumed all of the students' class time. Students worked on the floor and at desks. They brought in art work and construction projects which appeared on walls and shelves. They used audio-visual equipment to evaluate their work and the work of peers. At one point in a meeting of the whole class, students spontaneously brainstormed to develop a new list of presentation forms. Once they had begun, the teacher recorded for them. They improvised resourcefully, using a TRS-80 computer monitor as a filmstrip screen. A low achievement girl with high organizational skills stood to direct her committee. In another committee a middle achievement boy working on his art project exercised leadership while lying flat on his stomach. Two high achievement boys well-known in the school for their verbal skills worked on art projects assisted by low achievement students. The roles reversed on a later day when the low achievement students received assistance with reading and writing activities from the high achievement boys.

A low achievement girl became a primary resource to all students working on art projects or using audio-visual materials. While many students in all five committees talked to one another about their work, others continued their reading and writing activities, undistracted by their peers.

### Step Eleven

The teacher called upon the committees to present their final presentations. Four class periods were required for the presentations. (Though student evaluation occurred after each presentation, evaluation is presented here as Step Twelve).

#### Behavior of Class:

Students performed as presenters and as audience during this step. The class as audience appeared to be split in half between those who became physically and/or verbally involved and those who sat quite still. The students who were physically and/or verbally involved often stood at their seats or walked to different parts of the classroom to better see presentations. Several students moved to the front of the room and stood or sat very near the presenters. Several students voluntarily assisted with audio-visual equipment. Numerous students participated verbally by elaborating on information presented. Their sources usually were their own research findings. A few students asked questions of presenters. Presenters, who were demonstrating models and art work, performing skits, and delivering oral reports, responded to students' questions just as they did to the teacher's questions. Presenters sometimes engaged in extensive

discussions with the class arising out of questions from the audience. Most students who did not participate verbally or physically appeared to listen and watch the presentations. A few students appeared inattentive. They found other activities that did not relate to the topic of American Indians.

### Step Twelve

The teacher told the committees to evaluate their presentations immediately after they presented. She also asked the audience to participate in evaluating presentations they had just observed. She told them that when they evaluated they would tell what was good and why, what needed work and why, and what they still wanted to know.

### Behavior of Class:

Committees evaluated at the conclusion of their presentations. When they finished, members of the audience voluntarily pointed out their criticisms. Sometimes the remarks from the audience were in the form of questions, which then led the presenters to offer further information. After one presentation when the audience had only accepting, non-critical remarks, one high achievement boy pointed out that the committee should have tried a variety of presenting forms to be more interesting. As soon as he finished speaking, two other students had critical points to make. The presenting committee then re-evaluated its work, saying what they could have done to improve their quality. The critical thinking of one student speaking to the class led to deeper inspection of work by many students in the class.

Summary. This section first described the Problem Approach as an instructional approach used to place students in the role of active

learners. The procedure was next described in detail according to how it was implemented in this research and how the class behaved. The Problem Approach was described as providing an educational setting in which students were actively involved in achieving the learning goals they set for themselves. Students' level of involvement was seen to lead them into new role relationships and new learning behaviors. Describing the behavior of the class at each step was a useful way of providing the social framework within which the subjects behaved and were observed.

#### Data Collection Procedures

This section describes the observational methods by which data were collected. The observational instrument is explained. Reliability, including interrater reliability, is discussed.

Direct Classroom Observation. The process of acquiring independent learning behaviors was the focus of this study. Data were collected through direct classroom observation, as recommended by Medley and Mitzel (1963). Direct observation, as a method of naturalistic inquiry, is a superior way to study processes (Guba, 1978).

The researcher was a non-participant in the classroom. Gold (1969) identifies this research role as that of the "complete observer," while Schwartz and Schwartz (1969) identify the role as "passive participant observer." An observation instrument was used to simplify (Huck, Cormier & Bounds, 1974) and focus the data collection. Descriptive notes were taken to provide a context for the data.

The researcher spent three weeks in the classroom observing prior to beginning the data collection. The purposes of these preliminary observations were (1) to observe the teacher's usual teaching style, (2) to

train the other observers, (3) to practice with the observation instrument, and (4) to allow the students and the teacher to acclimate themselves to the presence of the researcher and other observers. During the preliminary observations, the researcher established several locations in the classroom for watching classroom interactions. Developing an observation routine prior to data collection prevented students from realizing when the actual research began.

The researcher sought to become familiar with the setting and the participants before collecting data on students' behaviors. Familiarity helped reduce errors in observations. Miller and Buckhout say that on unfamiliar ground, "We hesitate, look several times, and make mistakes" (1973, p. 188).

An  $A_1$ -B- $A_2$  data collection schedule was used. The  $A_1$  phase, or pre-treatment observation, was a two-week period which yielded eight observations points (20-minute time periods) for each subject. Two subjects were observed for 20 minutes, then the other two subjects were observed. The order in which a pair of subjects was observed alternated with the other pair each day. The subjects, along with the rest of the class, participated in the routine activities of the teacher's reading class, as described in the Teacher-Centered Instructional Situation above. In addition to activities described in the Teacher-Centered Instructional Situation, one class period was used for students to present reports to the whole class. All subjects were observed participating in whole class activities and in small group activities. During all three phases of the data collection, the researcher and co-observers sat in the proximity of subjects being observed. During

non-data collection intervals, they sat elsewhere in the room, giving the appearance of having other subjects of their observations. The class met in the classroom all days but one; the exception was a meeting in the media center. Even though the class was in the media center, the teacher followed her routine of directing one small group while others worked at tables. She even sat in a rocking chair in the media center and had the students all around her on a carpet, just as she did in the classroom.

Throughout the study, the researcher arrived in the classroom early enough and remained long enough each day to record field notes (Agar, 1980; Bogdan & Biklen, 1982) focused on the subjects' appearance and behavior and on the social context of the classroom that morning. This practice of collecting pertinent descriptive data helped ground the independent learning behavior frequency counts in the reality of the rich social context of the classroom.

The B phase, or treatment, was a six-week period which yielded 20 observation points for one subject, 17 for two subjects, and 16 for one subject. The observation procedures established during A<sub>1</sub> were followed. The first three days of treatment, as well as three subsequent days, were predominantly whole group meetings. During all other class periods of treatment, students met in small groups (five to six students). The researcher and co-observers observed the class in the classroom, in the media center, in the copying room next to the school office, and in the yard just outside of the classroom. The duration of the treatment extended beyond the proposed four weeks because of the need expressed by students for completing their projects. At the end of treatment students

presented their group reports to the whole class. Unlike several single case designs described by Hersen and Barlow (1978), treatment was not withdrawn for several observation points and then restored. In this study, treatment was withdrawn and the teacher returned to her usual teaching procedures at the conclusion of the instructional period being studied.

The grouping of subjects was an important consideration during treatment. Once the treatment reached the point of small group work, the researcher, with the cooperation of the teacher, placed all the students in the small groups. (Students remained unaware of the researcher's contribution to their procedures.) The small groups were heterogeneously composed along the following traits: race, sex, and reading achievement level. Additionally, friendship lines were broken, distributing friends among several groups. Organizing small groups in this manner follows the guidelines of the treatment procedures (Appendix A). To facilitate the data collection, the researcher placed two subjects in one group and the other two subjects in another group. Three other groups did not include any subjects. Subjects were placed in the five-member groups rather than in the six-member groups to enhance their opportunities for participation. So that subjects would be observed in new social contexts during treatment, the researcher separated the two low achievement subjects from one another and the two middle achievement subjects from one another in the small groups. In other words, Subjects #1 (low achievement boy) and #4 (middle achievement girl) were in one group, while #2 (low achievement girl) and #3 (middle achievement boy) were in another group.

The  $A_2$  phase, or post-treatment observation, was a two-week period which, like the pre-treatment phase, yielded eight observation points. All class meetings were in the classroom. The teacher followed her usual routine, as described in the Teacher-Centered Instructional Situation. A minor departure from  $A_1$  was that she did not take the class to the media center. The researcher did not feel this deviation from  $A_1$  would introduce significant error variance into the data because the teacher had conducted the class in the media center during  $A_1$  the same way she routinely taught in the classroom. During  $A_2$ , just as in phases  $A_1$  and B, students presented reports to the whole class.

In summary, the researcher trained a classroom teacher to use a teaching strategy which enhances the development of independent learning behaviors (McCann, 1982). Through direct classroom observation, the researcher and co-observers recorded the frequency of the subjects' independent learning behaviors before, during, and after treatment. Several classroom experiences, including working in small groups, meeting as a whole class, and giving oral presentations, occurred during all three phases. At the conclusion of the classroom research, descriptive data made it evident that at the withdrawal of treatment the teacher returned to her usual teaching style, as was required by the research design.

Observation Instrument. The Behavior Observation Checklist, developed by McCann (1982) was adapted and expanded for this research. The instrument measures independent learning behaviors divided into four categories--Questioning, Managing, Planning, and Evaluating. Each category consists of three specific, discrete, observable behaviors. The researcher using this instrument collects frequency data.

McCann's Behavior Observation Checklist meets the criteria stipulated by Weich (1968) for precise measures which do not sacrifice naturalness in naturalistic inquiry. Among these criteria for dependent variables are: They are plausible response measures within the setting, discrete from other behaviors, easy to observe and score, compatible with other measures, and they are sensitive to variations in the independent variables. The Behavior Observation Checklist meets recommendations by Weick (1968) for two other reasons: (1) it uses multiple measures, a feature of research instruments which often improves validity. (2) It provides composite scores for each of the four categories, which often provide greater inference value than single scores.

The Behavior Observation Checklist was altered somewhat for this research. Some items were re-written so that all items were expressed as observable behaviors. An example was added to one item to improve clarity. The Checklist was also expanded. In the form used in this research (Appendix B), additional space, with directions for use, was added for collecting data on the directionality of the independent learning behaviors. Directionality here refers to behavior that is initiated in the setting versus behavior that is in response to the specific stimulus of another individual's remarks or behavior. Additionally, this expanded form provides a coding system for labeling group size where independent learning behaviors occur. The expanded Checklist may be used to observe two subjects simultaneously. The initial format used by McCann was used for as many as five subjects at once.

Reliability. The data collection procedures of this study included two features which maximized reliability. First, the observation instrument

was found to have high reliability with interrater reliability scores ranging from 0.88 to 0.99 in similar research conducted previous to this study (McCann, 1982). The reliability of the instrument was enhanced by the precision with which it met the criteria for dependent variables identified by Weick (1968). See Observation Instrument above.

Second, the researcher was assisted in conducting the observations by two trained observers, one with a background in secondary reading and computer-assisted instruction and the other with a background in speech therapy. The researcher and one of the other observers had used the instrument in its original form in previous research. These individuals practiced with the expanded form of the instrument in the setting of the present research for the week preceding the A<sub>1</sub> phase. The third observer was trained with the instrument prior to and during the week of practice in the classroom. A procedure the researcher used during practice to train the co-observers was to focus on students who clearly manifested the independent learning behaviors identified by the instrument. In practice, then, observers had opportunities to see the behaviors they would be looking for during the actual data collection. They practiced discriminating between initiated behaviors and responding behaviors, and they practiced identifying the social contexts of the behaviors.

Interrater Reliability. Interrater reliability was estimated by using Pearson's Product Moment Correlation (r). The correlation, r, was computed as:

$$r = \frac{\sum XY - \frac{\sum X \sum Y}{n}}{(\sum X^2 - \frac{(\sum X)^2}{n}) (\sum Y^2 - \frac{(\sum Y)^2}{n})}$$

During practice the four students were not the same four who were selected as subjects. They are distinguished here as Students A, B, C, and D. The students selected as subjects are distinguished here and throughout this document as Students, or Subjects, #1, #2, #3, and #4. In computing reliability, the directionality (initiates versus responds) and social context were not considered. The categories of Questioning, Managing, Planning, and Evaluating were used as measures.

At the end of the practice phase, interrater reliability was estimated on two days of joint observing. There were, therefore, 8 measures considered. The following results of the practice data are provided:

Student A,  $r = 0.97$

Student B,  $r = 0.79$

Student C,  $r = 0.99$

Student D,  $r = 1.00$

During the pre-treatment, or  $A_1$ , phase, there were five days of joint observing, with 20 measures considered. The following results of the pre-treatment phase are provided:

Student #1,  $r = 0.96$

Student #2,  $r = 1.00$

Student #3,  $r = 0.97$

Student #4,  $r = 0.99$

During the treatment, or B, phase, the researcher was joined by a co-observer nine times. Thirty-six measures were considered. The following are the interrater reliability correlations of these observations:

Student #1,  $r = 0.94$

Student #2,  $r = 0.97$

Student #3,  $r = 0.95$

Student #4,  $r = 0.95$

In summary, interrater reliability correlations are extremely high. They are high resulting from the precision of the observation instrument and from the preparation of the observers.

#### Data Analysis Procedures

Because this study used single-case methodology, visual inspection of graphed data for each subject was the primary procedure for evaluating the data. Visual inspection, as the primary means of evaluating single-case study data refers to reaching judgments about the treatment effects by visually examining graphed data (Kazdin, 1982). Using visual inspection to evaluate data is a way of emphasizing potent treatment effects.

To supplement visual inspection, two statistical procedures were used. The sign test (Huck, Cormier, & Bounds, 1974; Jenkins & Hatcher, 1976; Siegel, 1956) was used to indicate directionality of the data. The basic operation was to obtain differences between paired scores. In this study where the treatment period was longer than the baseline and return to baseline periods, the raw scores were weighted. A plus or minus sign indicated directionality. The number of plus or minus differences were totaled separately. (When a difference score of zero occurred, 0.5 was attributed to the plus total, and 0.5 was attributed to the minus total). The binomial table (Jenkins & Hatcher, 1976; Siegel, 1956) was entered with the smaller of the two frequencies, either plus or minus, obtained from use of the sign test. If the value were less than .05, the decision was that the behaviors were unlikely to have occurred by chance.

The judgment to use the sign test and the binomial test derived from the type of data collected in the research. First, the Data in this single-case study is derived from methodology which used each subject as his or her own control. Second, the data are simply frequency counts, a type of nominal data (Siegel, 1956) without measurement of any qualitative differences. For frequency counts tests of consistency, rather than of magnitude, are appropriate (Jenkins & Hatcher, 1976). Jenkins and Hatcher (1976) explain that the sign test and the binomial test are appropriate analytic tools when the data have these characteristics.

### Summary

This chapter presented the methodology of the study. The content of the chapter falls into two broad categories: (1) what the researcher did to generate, collect, and analyze the data and (2) what the classroom teacher and class did as participants in the study. Specific activities and behaviors of the class concretely illustrate the implementation of the Problem Approach as the treatment of the research in the sixth grade class.

Direct, non-participant observation with a focused observation instrument enabled the researcher to collect data with minimal interaction with the teacher and the students. What little interaction occurred was generally incidental and not visibly related to the behaviors being observed. No one outside of the observation team was aware of the identity of the subjects. Moreover, the students were not informed that their "research unit"--the study of American Indians--was an experimental intervention.

## CHAPTER IV

### RESULTS

The purpose of the study was to observe independent learning behaviors of four subjects before, during, and after their participation in the Problem Approach. The subjects were male and female, middle and low scholastic achievement level students. Independent learning behaviors were observed in the categories of Questioning, Managing, Planning, and Evaluating. The null hypotheses are as follows:

a. It is hypothesized that during and after participating in the Problem Approach subjects will not manifest more questioning behavior than they did prior to treatment.

b. It is hypothesized that during and after participating in the Problem Approach subjects will not manifest more managing behavior than they did prior to treatment.

c. It is hypothesized that during and after participating in the Problem Approach subjects will not manifest more planning behavior than they did prior to treatment.

d. It is hypothesized that during and after participating in the Problem Approach subjects will not manifest more evaluating behavior than they did prior to treatment.

The null hypotheses are rejected if (1) treatment effects are clearly apparent through visual inspection of graphed data for single subjects, and (2) if the probability that treatment effects occurred by chance was less than .05, as estimated by using the sign test and the binomial test for aggregated data.

This chapter provides results of the study. First, findings for each of the four subjects are presented separately with behavioral descriptions, derived from field notes and the observation instrument, and graphic presentations of independent learning behaviors in the categories of Questioning, Managing, Planning, and Evaluating. Second, the results of the data aggregated on the four subjects are provided along the dimensions of the four independent learning behavior categories. Third, the results aggregated on the four subjects along the dimensions of directionality (initiates versus responds) and social context are presented. Finally, this chapter presents the outcomes of the students' evaluations of their experiences with the Problem Approach and the teacher's evaluations of her use of the Problem Approach.

### Individual Behavioral Descriptions

#### Student #1, a Low Achievement Boy

Baseline. Prior to treatment the behavior of Student #1 can be generally described as academically unsuccessful. In his low achievement level reading group, he was observed as a poor reader who read haltingly and in a monotone when reading aloud. He used his finger to point at words as he read. He occasionally exhibited behaviors which appeared to annoy the teacher so much that she scolded him. He always sat apart from other students in his group. He rarely interacted with the others. He was observed to participate without distraction only in highly structured reading group discussions of homework assignments in which the teacher asked literal questions.

When Student #1 was at his desk his performance was also observed to be academically unsuccessful. He avoided performing reading and writing tasks when they were assigned. Instead of working on assignments, he walked around the room, sat without books in the rocking chair, stared into space, talked to other students, or played with small toys at his desk. He repeatedly exhibited behaviors which resulted in the teacher stopping her own activity to scold him. He sometimes sought assistance from the teacher. She complied when he simply stated, "I think I need help." His assigned seat was next to a high achievement boy with whom he socialized frequently. On numerous days during baseline Student #1 appeared intent upon avoiding his own work and on distracting his high achievement level seatmate from completing his. Occasionally he asked the seatmate for help with an assignment.

In the eight days of baseline observations, Student #1 manifested independent learning behavior in the four categories of Questioning, Managing, Planning, and Evaluating. On the day of his highest frequency of independent learning behaviors, Student #1 manifested two Questioning behaviors, two Managing behaviors, two Planning behaviors, and no Evaluating behaviors. Only on one day during baseline did he have no independent learning behaviors. See the graphs for Student #1--Figures 8, 9, and 10--to visually inspect the frequency of his independent learning behaviors during baseline. (In all four individual behavioral descriptions, the first and second figures of graphs present graphed raw frequency counts; the third figure presents averaged independent learning behaviors equated on a one-week time unit base. The markers in the third figures denote the average number of independent learning behaviors per week in each phase of the study.)

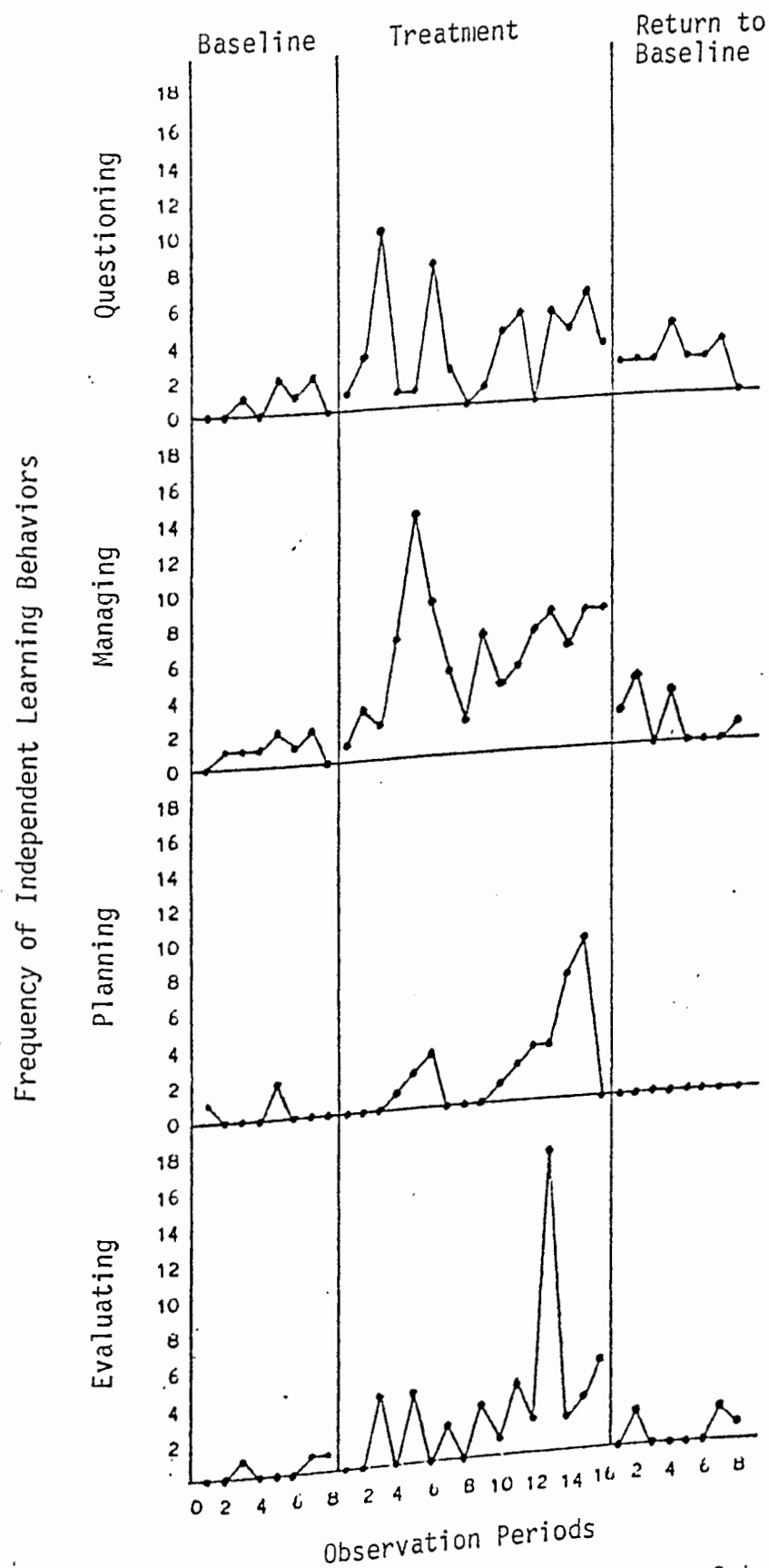


Figure 8. Independent Learning Behaviors in Four Categories for One Student (#1)

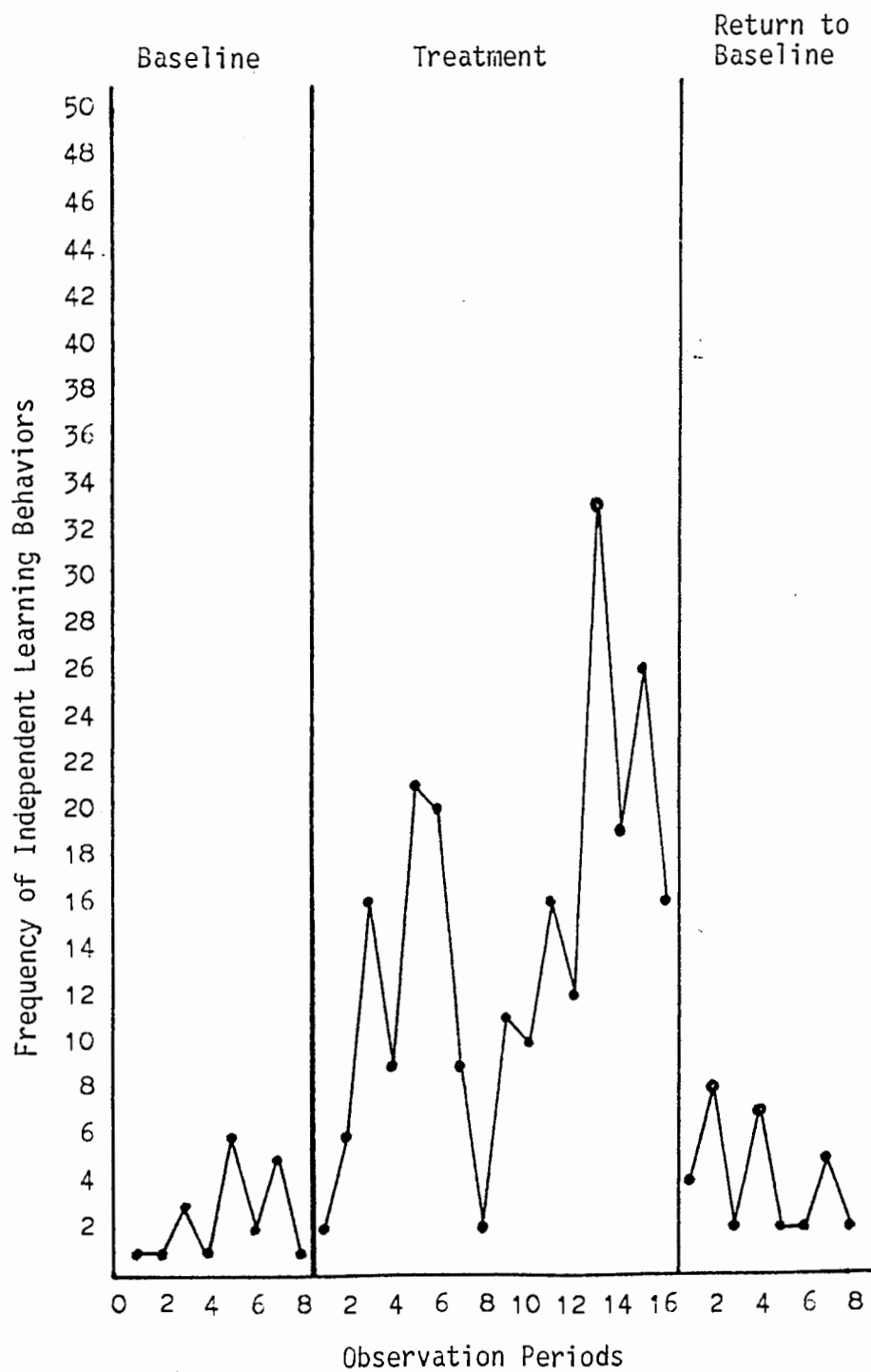


Figure 9. Combined Independent Learning Behaviors For One Student (#1)

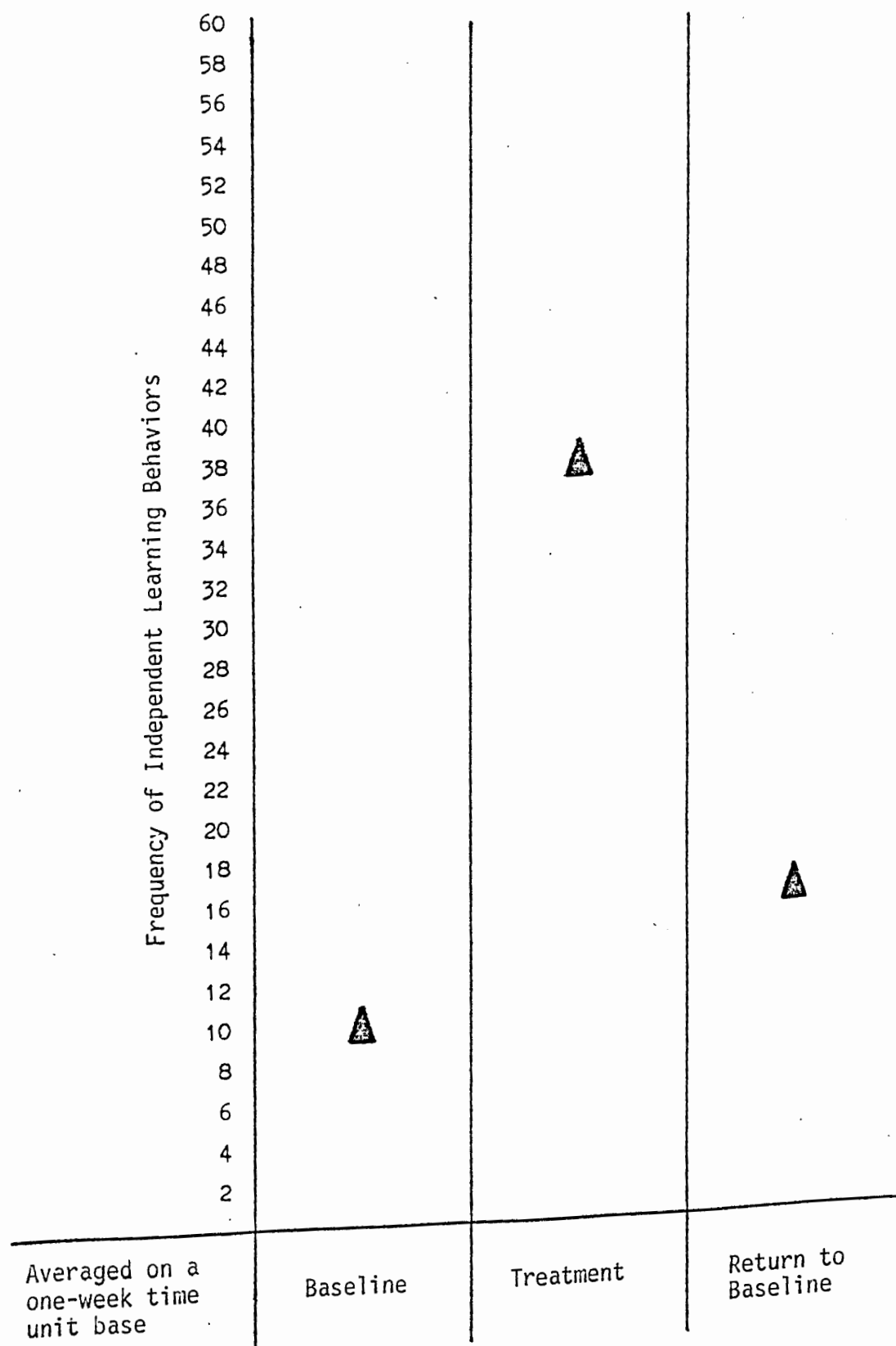


Figure 10. Combined Average Independent Learning Behaviors for One Student (#1)  
(Equated for Common Time Units)

Treatment. The description of Student #1's behaviors during treatment is presented according to the three major phases of the Problem Approach: (1) topic identification, (2) planning and implementation, (3) presentation and evaluation. The first phase, topic identification, and the third phase, presentation and evaluation, occurred with the teacher directing the whole class. The second phase, planning and implementation, occurred primarily with students working with one another in committees.

During topic identification Student #1 appeared to be involved throughout. Data collected during this phase are represented on the graphs as the first three observation points of treatment. He offered a question about American Indians in the first five minutes of Step One. He continued asking questions. He exhibited managing behaviors in the following ways: He remarked that the class was developing a set of questions they would have to answer. He asked other students for clarification. He elaborated upon other students' ideas. He took notes voluntarily. Though he exhibited no planning behavior, he was the first student in the class to evaluate the class's efforts. His evaluative remark about the categorizing process stimulated a discussion at the beginning of a class period.

During the planning and implementation phase Student #1 remained involved. Data collected during this phase are represented on the graphs as the 4th through 15th observation points of treatment. He asked numerous questions, usually inquiring "how", "why", or "what does it mean". He learned, through trial and error, to ask concrete, content-related questions. When he appeared helpless, the high achievement boy in his group ignored Student #1. (The high achievement boy in his committee

was not the same high achievement boy who sat next to Student #1 before and after treatment.) When Student #1 read from a source first and wrote a paragraph to read to the boy, then asked for help for a specific problem, the high achievement boy helped him. Student #1 repeatedly succeeded with this method of receiving peer assistance.

Student #1's frequent managing behaviors during the planning and implementation phase were usually manifested as facilitation of group learning processes. In his committee he gave advice and directions, checked on the progress of his group members, addressed his whole committee in ways that stimulated group cooperation, attempted to alleviate inter-personal conflicts within his group. Though he did not serve as chairperson of his group, he often manifested leadership behaviors.

During the planning and implementation phase, Student #1 manifested most of his planning and evaluating behaviors when his group was preparing for the final presentations. He planned both art work and written work for his part of the group presentation. Until Student #1 spent extensive time (30 minutes) working on an art project, he did not exhibit many planning and evaluating behaviors, and he avoided reading and writing activities. Moreover, he was easily distracted by students around him working on art projects. After he worked on his own art project, however, he planned and evaluated. He helped other students with their art projects. He also spent uninterrupted time reading about Indians and taking notes. His highest frequency of evaluating behaviors occurred during the time that he gave art assistance to the high achievement boy, who had given him frequent assistance with his reading and writing activities. It appeared that the interdisciplinary nature of project work allowed

Student #1 to perform in areas of both his strengths and his weaknesses. Moreover, it appeared that working first in his area of strength--art--helped him move next to areas of weakness--reading and writing.

The final phase of the students' research unit on American Indians was the presentation and evaluation phase. Data collected during this phase are represented on the graphs as the last observation point of treatment. Student #1 appeared involved, as he had in earlier phases. When his group presented, he gave a brief oral report and showed transparencies he had made. When other groups presented, he managed equipment by voluntarily assisting with audio-visual machines and materials, and information, by elaborating upon the content in other students' reports. He asked questions and made evaluative remarks to presenters. In one instance, Student #1 demonstrated so much interest in another committee's presentation that he moved gradually from his seat in the back of the room to the front of the room. He then stood two feet from the overhead projector screen, the focal point in the classroom.

During the treatment Student #1 manifested independent learning behaviors in the categories of Questioning, Managing, Planning, and Evaluating (Figure 10). His frequency counts for Questioning and Managing were highest when he served as recorder during the planning and implementation phase. His Planning count was highest when he was helping his committee prepare for its final presentation. His Evaluating count was dramatically highest when he assisted a committee member with an art project. The evaluative remarks Student #1 made then related to the art project and to the preparations all of the committee members were making for the final presentation. The only observation periods Student #1's

frequency count of independent learning behaviors was at his baseline level were observation periods when the teacher directed the whole class (Figure 9).

Return to Baseline Conditions. At the conclusion of treatment, classroom instruction was returned to the baseline conditions of teacher-centered instruction. Once again, Student #1 experienced teacher-directed reading group instruction among students who, like himself, were placed in the low reading achievement group. When Student #1 sat in the circle on the carpet with his reading group, he always sat apart from other students, just as he had prior to treatment. He volunteered answers to literal questions which he had prepared as homework. He occasionally elaborated upon the teacher's remarks. Once he corrected a mistake the teacher made, but the teacher told him he was wrong. When these group facilitation behaviors were unsupported by either the teacher or peers, he attempted fewer group facilitation behaviors. Volunteering answers to direct questions was not considered independent learning behavior in this study, but group facilitation behaviors were considered independent learning behaviors in the Managing category.

During the return to baseline Student #1 once again had daily opportunities to attend to teacher-directed independent work at his desk. He sat next to the high achievement boy he had sat next to prior to treatment. Again he socialized frequently with this boy and occasionally asked for his assistance with assignments. He also asked for assistance from the teacher. In spite of being told by a peer and by the teacher how to complete his work, Student #1 avoided completing reading/writing assignments. Student #1 resumed his baseline behavior of being easily

distracted from reading/writing activities. His avoidance of these activities was so consistent that he was observed to be reading to himself on only one occasion. Moreover, he attempted a writing assignment on only one occasion.

The attention Student #1 gave to the one writing assignment was remarkable because of its timing. One day when the whole class had a complicated word puzzle to solve, Student #1 brought together five students to work together. (The group formed informally without the direction or intervention of the teacher.) With Student #1 in this group were high and middle achievement, black and white, boys and girls, a group similar to but not the same as his Problem Approach committee. Following the completion of the task, Student #1 performed the writing assignment from the previous day. Student #1's bringing together of a problem-solving group was the only strong, immediate transfer effect of treatment that he demonstrated during observation periods.

See the graphs for Student #1--Figures 8, 9, and 10--to visually inspect the frequency of his independent learning behaviors during the return to baseline conditions.

Evaluation of Frequency Data. Through visual inspection of the graphed frequency counts, it is clear that Student #1 manifested much more independent learning behaviors in all four categories during treatment than in observation periods before and after treatment. Differences between pre-treatment and post-treatment are strong only in the category of Questioning (Figure 8). The null hypotheses, then, are rejected regarding the comparison of treatment behaviors with pre-treatment and

post-treatment behaviors. The null hypothesis regarding the comparison of pre-treatment and post-treatment behaviors is rejected in the Questioning category.

Student #2, a Low Achievement Girl

Baseline. Prior to treatment the most observed behavior of Student #2 was her consistent attention to teacher-directed tasks. In small reading group meetings with the teacher, Student #2 always followed directions and sometimes volunteered to answer literal questions. (She did not volunteer answers to inference questions.) During oral reading lessons she skipped ahead of the group to practice reading her paragraph in preparation for her turn. She usually did not interact with other members of her group.

When Student #2 was at her desk she usually showed consistent attention to teacher-directed tasks. Only during students' oral reports to the whole class did she appear inattentive. Then she colored pictures. She did not participate in whole class discussions. As long as she had assigned lessons to complete, she worked without being distracted. She gave assistance to other low achievement group girls when they came to her for help. When Student #2 needed help, she asked the middle achievement girl sitting next to her. She sometimes commented to the girl next to her that she had completed a lot of her work. (This was the only type of evaluative remark she made prior to treatment.) She always returned to her assignment after brief interactions with other students. She never left her desk to ask for help from either the teacher or another student.

In the eight days of baseline observations, Student #2 manifested independent learning behavior in the four categories of Questioning, Managing, Planning, and Evaluating. However, in the categories of

Questioning, Planning, and Evaluating, she exhibited independent learning behavior only once in the baseline phase. She demonstrated managing behaviors six of the eight days with a total count of 11 behaviors. See the graphs for Student #2--Figures 11, 12, and 13--to visually inspect the frequency of her independent learning behaviors during baseline.

Treatment. The description of Student #2's behaviors during treatment is presented according to the three major phases of the Problem Approach: (1) topic identification, (2) planning and implementation, (3) presentation and evaluation. The first phase, topic identification, and the third phase, presentation and evaluation, occurred with the teacher directing the whole class. The second phase, planning and implementation, occurred primarily with students working with one another in committees.

During topic identification, Student #2 appeared to listen. Data collected during this phase are represented on the graphs as the first three observation points of treatment. On the first day of the Problem Approach Student #2 attempted to work on her math homework while listening. She offered one question for the teacher to write on the board. Her question was a follow-up to a question just asked by another low achievement girl. On succeeding days she appeared to listen and took notes voluntarily. In the first three days of the Problem Approach, she asked one question each day, and she exhibited only one or two managing behaviors each day. She did not demonstrate any independent learning behaviors in the areas of Planning and Evaluating. (See Figure 11.)

During the planning and implementation phase Student #2 became actively involved in group processes. Data collected during this phase are represented on the graphs as the 4th through 16th observation points

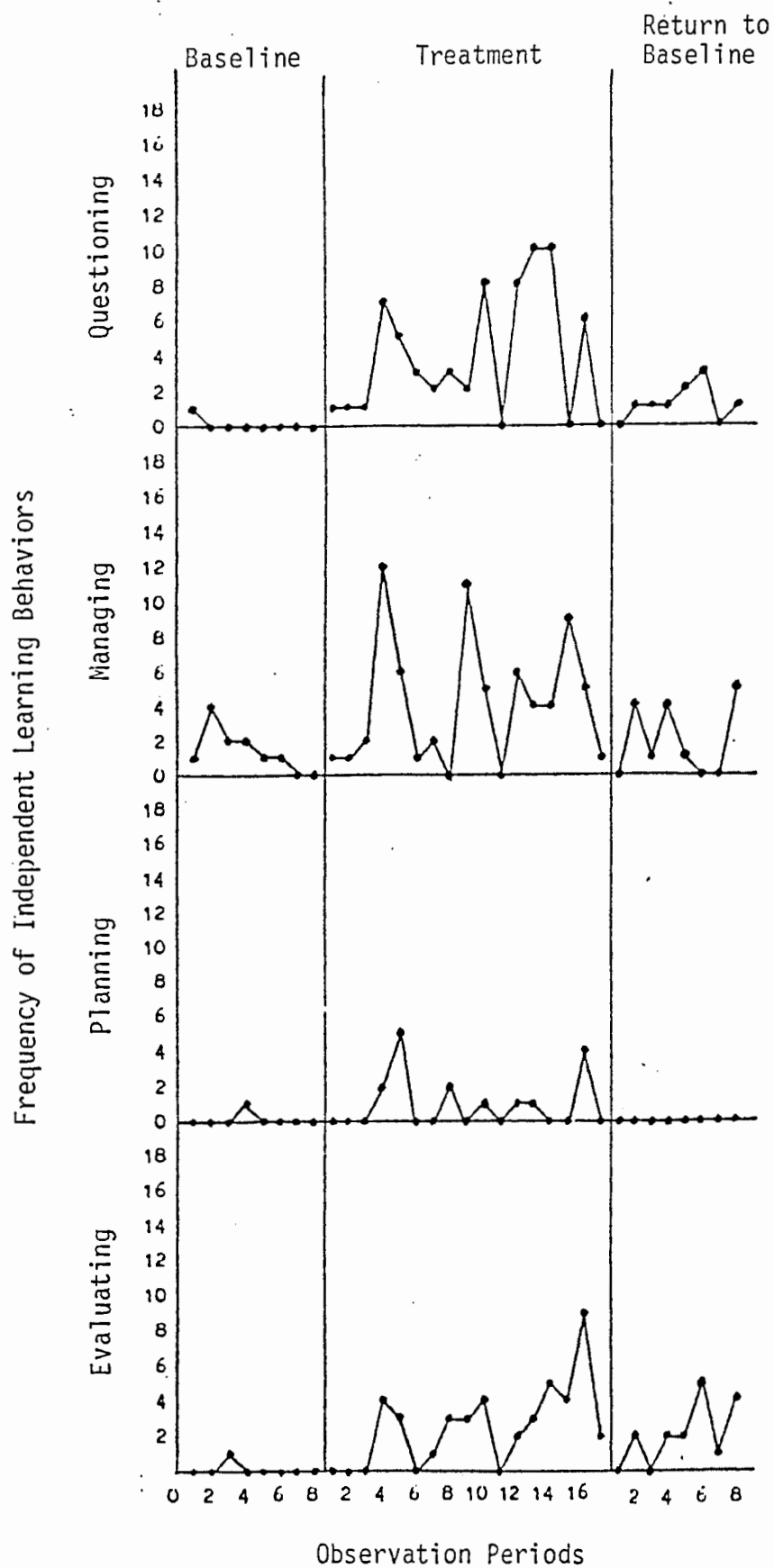


Figure 11. Independent Learning Behaviors in Four Categories for One Student (#2)

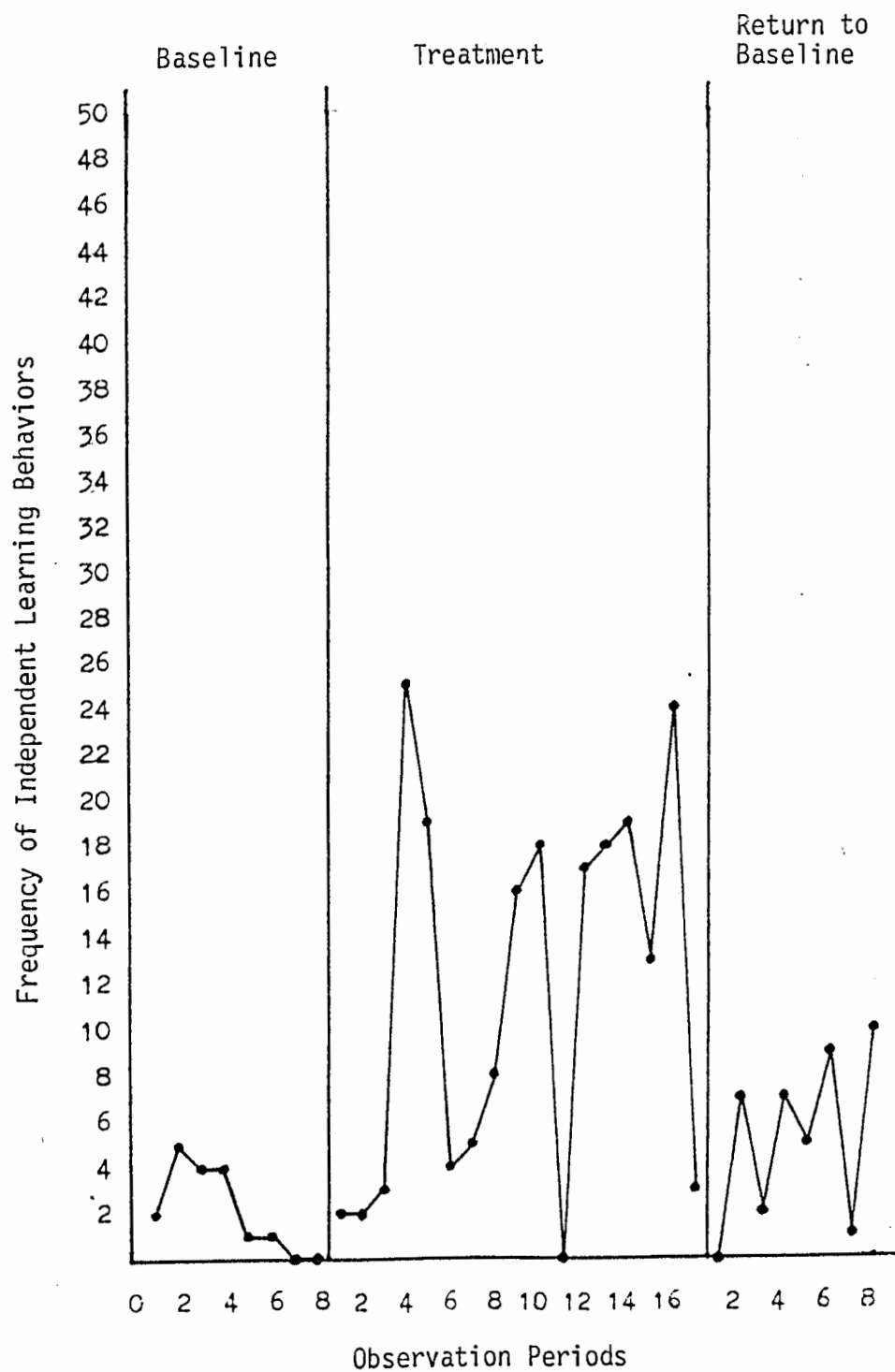


Figure 12. Combined Independent Learning Behaviors For One Student (#2)

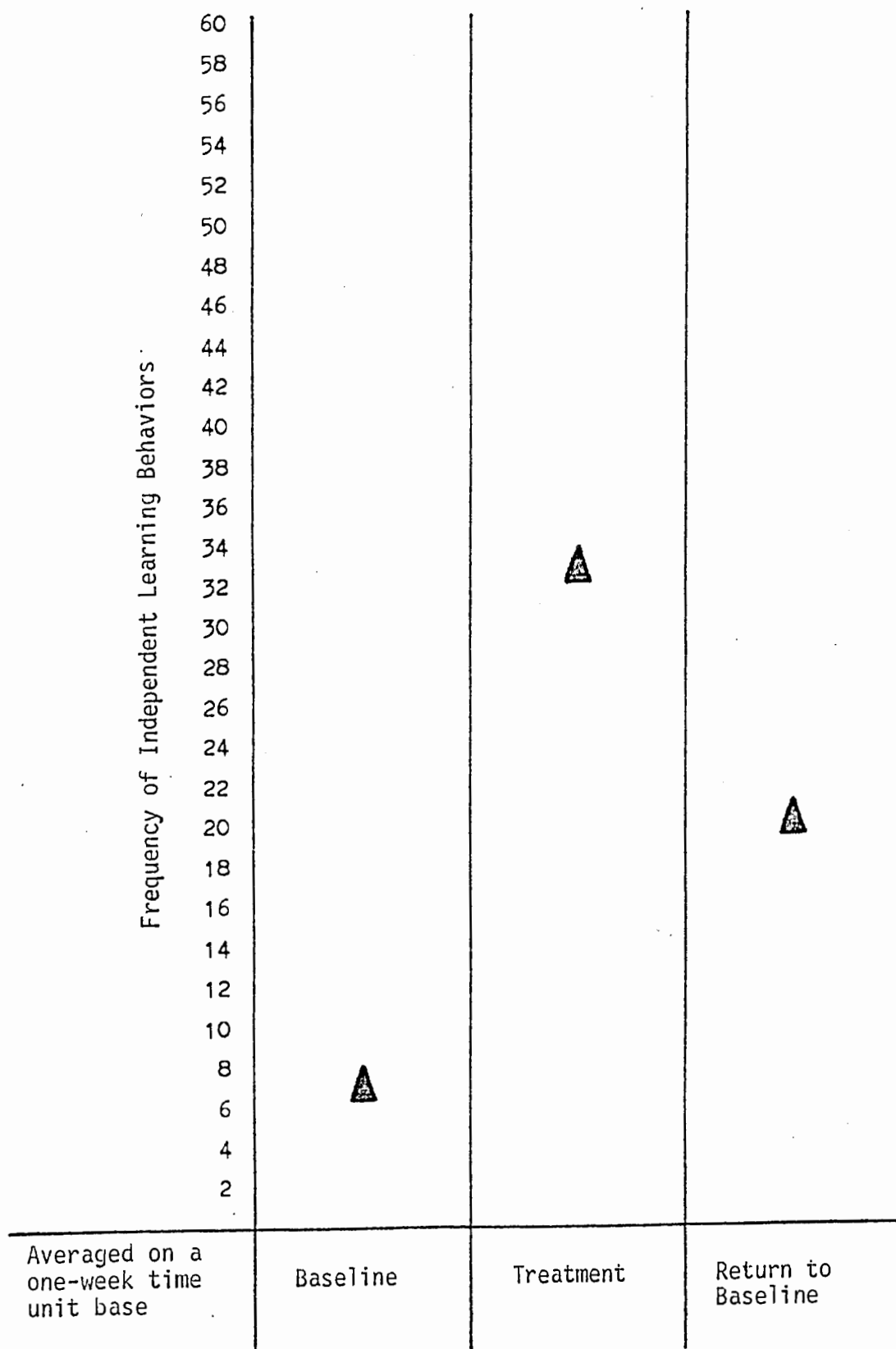


Figure 13. Combined Average Independent Learning Behaviors for One Student (#2)  
(Equated for Common Time Units)

of treatment. Most days Student #2 asked numerous questions. As recorder during the planning stage, she asked members to participate. She asked for clarification when they suggested questions or resources. She asked group members to elaborate upon their ideas. As she began to implement her part of the group plan, she asked the teacher for assistance with materials and equipment. She also asked other group members for assistance when she worked on reading/writing aspects of her research.

During this phase of the Problem Approach Student #2 was observed frequently to be managing people or information. In her committee she assumed a leadership role as the first recorder of her group. Even though she never became chairperson, she was the only group member who had sufficient leadership skills to stimulate communication among all group members on issues important to the group. She spoke to everyone asking that all members decide on questions and resources so she could record the business of the group. She elicited participation by the one other girl, who was too reticent to participate voluntarily. She stimulated interaction between the boys and the girls of the group by asking the boys direct content-related questions and making specific content-related remarks. She sometimes argued with one or more boys in her group, using evidence to support her viewpoints. Without her efforts at whole committee interaction, it appeared the boys would not speak to the girls.

During the planning and implementation phase, Student #2 did not demonstrate frequent planning behaviors which could be recorded by the use of the observation instrument. The instrument is sensitive only to verbalized planning. Student #2 was highly active with her reading/writing

and art projects, but she was not often observed to verbalize her plans for these activities. Her highest planning count occurred when her committee planned the specific questions they wanted to answer and the resources they would use. Her next highest planning count occurred when her committee had its last planning for presentation.

During this phase Student #2 was observed to be evaluating her work and the work of her classmates every day that she worked predominantly in her committee. When she worked predominantly alone or when the teacher directed the class, she was not as verbal, and evaluating behavior was not observed. Her highest evaluating count occurred just before final presentations when students in her committee and out of her committee sought her opinions, primarily of their art work.

An interesting aspect of Student #2's behavior during the planning and implementation phase was the manner in which she rose from the whole class to become the primary art and audio-visuals resource person in the class. She had initiated the art work in the class and received considerable attention from students in all the committees. Her project included the use of a filmstrip projector and filmstrips, as well as art supplies. Other students watched while Student #2 worked. They praised her work. Soon they asked her to help with their art projects and with their use of audio-visual materials and equipment. Throughout this phase of the Problem Approach, Student #2 helped numerous students with their work. In the media center and in the classroom she traveled from committee to committee giving assistance and evaluating their progress.

During the final phase--presentation and evaluation--Student #2 did not continue to manifest her high level of active involvement. Data

collected during this phase are represented on the graphs as the last observation point of treatment. Dissension had occurred in her committee, and she and the other girl had withdrawn from a skit the three boys planned. The committee presentation, therefore, was fragmented, and Student #2 appeared minimally involved. The boys presented their reports and then their skit. Next Student #2 presented her report with her posters and her transparencies. In Student #2's evaluation of the project work she said she had worked hard and the boys had been difficult to work with. Also, she said she was pleased with her art projects and her report. Throughout the other committees' presentations, Student #2 did not participate actively through commenting or questioning, though she appeared to listen.

While Student #2 was in the audience for other committees, she participated in an interaction which appeared to have been influenced by dynamics of the Problem Approach. She used several opportunities between reports to plan an art project for a hall bulletin board with two other girls from different Problem Approach committees. Student #2 assigned tasks to the high achievement girl sitting on one side of her and to the low achievement girl sitting on the other side of her. A conflict arose between Student #2 and the other low achievement girl, who, like Student #2, had practiced and developed leadership behaviors in the Problem Approach activities. In the end, Student #2 had her way with the two girls and the bulletin board was decorated according to Student #2's plan. The three girls remained friends.

During the treatment Student #2 manifested independent learning behaviors in the categories of Questioning, Managing, Planning, and

Evaluating, (Figure 11). Her frequency count was highest for Questioning when she was preparing for the committee presentation. In the Managing category her independent learning behaviors peaked at high levels three times when she planned and implemented prior to presentations. In the Planning category she was not often observed to be verbalizing plans, so her count was generally low. In the Evaluating category her highest count occurred when she was helping numerous classmates prepare their art projects for final presentations. Student #2's frequency count of independent learning behaviors was at her baseline level only when the teacher directed the whole class, when Student #2 worked alone during an observation period, and during the final presentations and evaluations. (See Figure 12.)

Return to Baseline Conditions. At the conclusion of treatment, classroom instruction was returned to the baseline conditions of teacher-centered instruction. Once again, Student #2 experienced teacher-centered reading group instruction. Student #2 volunteered answers to the teacher's literal questions. She followed directions and ignored distractions which interfered with the work of others in her group. She helped another girl in her group. She volunteered her opinions to classmates regarding their assignments. Volunteering opinions and communicating readily with other students appeared to have transferred from treatment. These behaviors were not observed prior to treatment.

During the return to baseline Student #2 again had daily opportunities to complete teacher-directed assignments at her desk. She worked without distraction. She asked questions when she needed help. She traveled to several students in the room and eventually to the teacher to seek clarification of assignments. This traveling in the classroom appeared

to have transferred from the treatment when Student #2 was observed to be one of the most mobile students in the class. During baseline observations she never got up from her desk except when the class routine specified movement.

Similar to Student #1, Student #2 participated in an informally formed problem-solving group to work on an assigned word puzzle. Similar to the group that Student #1 joined, Student #2's group was five students (boys, girls; white, black, Asian; high, middle and low achievement), just as two of the Problem Approach committees had been. As in the case of Student #1, this group formed without the direction or the intervention of the teacher. The phenomenon appeared to be a strong and immediate transfer effect of the Problem Approach.

See the graphs for Student #2--Figures 11, 12, and 13--to visually inspect the frequency of her independent learning behaviors during the return to baseline conditions. She manifested independent learning behaviors in all categories but Planning. Inspection of graphed frequency counts in the Evaluating category gives the impression that Student #2 learned to exhibit evaluating behavior during treatment. Clear transfer effects are evident in the return to baseline data.

Evaluation of Frequency Data. Through visual inspection of the graphed frequency counts (Figures 11, 12, and 13) it is clear that Student #2 manifested much more independent learning behaviors in all four categories during treatment than in observation periods before and after treatment. Differences between pre-treatment and post-treatment are strong in the categories of Questioning and Evaluating. The null hypotheses, then, are rejected regarding the comparison of treatment behaviors with

pre-treatment and post-treatment behaviors. The null hypotheses regarding the comparison of pre-treatment and post-treatment behaviors are rejected in the Questioning and Evaluating categories.

Student #3, a Middle Achievement Boy

Baseline. Prior to treatment the behavior of Student #3 can be generally described as socially inactive in teacher-dominated situations and socially active in situations not dominated by the teacher. In his middle achievement reading group, he was consistently observed as socially inactive. While group members usually formed a single circle on three sides of the teacher, Student #3 sometimes sat behind another student. When he did not sit behind someone, he sat on a side of the teacher where she would have to turn around to see him. During observed lessons, Student #3 did not respond to any inference questions, and he responded to literal questions only when the teacher called on him. He appeared to listen to all reading group discussions. He showed involvement by occasionally smiling at story content and making private remarks to himself. He did not address single students, the teacher, or the group.

When Student #3 was at his desk, his performance was in marked contrast to his reading group behavior. The key difference for Student #3 appeared to be the presence of the teacher. During most periods of seat work, the teacher was either directing a reading group on the other side of the classroom from Student #3, or she was at her desk, which was also on the other side of the room. During most observed periods of seat work, Student #3 worked on assigned class work and interacted with numerous other students. He frequently traveled to four other boys in his reading group in other parts of the room to give and receive help with reading

and writing activities. These interactions with his reading group male peers often appeared to be related to class work. Following each excursion to a friend in another part of the room, Student #3 returned to his desk and worked on his assignment. He also interacted frequently with his seatmates. These interactions usually appeared to be more social than academic. The seatmates were a high achievement boy and a middle achievement girl. Student #3 usually appeared to control the amount of his off-task behaviors so that he had adequate class time for completing his class work. Though he was one of the most gregarious students in the class during baseline observations, he never appeared to distract the teacher from her activities.

In the eight days of baseline observations, Student #3 manifested independent learning behaviors in the three categories of Questioning, Managing, and Evaluating. On the day of his highest frequency of independent learning behaviors, Student #3 manifested three Questioning behaviors, two Managing behaviors, and one Evaluating behavior. His independent learning behaviors during baseline were observed during periods of independent seat work when he interacted with other students. His two observed evaluating behaviors were remarks he made to himself regarding the quality of his class work. He did not exhibit independent learning behaviors during observed reading group meetings with the teacher. (See the graphs for Student #3--Figures 14, 15, and 16--to visually inspect the frequency of his independent learning behaviors during baseline.)

Treatment. The description of Student #3's behaviors during treatment is presented according to the three major phases of the Problem Approach: (1) topic identification, (2) planning and implementation, (3) presentation

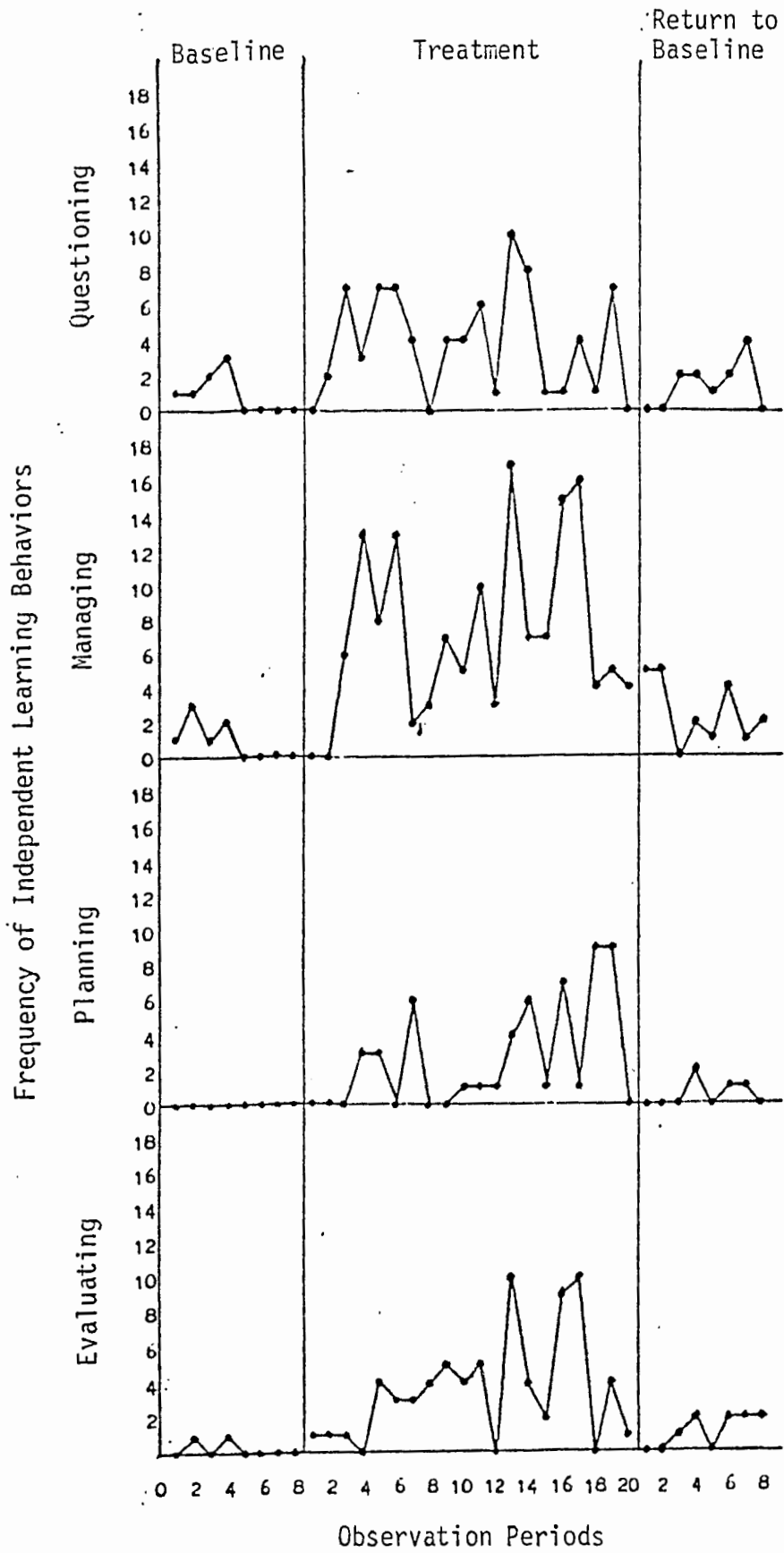


Figure 14. Independent Learning Behaviors in Four Categories for One Student (#3)

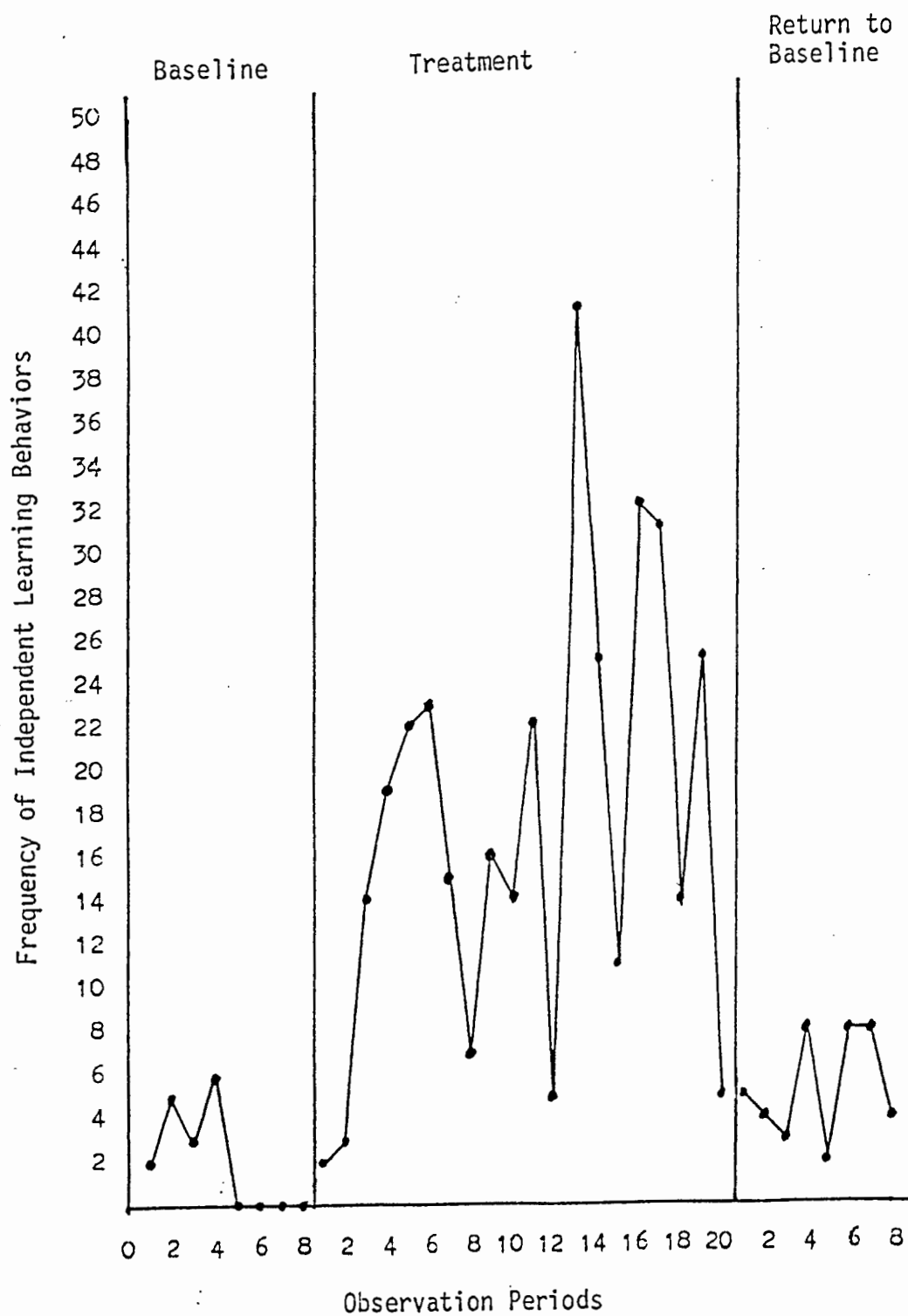


Figure 15. Combined Independent Learning Behaviors For One Student (#3)

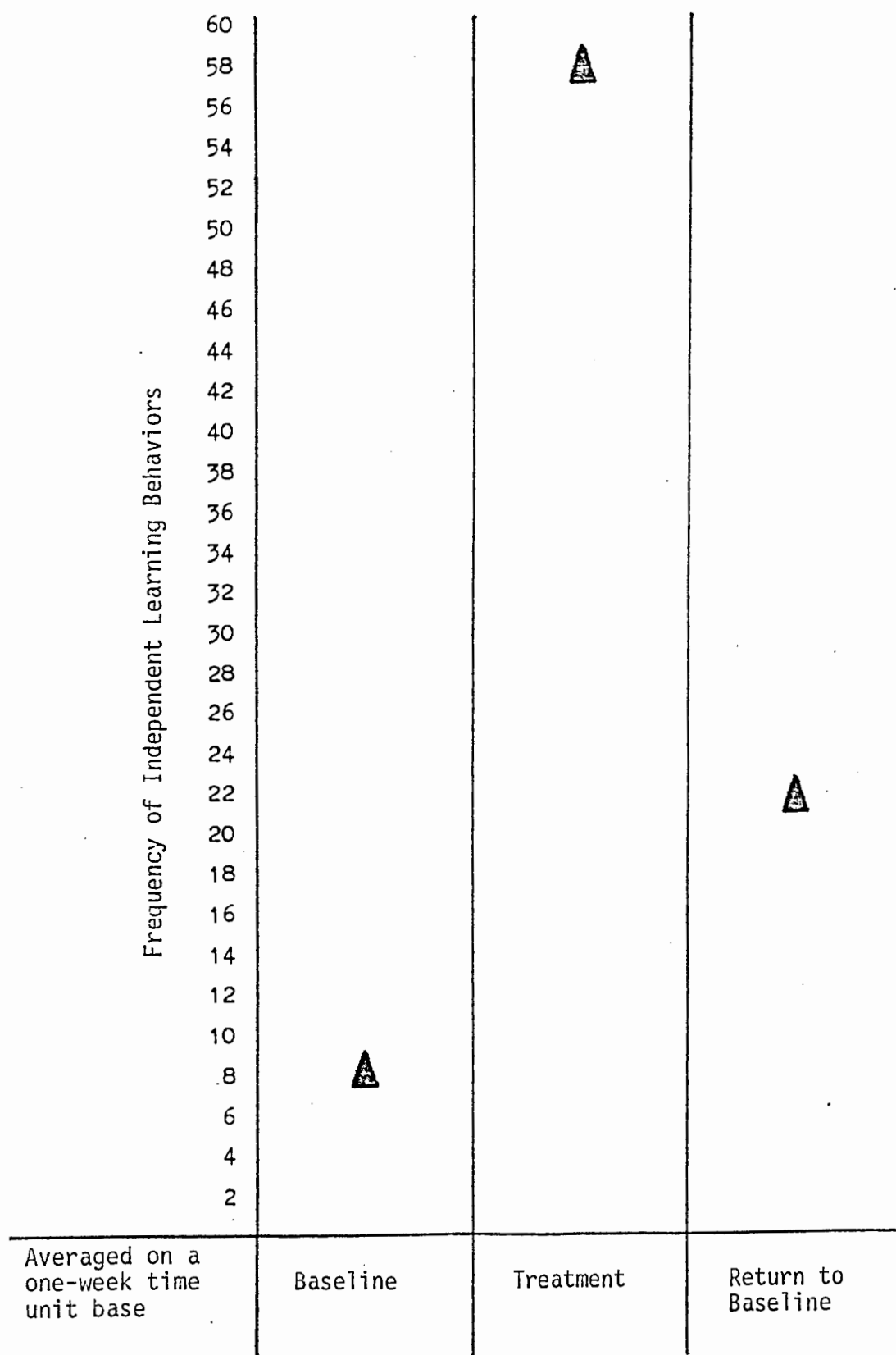


Figure 16. Combined Average Independent Learning Behaviors for One Student (#3)  
(Equated for Common Time Units)

and evaluation. The first phase, topic identification, and the third phase, presentation and evaluation, occurred with the teacher directing the whole class. The second phase, planning and implementation, occurred primarily with students working with one another in committees.

During topic identification Student #3 appeared at first simply to listen. On the second day he voluntarily took notes, a managing behavior. On the third day he made a contribution to class discussion which, though he laughed when he made it, was taken seriously by the teacher and the students. His suggested resource--"Ask an Indian"--stimulated discussion in the class on the same topic. Student #3 appeared to notice the effect of his contribution. He then started naming Indian artifacts he could bring to class. He offered more suggestions about how to make studying Indians fun. From this point on in the Problem Approach, Student #3 remained a major contributor. Data collected during the topic identification phase are represented on the graphs (Figures 14 and 16) as the first three observation points of treatment. The graphs indicate Student #3's surge of independent learning behavior in the areas of Questioning and Managing which occurred on the third day when he began to contribute to the naming of resources. He did not show any planning behavior. He made evaluative remarks at the rate of one each observation period during topic identification.

During the planning and implementation phase Student #3 remained actively involved in group processes. Data collected during this phase are represented on the graphs as the 4th through 19th observation points of treatment (Figures 14 and 15). Most days Student #3 asked numerous questions. When his committee developed its lists of questions and

resources, he presented bursts of questions, one right after another. He verbalized possibilities beyond the immediate discussion, particularly when he was interpreting pictures of Indians and when he was planning for his group's skit. He asked "how", "why", and "what does it mean" questions. He also asked about alternative solutions to problem situations, particularly when he was assisting the two high achievement boys in his group in using non-print resources.

During this phase of the Problem Approach Student #3 was frequently observed to be managing information, materials, and people. His handling of information and materials often appeared so enthusiastic that his interest in American Indians seemed to heighten the interest in Indians among the other boys in his group. He showed the other two boys pictures of Indians and interpreted what he saw. He read captions and portions of text aloud to the other boys. He influenced another boy to join him in acting out scenes from pictures. While studying pictures and texts, Student #3 talked about projects the boys in the group could make. He took notes from book after book. He brought Indian artifacts to committee meetings to share. He appeared to immerse himself in project work in the areas of developing visual aids for his report and developing a skit for members of his group to perform. During the observation periods in which he developed intricately detailed transparencies, he lay on his stomach and drew, moving about only to retrieve marking pens from other students. During observation periods in which he developed a skit with members of his group, he dictated what the skit would be about, what props, costumes, and make-up they would use, and what characters would say. While attending to his own work, he also took responsibility for finding

materials and equipment for other students and for explaining, in even greater detail than the teacher, how to perform certain tasks, such as making transparencies.

Student #3 was also highly active in managing people. He served as chairperson in the last week of committee work, but he demonstrated leadership among the boys of his group throughout committee work, while appearing to exclude the two girls. (In the same committee with Student #2, Student #3 usually interacted with the girls only when Student #2 addressed him directly.) He convinced a reluctant high achievement boy in his group to be recorder. He brought the teacher to his committee's work area and told her she needed to help one of the male committee members prepare for a telephone interview. After talking with the teacher, Student #3 took over the responsibility of helping prepare the boy for the telephone interview. He also followed up with the boy after the call to find out if the call went well. While planning and writing the skit, Student #3 used a meeting when assertive Student #2 was absent to virtually write Student #2 and the other girl out of the skit, causing both girls to drop out of the skit. Student #3's planning and writing of the skit consisted of giving specific directions to the other two boys, both high achievement level. With the boy who still had a lot of reading and notetaking to do, Student #3 insisted that the boy sit nearby and work on his report not on the skit. Student #3 dictated the skit, telling the other boy to write everything down. The high achievement boy, who often disagreed with Student #3, asked many questions but generally complied with Student #3. Student #3 clarified and elaborated upon his ideas to answer the questions of the other boy and to maintain his leadership in the skit preparation.

During the planning and implementation phase, most of Student #3's planning and evaluating occurred when he and his committee were preparing projects for final presentation. He demonstrated planning behavior in proposing to two other committee members that they seek information from out-of-school resources by telephoning. The skit planning showed evidence of independent learning behavior because it provided a strategy for presentation of information which was beyond the usual reading/reporting mode. He frequently demonstrated evaluating behavior by verbalizing his opinions based on evidence he cited and by verbalizing his judgment of his own and/or peers' work. He, for example, criticized Student #2 for doing an art project that he thought was not sufficiently relevant to their group's content area. Occasionally he criticized misleading, biased, or inaccurate use of information. Once he criticized a male group member for a racial slur toward a girl in their group. He said, "That's not nice. Don't talk like that to her" when the group member said, "We don't want to go to her neighborhood for a meeting."

An interesting aspect of Student #3's behavior during the planning and implementation phase was the manner in which he gradually isolated himself from the out-of-group male friends with whom he had socialized so frequently during baseline. In the first weeks of committee work, Student #3 traveled to the committee tables of out-of-group friends off and on during each committee meeting. In the second week of committee work, Student #3 did not travel to anyone else's table, but out-of-group friends came to his table to visit. Friendly reciprocal interactions occurred, just as they had the previous week. At the end of the second week, Student #3 was observed saying, to no one in particular, "This is

fun!" regarding his reading and notetaking activities. He was the last student to leave the media center that morning. During the succeeding weeks of committee work, Student #3 ignored out-of-group friends when they came to his work area. During the time Student #3 appeared to be engrossed in his project work--art and skit-writing--his out-of-group friends stopped coming to him to visit.

During the final phase--presentation and evaluation--Student #3 did not continue to manifest his high level of active involvement. Data collected during this phase are represented on the graphs as the last observation point of treatment (Figures 14 and 15). As a presenter Student #3 joined the other two boys in his committee in giving a report with visual aids and in presenting a skit which included props, costumes, and memorized lines. As a member of the audience for other presentations, Student #3 did not often appear interested. Much of the time he played with modeling clay and talked quietly to students sitting nearby. As an evaluator, he said he liked his skit and should have worked harder on his report, but he did not contribute to any evaluation discussions with other committees.

During treatment Student #3 exhibited independent learning behaviors in the categories of Questioning, Managing, Planning, and Evaluating. His frequency count was highest for Questioning during an observation period in which he participated in selecting new committee officers, in drawing his transparencies, and in using printed resources. He showed frequent questioning behavior when his committee planned its lists of questions and resources, when he spent extensive time (20 minutes or more) interpreting Indian pictures, and when he planned and dictated the skit. In

the Managing category his independent learning behaviors peaked the same observation period that his Questioning behaviors reached their highest level. His other high points in Managing occurred when his group collected information and when it prepared for its presentation. In the areas of Planning and Evaluating, Student #3 showed increases, including peaks, of independent learning behavior during observation periods when his group was involved in preparing for the final presentation. Student #3's frequency count of independent learning behaviors was at his baseline level only when the teacher directed the whole class and during the final presentations and evaluations (Figure 15).

Return to Baseline Conditions. At the conclusion of treatment, classroom instruction was returned to the baseline conditions of teacher-centered instruction. Once again, Student #3 experienced teacher-centered reading group instruction. Just as he had prior to treatment, Student #3 sat always to the side of the teacher or slightly behind another student. This time in the reading group, though, he was observed to exhibit independent learning behaviors in the Managing category. He directed group facilitation remarks to students sitting near him. Prior to treatment he had not exhibited independent learning behaviors in small group settings. The managing behaviors that he showed in the two observation periods immediately after treatment were at the same level as his treatment behaviors for the preceding three observations. The treatment level dropped, however, in the third return to baseline observation. From this point on, his managing behaviors were at their baseline level. The instructional conditions of the return to baseline did not appear to support treatment-level managing behaviors.

During the return to baseline Student #3 again had daily opportunities to attend to teacher-directed assignments at his desk. He traveled to several other students in the room, the same students he had frequently conversed with in similar instructional situations during baseline. He asked questions about assignments, and he facilitated other students with their class work. Unlike his observed behavior during baseline, he now returned to his desk with advice, information, and evaluative remarks for the high and middle achievement seatmates which derived from his meetings with students in other parts of the room. He appeared to exercise greater leadership within his social network than he had prior to treatment. During the return to baseline conditions, he exhibited independent learning behaviors at higher than baseline levels in all four categories. See the graphs for Student #3--Figures 14, 15 and 16--to visually inspect the frequency of his independent learning behaviors during the return to baseline conditions.

Evaluation of Frequency Data. Through visual inspection of the graphed frequency counts (Figures 14, 15 and 16) it is clear that Student #3 manifested much more independent learning behaviors in all four categories during treatment than in observation periods before and after treatment. Differences between pre-treatment and post-treatment are strong in the categories of Managing and Evaluating. The null hypotheses, then, are rejected regarding the comparison of treatment behaviors with pre-treatment and post-treatment behaviors. The null hypotheses regarding the comparison of pre-treatment and post-treatment behaviors are rejected in the categories of Managing and Evaluating.

Student #4, a Middle Achievement Girl

Baseline. Prior to treatment Student #4 appeared to have only superficial involvement in her class work. In her middle achievement reading group, she was not observed to volunteer any verbal responses to lessons. She appeared to carry out the teacher's directions but without interactions with the teacher. She was not with any girls from her social group. She always sat next to the only other girl in the group, but she did not speak to this girl or to any of the boys in the group during any of the observed lessons. She usually kept her eyes on her materials without looking at anyone in the group. She did not exhibit any independent learning behaviors during observed reading group meetings of baseline.

When Student #4 was at her desk she showed more involvement with her peers but still appeared to be involved with class work at only a surface level. She sat next to a high achievement girl in her social group. One day each week during baseline and three weeks into treatment Student #4, the girl seated next to her, and one other girl wore clothing that matched. During each observation the high achievement girl worked steadily on her assignments. During all observations in which Student #4 and her high achievement seatmate were seated next to one another, Student #4 repeatedly asked for help from the other girl. She asked the other girl to give approval of her work. She asked the other girl if her work was "neat". During one observation, Student #4 appeared to be imitating the other girl's behaviors while working on a workbook assignment. Student #4 moved in synchrony with the other girl, moving her head and body, reading, writing, pausing, and turning pages when the other girl did. During another observation, Student #4 persuaded her seatmate to

do her assignment for her. She then copied her seatmate's responses. Once when the seatmate was not next to her, Student #4 did not attempt any class work throughout an observation. During oral reports on the last day of baseline, Student #4 read her report to herself, as though rehearsing, while another student reported, but she did not volunteer to report. She chatted with a middle achievement boy sitting nearby. She did not appear to listen to any of the reports.

In the eight days of baseline observation, Student #4 manifested independent learning behaviors in the categories of Questioning, Managing, and Evaluating. Her levels of performance in these areas were extremely low. See the graphs for Student #4--Figures 17, 18 and 19--to visually inspect the frequency of her independent learning behaviors during baseline.

Treatment. The description of Student #4's behaviors during treatment is presented according to the three major phases of the Problem Approach: (1) topic identification, (2) planning and implementation, (3) presentation and evaluation. The first phase, topic identification, and the third phase, presentation and evaluation, occurred with the teacher directing the whole class. The second phase, planning and implementation, occurred primarily with students working with one another in committees.

During topic identification Student #4 appeared to listen. Data collected during this phase are represented on the graphs as the first three observation points of treatment (Figures 17 and 18). On the first day of the Problem Approach Student #4 attempted to work on homework while listening. Fifteen minutes into the listing of topics, she voluntarily contributed a question to the list. On the second day she voluntarily

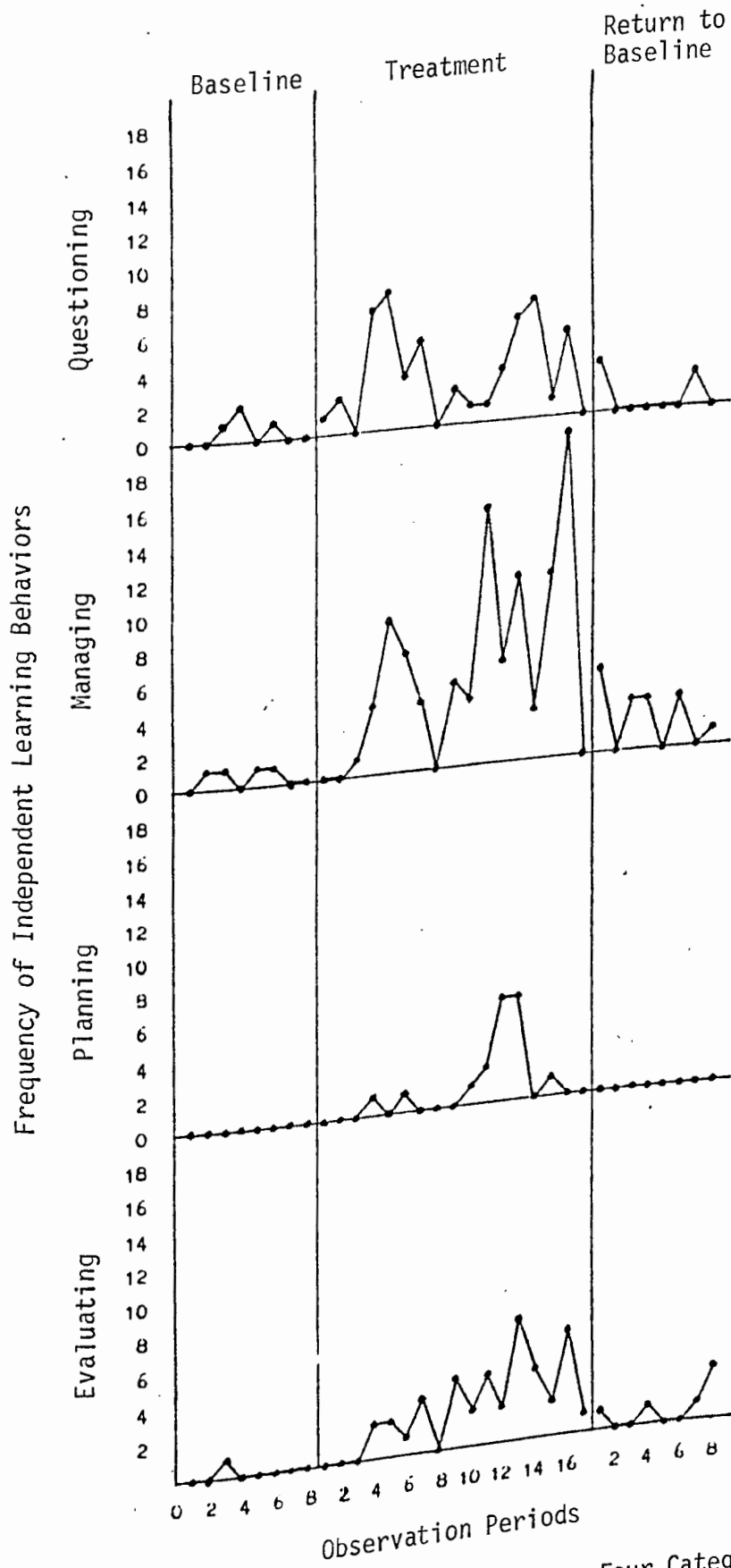


Figure 17. Independent Learning Behaviors in Four Categories for One Student (#4)

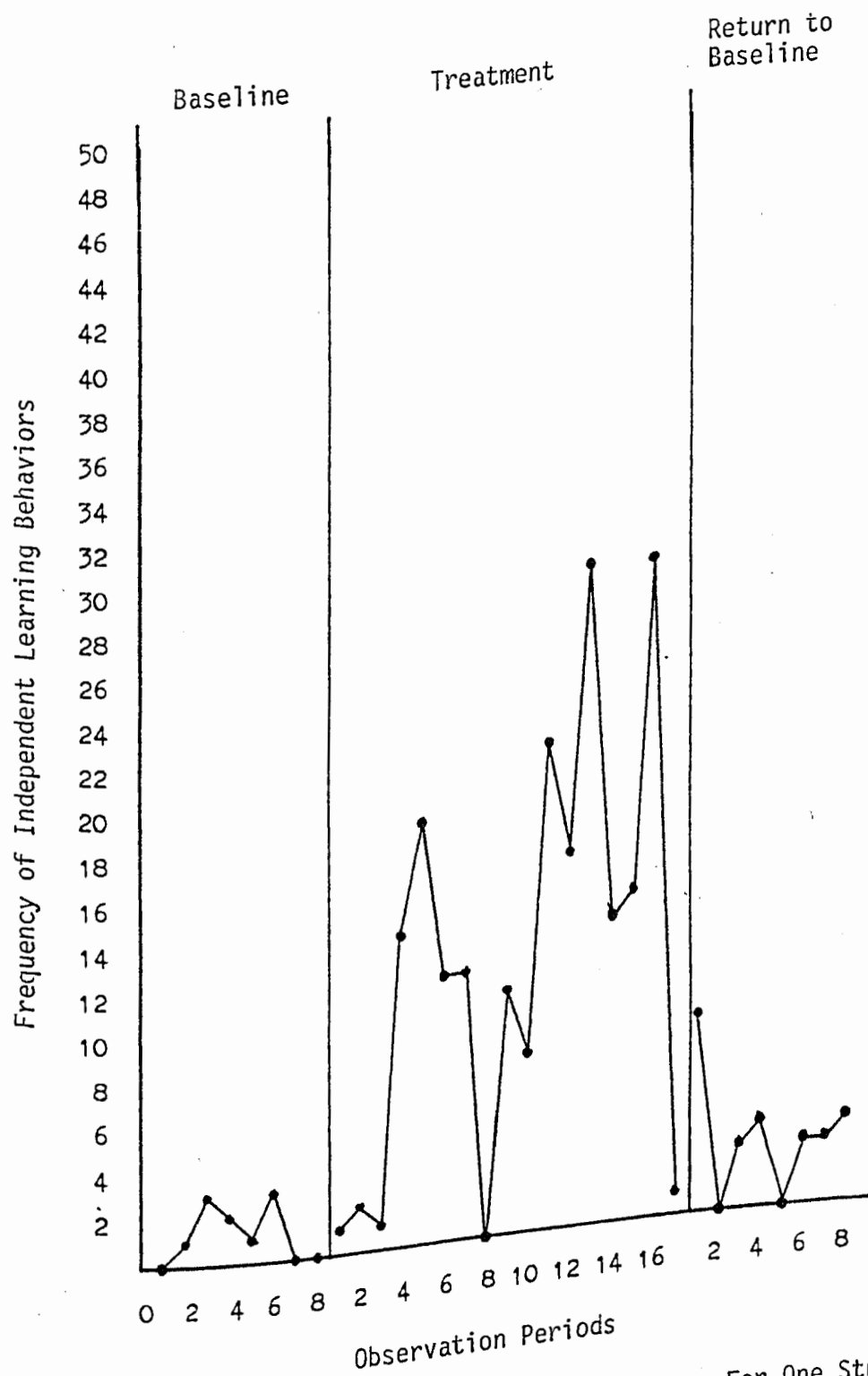


Figure 18. Combined Independent Learning Behaviors For One Student (#4)

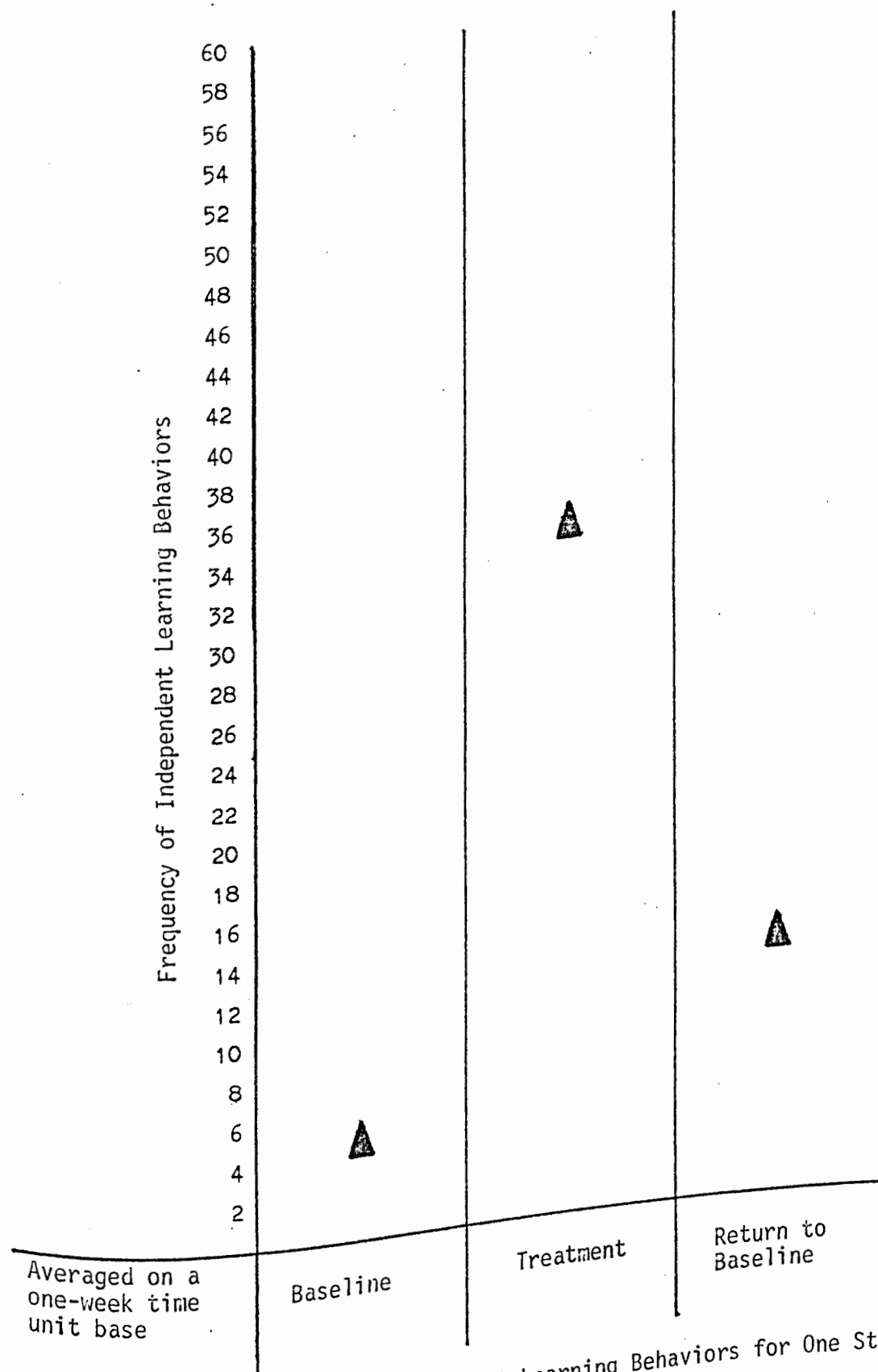


Figure 19. Combined Average Independent Learning Behaviors for One Student (#4)  
(Equated for Common Time Units)

took notes, a managing behavior. Periodically she glanced at the notes of her high achievement female seatmate and then adjusted her own notes. She did not contribute any further to the topic identification phase. Her level of independent learning behaviors was quite low compared to her behaviors in the other three categories. (Figures 17 and 18.)

During the planning and implementation phase Student #4 became actively involved in group processes. Data collected during this phase are represented on the graphs as the 4th through the 16th observation points of treatment. She became the first recorder of her group. As recorder she left her group to ask the high achievement girl she sat next to during baseline how to be a recorder. In the next two days she stopped asking her baseline seatmate for help, but repeatedly asked the high achievement girl in her group if she were recording correctly and if her record-keeping looked neat. Once Student #4 began using media center materials, she often asked how to find information. She asked about the meaning of information in books and in charts. She asked for help in writing paragraphs in her report. She asked a committee member with artistic ability to help her draw a poster. Aside from asking for help, she also asked others in her committee to report information for her to record.

Student #4's frequent requesting of assistance was an interesting aspect of treatment observations of her. Moreover, her behavior over time was similar to the behavior of Student #1, who also frequently sought help and learned to become specific in stating his needs. Student #4's early attempts to enlist help were often non-specific complaints, such as, "I just don't know how to do this" and "Can you help me? I don't

know how." In the first two weeks the high achievement girl in her group helped Student #4 even when she simply appeared helpless. Sometimes the high achievement girl and the low achievement boy in the group performed Student #4's work for her. Eventually, the high achievement girl began asking Student #4 questions to help her think about her problems. Finally, in the fourth week the high achievement girl ignored Student #4's requests for help if Student #4's requests were non-specific. Student #4 then seemed to discover a more successful way to communicate her needs. She began asking for help with this type of wording: "Here is what I have written so far. I'm telling about the cooking tools the Plains Indians used. Now can you help me write the ending?" Then she received help from the high achievement girl. It appeared that peers in Student #4's committee learned to be less manipulated by an overly dependent member, who then learned to be less manipulative and less dependent. Interestingly, when Student #4 appeared to become more independent with her academic tasks, she began helping other students with theirs.

Student #4's frequent managing behaviors during the planning and implementation phase were usually observed as facilitation of group discussions. She was the first member of her committee to consult media center materials to help expand the committee's list of questions and resources. She made recommendations about resources to others in the group, and then they too consulted available materials. During the week that Student #4 was recorder, she helped all other members assign questions to themselves. She checked on their progress. She told two of the boys to work harder. When her committee began compiling information for reports and art projects, she verbalized her own ideas, extended the

ideas of others, evaluated ideas, and spoke to all members, stimulating cohesiveness in her group. Later when her committee was ready to plan the format of their presentation, Student #4 was the first member to accept the responsibility for coordinating individual efforts to produce a group presentation.

The leadership Student #4 showed in helping her group plan its presentation provided the opportunity for her to demonstrate numerous independent learning behaviors in all four categories, including her treatment peaks in Planning and Evaluating. Her first efforts to coordinate the individual projects were unsuccessful, however. While her committee worked on art projects and reports, she suggested they perform a skit. The other students in her group ignored her. She seemed to give up her planning efforts. However, in 15 minutes she returned to the center of her committee's work area and told the others they should have a visual presentation. They would use the transparencies and filmstrips they were making, and they would give oral reports, she said. The other students agreed with her plan. She then assigned four students to two-member teams and left out the middle achievement boy who usually worked by himself. She told them to "get busy" on their reports. When Student #4 appeared to realize she did not know how to begin the presentation, she and her partner sought the advice of the teacher. After learning about an introduction from the teacher, Student #4 returned to the committee and explained how they would introduce their presentation.

Though Student #4 demonstrated her highest frequency of evaluating behaviors when she led her committee in planning for the final presentation, she revealed meaningful self-evaluating behaviors when she began assigning

research tasks to herself. As recorder, she took responsibility for seeing that each member selected research questions, but she did not select any assignments for herself. In the second week when she was no longer recorder, she appeared to discover that she was not doing as much work as other committee members. She said, "I'm not doing this right. Now I have to catch up." She then assigned work to herself and appeared to become more involved in information gathering.

The final phase of the students' research unit on American Indians was the presentation and evaluation phase. Data collected during this phase are represented on the graphs as the last observation point of treatment. Student #4 did not remain as actively involved as she had been while she worked in her committee. As a presenter she gave a brief report, showed the poster she had colored, and helped show the filmstrip she had made with the high achievement girl. She did not give credit to the boy who had drawn most of her poster. As an audience she did not appear to listen to any other presentations. She colored pictures, and she cleaned out her desk. She evaluated her own work by saying she liked her filmstrip. She did not tell why she liked it when a student from another committee asked. She did not make evaluative remarks to any other presenters.

During the treatment Student #4 manifested independent learning behaviors in the categories of Questioning, Managing, Planning, and Evaluating (Figures 17, 18 and 19). Her frequency count was highest for Questioning when, as recorder, she helped her committee develop its lists of research questions and resources and when she helped her committee prepare for its final presentation. Her frequency counts were highest for

Managing, Planning, and Evaluating when she helped her committee prepare for its final presentation. Student #4's frequency count of independent learning behaviors was at her baseline level only when the teacher directed the whole class and during final presentations and evaluations.

Return to Baseline Conditions. At the conclusion of treatment, classroom instruction was returned to the baseline conditions of teacher-centered instruction. Once again, Student #4 experienced teacher-centered reading group instruction. In contrast to her initial baseline behavior, when she appeared generally uncommunicative, she volunteered answers to the teacher's literal level questions. (She still did not verbally respond to inference level questions.) She also frequently spoke to the other girl in her group, whom she had not spoken to during initial baseline observations.

During the return to baseline conditions Student #4 again had daily opportunities to complete teacher-directed assignments at her desk. Her behavior seemed quite similar to initial baseline behavior. Similar to her performance during initial baseline, she asked her high achievement seatmate to help her with assignments. Her question each time was, "How do you do this?" Once after being helped, she was able to complete a lesson more quickly than the middle achievement boys sitting near her. She bragged to them about being so far ahead of them.

Similar to her initial baseline performance, she appeared to be only superficially involved with her class work. During several observations she worked on highly structured workbook lessons briefly (5-10 minutes) and then stared into space and played with objects at her desk. She rarely showed sustained involvement (attention to an assignment for at

least 15 minutes without interruption) even though peers of all achievement levels were showing sustained involvement.

Similar to initial baseline and treatment performances, when Student #4 had an opportunity to be an audience for oral presentations by peers, she appeared inattentive. Remarkably, the presentation during the return to baseline which she was observed to ignore was a puppet show with sound effects.

See the graphs for Student #4--Figures 17, 18, and 19--to visually inspect the frequency of her independent learning behaviors during the return to baseline conditions. She manifested independent learning behaviors in all categories except Planning. Inspection of graphed frequency counts in the Managing category gives the impression that Student #4 experienced some transfer effect from treatment.

Evaluation of Frequency Data. Through visual inspection of the graphed frequency counts (Figures 17, 18, and 19), it is clear that Student #4 manifested much more independent learning behaviors in all four categories during treatment than in observation periods before and after treatment. Differences between pre-treatment and post-treatment are strong only in the category of Managing. The null hypotheses, then, are rejected regarding the comparison of treatment behaviors with pre-treatment and post-treatment behaviors. The null hypotheses regarding the comparison of pre-treatment and post-treatment behaviors are rejected in the Managing category.

### Summary

Individual behavioral descriptions of each of the four subjects were provided. Details of subjects' questioning, managing, planning, and

evaluating behaviors were given corresponding to baseline, treatment, and return to baseline phases of this study. In all cases behaviors in these four categories increased extensively during treatment, in comparison with baseline and return to baseline observations. Frequency counts of independent learning behaviors during treatment dropped to baseline levels only when either the teacher or a group of students directed the class or when a subject worked predominantly alone. Transfer effects of treatment to post-treatment situations were evident, though not extensive in one or more categories for each subject in return to baseline observations.

#### Independent Learning Behavior Data Aggregated on Four Subjects

The results of the aggregate data on the four subjects are provided in Table 3 along the dimensions of the four independent learning behavior categories. The categories are Questioning (Q), Managing (M), Planning (P), and Evaluating (E). While the number of observations in the pre-treatment and post-treatment phases was consistent for each student (eight in each phase), the number of observations in the treatment phase varied (Student #1: 16; Students #2 and #4: 17; Student #3: 20). Therefore, the raw frequency counts have been weighted in the following ways:

Student #1: treatment values were divided by 2.0

Student #2: treatment values were divided by 2.125

Student #3: treatment values were divided by 2.5

Student #4: treatment values were divided by 2.125

Table 3 presents weighted frequency counts.

The sign test and the binomial expansion were used to analyze the aggregate data on the four subjects. First, differences between paired

Table 3

Independent Learning Behavior Data Aggregated on Four Subjects(Weighted For Equivalency of Observation)

	Baseline to Treatment	Treatment to Return to Baseline	Baseline to Return to Baseline
<u>Student #1</u>			
Q	6.00 (+) 27.00	27.00 (-) 17.00	6.00 (+) 17.00
M	8.00 (+) 48.00	48.00 (-) 10.00	8.00 (+) 10.00
P	3.00 (+) 15.50	15.50 (-) 0.00	3.00 (-) 0.00
E	3.00 (+) 23.50	23.50 (-) 5.00	3.00 (+) 5.00
<u>Student #2</u>			
Q	1.00 (+) 31.53	31.53 (-) 9.00	1.00 (+) 9.00
M	11.00 (+) 32.94	32.94 (-) 15.00	11.00 (+) 15.00
P	1.00 (+) 7.53	7.53 (-) 0.00	1.00 (-) 0.00
E	1.00 (+) 20.24	20.24 (-) 16.00	1.00 (+) 16.00
<u>Student #3</u>			
Q	7.00 (+) 30.80	30.80 (-) 11.00	7.00 (-) 11.00
M	7.00 (+) 58.00	58.00 (-) 19.00	7.00 (+) 19.00
P	0.00 (+) 20.80	20.80 (-) 4.00	0.00 (+) 4.00
E	2.00 (+) 28.40	28.40 (-) 9.00	2.00 (+) 9.00
<u>Student #4</u>			
Q	4.00 (+) 24.47	24.47 (-) 5.00	4.00 (+) 5.00
M	4.00 (+) 46.59	46.59 (-) 15.00	4.00 (+) 15.00
P	0.00 (+) 8.47	8.47 (-) 0.00	0.00 (NC) 0.00
E	2.00 (+) 18.82	18.82 (-) 6.00	2.00 (+) 6.00

## Sign Test:

16 (+) of 16 measures    16 (-) of 16 measures    13.5 (+) of 16 measures

## Binomial Test:

p = .00002

p = .00002

p = .0175

Significant if  $p \leq .05$ .

Q = Questioning    M = Managing    P = Planning    E = Evaluating

NC = No Change

values were obtained with plus and minus signs used to indicate the direction of change. Second, the number of plus and minus signs were totaled separately. Third, a binomial expansion table was entered with the smaller of the two frequencies, either plus or minus. The value found in the table indicates the probability ( $p$ ) of behaviors occurring by chance. In this study, significant was set as .05.

Table 3 indicates that in the comparison of baseline to treatment the four subjects had higher frequency of independent learning behaviors during treatment in 16 out of 16 measures. The probability of this result occurring by chance is .00002. In the comparison of treatment to return to baseline, the four subjects had lower frequency of independent learning behaviors during return to baseline in 16 out of 16 measures. Again, the probability of this result occurring by chance is .00002. In the comparison of baseline to return to baseline, the four subjects had higher frequency of independent learning behaviors during return to baseline in 13 out of 16 measures with no change on one measure. The probability of this result occurring by chance is .0175. The null hypotheses are rejected, therefore, because the probability that treatment effects occurred by chance during and after treatment was less than .05 for aggregated data.

Independent Learning Behavior Data Aggregated on Four Subjects  
for Directionality and Social Context

The primary objective of this study was to observe independent learning behaviors in the categories of Questioning, Managing, Planning, and Evaluating. Additional information was collected to enhance the observations of independent learning behaviors. The secondary objective,

then, of this study was to observe the directionality (initiates versus responds) and the social contexts of independent learning behavior.

#### Directionality of Independent Learning Behaviors

The results of the directionality data aggregated on the four subjects are provided in Table 4 along the dimensions of the four independent learning behavior categories. The categories are Questioning (Q), Managing (M), Planning (P), and Evaluating (E). The directionality of independent learning behaviors refers to initiated versus responsive behaviors. In Table 4 raw values for "initiates" versus "responds" have been converted to ratios (percentages) of initiated behaviors out of total behaviors for each measure. Raw Frequency counts of independent learning behaviors by the four categories and by the "initiates" and "responds" dimensions are presented in Appendix D. In Table 4 an asterisk (\*) denotes situations in which initiates-versus-responds relationships cannot be presented because initiated behaviors were not observed. This situation occurred five times in baseline. Directionality can be deduced even though a ratio for the baseline measures cannot be mathematically computed.

The sign test and the binomial expansion were used to analyze the aggregated data on the four subjects along the dimension of directionality. First, differences between paired percents were obtained with plus and minus signs used to indicate the direction of change. Second, the number of plus and minus signs were totaled separately. Third, a binomial expansion table was entered with the smaller of the two frequencies, either plus or minus. The value found in the table indicates the probability (p) of behaviors occurring by chance. In this study, significance was set as .05.

Table 4

Directionality: Ratios (Percentages) of Initiates to Total Independent Learning Behaviors

	Baseline to Treatment	Treatment to Return to Baseline	Baseline to Return to Baseline
<u>Student #1</u>			
Q	0.50 (+) 0.56	0.56 (-) 0.82	0.50 (+) 0.82
M	0.13 (+) 0.52	0.52 (-) 0.50	0.13 (+) 0.50
P	0.67 (+) 0.78	0.78 (-) 0.00	0.67 (-) 0.00
E	* (+) 0.74	0.74 (+) 1.00	0.25 (+) 1.00
<u>Student #2</u>			
Q	* (+) 0.80	0.80 (+) 1.00	0.50 (+) 1.00
M	0.09 (+) 0.56	0.56 (-) 0.40	0.09 (+) 0.40
P	1.00 (-) 0.88	0.88 (-) 0.00	1.00 (-) 0.00
E	* (+) 0.56	0.56 (+) 0.75	0.50 (+) 0.75
<u>Student #3</u>			
Q	0.43 (+) 0.46	0.46 (+) 0.82	0.43 (+) 0.82
M	0.14 (+) 0.34	0.34 (+) 0.42	0.14 (+) 0.42
P	0.00 (+) 0.54	0.54 (-) 0.52	0.00 (+) 0.50
E	0.50 (-) 0.34	0.34 (+) 0.67	0.50 (+) 0.67
<u>Student #4</u>			
Q	1.00 (-) 0.68	0.68 (+) 1.00	1.00 (NC) 1.00
M	* (+) 0.46	0.46 (-) 0.33	0.20 (+) 0.33
P	0.00 (+) 0.58	0.58 (-) 0.00	0.00 (NC) 0.00
E	* (+) 0.66	0.66 (+) 1.00	0.33 (+) 1.00

Sign Test:

13 (+) of 16 measures      9 (+) of 16 measures      13 (+) of 16 measures

Binomial Test:

p = .011

p = .402

p = .011

Significant if  $p < .05$

\* = No initiated behaviors

NC = No Change

Table 4 indicates that in the comparison of baseline to treatment the four subjects showed increases in the percent of initiated behaviors in 13 out of 16 measures. The probability of this result occurring by chance is .011. Therefore, the higher percentage of initiated behaviors is significant. In the comparison of treatment to return to baseline, the four subjects had higher percentages of initiated behaviors during the return to baseline in 9 out of 16 measures. The probability of this result occurring by chance is .402, which is not significant. In the comparison of baseline to return to baseline, the four subjects had higher percentages of initiated behaviors during the return to baseline in 13 out of 16 measures. The probability of this result occurring by chance is .011. Therefore, the higher percentage of initiated behaviors is significant.

In summary, use of the sign test and the binomial expansion to analyze directionality enhances the analysis of independent learning behaviors when student-centered instruction (based on the Problem Approach) is compared to teacher-centered instruction. It appears that subjects took more initiative in learning activities during and after participating in the Problem Approach than they did prior to participating in the Problem Approach.

#### Social Contexts of Independent Learning Behaviors

The results of the social contexts data on the four subjects are provided in Table 5. The data are from all three research phases--baseline, treatment, and return to baseline. Since this aspect of analysis is concerned only with social contexts, data are not separated into the

Table 5

Social Contexts and Verbal Communication Objects of Independent Learning Behaviors

Verbal Communication Objects	Predominant Instructional Situations in Terms of Social Contexts <sup>1, 2</sup>					
	Independent Activity	Peer Small Groups (4-6)	Large Groups with Teacher (7-15)	Whole Class with Teacher	Teacher with Individual	Total
	(29)*	(50)*	(24)*	(35)*	(0)*	(135)*
Self	1 (0.03)	30 (0.60)	1 (0.04)	6 (0.17)		38 (.28)
Peer Dyad/Triad	78 (2.69)	690 (13.80)	40 (1.67)	53 (1.51)		861 (6.4)
Peer Small Group (4-6)		159 (3.46)				159 (1.18)
Large Group with Teacher (7-15)			10 (0.42)			10 (0.07)
Whole Class with Teacher				23 (0.66)		23 (0.17)
Individual with Teacher	7 (0.24)	36 (0.78)	30 (1.25)	22 (0.63)		95 (0.70)
Total	86 (2.97)	915 (18.30)	81 (3.38)	104 (2.97)		1186 (8.79)

1 = raw frequency count

\* Observation Periods

2 = (average number of independent learning behaviors per observation period)

three research phases. Instead, the social context data on the four subjects are aggregated according to the following dimensions: (1) predominant instructional situations in terms of social contexts, and (2) verbal communication objects, referring to the audience for subjects' communication.

Table 5 illustrates the relationship between the social contexts of instructional situations and the verbal communication objects of subjects' independent learning behaviors. In the total 135 observation periods, 1186 independent learning behaviors were recorded. Because observation periods were not equal in number for each instructional situation, average numbers of independent learning behaviors per observation period are given in parentheses in the table and in this analysis. Of the 1186 independent learning behaviors (an average of 8.79 per observation period), 861 (an average of 6.4 per observation period) occurred when a subject interacted with one or two other students ("dyad/triad") without the teacher participating. Moreover, 690 (an average of 13.80 per observation period) of these interactions with just one or two other students occurred when the predominant instructional situation was small groups without the teacher participating. Additionally, 915 independent learning behaviors (an average of 18.30 per observation period) of the observed 1186 independent learning behaviors occurred while students participated in small groups. Independent learning behaviors were observed with considerably less frequency when subjects participated in independent instructional activities (86, an average of 2.97 per observation period) and when they participated in large groups (81, an average of 3.38 per observation period) and in whole class activities (104, and average of 2.97 per observation

period). Interestingly, of the 1186 observed independent learning behaviors (an average of 8.79 per observation period), only 95 (an average of 0.70 per observation period) occurred when the teacher was the object of subjects' verbal communication.

It appears from these results that small group instructional situations, without the participation of the teacher, maximize opportunities for students to manifest independent learning behaviors. Small group work is the predominant instructional situation of the Problem Approach.

#### Students' Evaluation

At the conclusion of this study, the class was asked to complete a non-formal self-evaluation form. To the question "What did you like best about the American Indians research unit?" many students, including Student #4, reported they liked learning new information and/or sharing information in their committees. Many other students, including Students #1 and #2, identified a specific topic they had liked most. Student #3 and several others liked the guest speaker best. Making art projects was also named by several students as a well-liked part of the unit.

The class responded to "What did you like least about the American Indians research unit?" The two most frequently given answers were "the written work" and a specific topic about Indians. Student #1 named a specific topic that he did not like to study. Student #2 did not like having to use so many resources. Student #3 did not like working in the media center. Student #4 said she did not like not being able to select her own research questions. (What occurred in her committee was that the

other committee members selected their questions first, and Student #4 accepted those questions which were left over.)

A third general question the class answered was "What was most interesting to you and why?" More than half the class, including Students #1, #2, #3, and #4, identified a part of their own project as most interesting. Several students said that information or art from someone else's presentation was most interesting.

The last question asked was "Is there something about American Indians you would still like to know? What?" One-third of the class, including Student #4, gave a specific question they would like answered. Student #3 responded to this question by saying, "I want to be an Indian."

#### Teacher's Evaluation

At the conclusion of the study, the researcher conducted a taped interview with the teacher. Her evaluation of her first implementation of the Problem Approach is provided here. At the time of the interview, the teacher did not know the identities of the four subjects.

#### What the Teacher Liked Best

The teacher observed that her favorite part of the Problem Approach was the way students who had not had opportunities to demonstrate leadership before now were in leadership positions. "Some have shown rather outstanding abilities," the teacher said. She liked seeing leadership abilities develop among students of all achievement levels in the heterogeneously organized groups. The mixed groupings, she said, were "marvelous," because they allowed people to see that it is not just the Talented and Gifted students who do good work. She said she saw students take responsibility for

information, materials, and one another without being told what to do. She said she saw students teaching one another effectively.

Another aspect of the treatment the teacher liked was seeing students develop self-confidence. The teacher thought that many students discovered they were more competent than they realized. She noticed students trying activities which they formerly would not have attempted voluntarily. She said she saw students move from being highly dependent on a friendship group to being more dependent on themselves. She observed that students appeared to trust one another more. "This trust in a room with such diversity is superb," the teacher said.

#### Other Areas of Interest

Numerous outcomes of the six-week treatment interested the teacher. She noticed that students' worthwhile contributions to the class seemed to improve their social acceptability among their peers. Regarding the depth that students studied American Indians, she said that some students skimmed the topic, while others studied so deeply that "they are still down there." She was impressed by the levels of involvement, including physical involvement and amount of time on task, that she saw students demonstrate. She said the reading levels of materials some students were using were higher than their normal classroom materials. Some books were college material, she said.

The teacher noticed transfer of more independence and assertiveness by many students during activities that did not relate to the study. She also noted that some students' appearance changed somewhat during treatment. She thought that low achievement students no longer "looked" like they were in a low group. Among the group of girls who had often dressed alike,

the teacher began to see more individuality in their clothing. She said that some students were just beginning to manifest behavioral changes at the conclusion of the Problem Approach. She was referring to improved self-esteem and independence.

The teacher was impressed with what she saw as a transfer effect from treatment to another situation. Several days after treatment she gave the class a "free period." She said she saw them use "free time" with more maturity and self-discipline than she had ever seen demonstrated by a class before. The researcher was present for this "free period" during a non-observation period and saw that students voluntarily moved into pairs and small groups while some students worked independently. All students were busy, some with art, some with spelling, some with math, some with word puzzles.

#### What the Teacher Liked Least

The teacher mentioned that the students needed more time and they needed to use more outside resources. Her major criticism, though, was that the final presentations did not adequately demonstrate the "tremendous amount of work" students had put into their preparations for final presentations so their efforts would have had polish. She complained that she "would like to have been more actively involved in their work."

#### Will the Teacher Use the Problem Approach Again?

The teacher ended the interview saying she would use the Problem Approach again. She said, "Yes, I must keep these new skills and new behaviors going. We can't stop it now!"

### Summary

This chapter presented the results of this study. First, individual behavioral descriptions of each of the four subjects were presented with graphs of independent learning behaviors. Second, results of independent learning behavior data aggregated on the four subjects were explained and illustrated in a table. Third, the results aggregated on the four subjects along the dimensions of directionality (initiates versus responds) and social context were presented. This chapter concluded with the students' and the teacher's evaluations of their participation in the Problem Approach.

## CHAPTER V

### SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Chapter Five summarizes this research, draws conclusions, and suggests implications. The purpose, problem, hypotheses, design and procedures, and findings are reviewed. Conclusions are then presented as they are drawn from the primary and secondary research objectives. Limitations of the study as they relate to the primary objective are presented. Finally, implications for theory, research, and practice are suggested.

#### Summary

##### Purpose

The purpose of this study was to observe the independent learning behaviors of sixth grade students. Independent learning behaviors were observed in the following categories: Questioning, Managing, Planning, and Evaluating. The sixth graders were two middle achievement students, one boy and one girl, and two low achievement students, one boy and one girl. Achievement level was determined by 5th grade California Achievement Test scores and school performance.

An instructional procedure known as the Problem Approach was used as treatment. As a student-centered instructional technique, the Problem Approach was experienced by students as a contrast to the more teacher-centered teaching that students experienced before

and after treatment. An observation instrument and field notes were used to observe students' independent learning behaviors before, during, and after treatment.

To enhance findings about independent learning behavior, two other dimensions were observed. These dimensions are the directionality of independent learning behavior, referring to initiated and responsive behaviors, and the social contexts of independent learning behavior.

### Problem

The literature indicates a need for schools to help students to develop their ability to reason and to function as independent learners. The Problem Approach is an instructional approach which has been used in practice and in research as a procedure for helping participants develop their reasoning ability and their ability to function as independent, self-directed learners (Brigham, 1961, 1974, 1975, 1975, 1979; Brigham & Pilato, 1980, 1981, 1982; Dudley, Pilato & Brigham, 1982; McCann, 1982). The following problem statement was investigated in this research: Will instruction using the Problem Approach with male and female, middle and low scholastic achievement level preadolescents lead to a greater frequency of independent learning behaviors, observed in social contexts, during and after the treatment phase compared to periods of instruction which are more teacher-directed?

### Research Hypotheses

Specifically, it was hypothesized that the subjects of this research would manifest a greater frequency of independent learning behaviors during and after treatment using the student-centered Problem Approach compared to periods of teacher-centered instruction not using the Problem

Approach. Hypothesis statements were developed for each category of independent learning behavior--Questioning, Managing, Planning, and Evaluating. In the Conclusions section of this chapter, the specific hypothesis is provided to introduce the discussion of conclusions in each category.

### Design and Procedures

The sixth grade reading class used for this research was located in a suburban public elementary school which serves numerous neighborhoods that are diverse according to their ethnic, racial, and socio-economic composition. Though the entire class of 28 students participated in this research, four students were observed as the subjects of the investigation. Only the research staff knew the identity of the subjects.

The researcher used a single case study design with four parallel applications to observe the independent learning behaviors of the four subjects. Using this design, data collection observations were grouped into three separate phases: baseline, treatment, and return to baseline conditions. Baseline observations were recorded every reading class period for two weeks. Treatment observations were recorded every class period for six weeks. Return to baseline observations were recorded after treatment for two weeks. Data recorded during each of these phases included (1) frequencies of questioning, managing, planning, and evaluating behaviors coded on an observation instrument for initiative versus responsiveness and for social contexts and (2) descriptive information observed by the researcher. The coded frequency counts were collected by the researcher and two co-observers. Descriptive information was recorded solely by the researcher. During the treatment phase the

teacher conducted her class using the Problem Approach which had been taught to her by the researcher. To minimize the threat of the Hawthorne effect, students were not informed that their unit of study using the Problem Approach was a research treatment.

Upon completion of the observations, data were analyzed. Visual inspection of graphed frequency counts for each subject was the primary means of evaluating data. Individual behavioral descriptions enhanced the meaningfulness of the graphed data. A supplemental means of evaluating the data was the use of the sign test in combination with the binomial test, which are nonparametric methods of analyzing data.

### Findings

In summary of the findings reported in Chapter IV, the null hypotheses regarding the comparison of treatment behaviors to baseline and return to baseline behaviors were rejected. Some variation, however, existed from individual to individual regarding the rejection of null hypotheses comparing baseline and return to baseline behaviors. Transfer effects in return to baseline conditions, though, were evident in one or more categories of independent learning behaviors for each subject. In the areas of directionality and social context, Chapter IV reported that subjects appeared to exhibit more initiative, compared to responsiveness, during and after treatment compared to before treatment. Finally, findings in Chapter IV indicated that in this research the social context of small group instructional situations maximized independent learning behavior.

Research findings are presented with greater specificity in the following section of this chapter. In the remainder of this chapter, findings are treated as the bases for conclusions and implications.

### Conclusions

Conclusions are presented here as they derive from research results, or findings. They are grouped in two ways: (1) according to the primary objective of this research, the observation of independent learning behavior in Questioning, Managing, Planning, and Evaluating categories and (2) according to the secondary objective, the observation of both directionality (initiates versus responds) and social contexts.

#### Independent Learning Behavior in Four Categories

Research Hypothesis #1: It was hypothesized that during and after participating in the Problem Approach subjects would manifest more questioning behavior than they did prior to treatment.

Result: All four subjects exhibited much more questioning behavior during treatment than they did before and after treatment. In the comparison of baseline-to-return-to-baseline questioning behavior, the results varied. Students #1 and #2 showed strong positive differences, indicating a transfer effect of treatment on subsequent behavior. Students #3 and #4, however, showed positive but weak differences, not indicating a transfer of questioning behavior under post-treatment conditions.

Conclusion: It appears that the Problem Approach, as it was implemented in this research, provides conditions which enhance students' opportunities to manifest questioning behavior. However, it appears that when the instructional conditions of the Problem Approach are removed and the more teacher-centered conditions of baseline are restored, students' opportunities to question are lessened. While some students may demonstrate an immediate transfer effect of the Problem Approach on their questioning

behavior, others do not. Since the post-treatment observation period was only two weeks in length, it is not known if transfer effects on questioning behavior would vary further over a longer time period. The overall conclusion is that student-centered instruction, such as that provided by the Problem Approach, is useful for helping students develop questioning behavior.

Research Hypothesis #2: It was hypothesized that during and after participating in the Problem Approach subjects would manifest more managing behavior than they did prior to treatment.

Result: All four subjects exhibited much more managing behavior during treatment than they did before and after treatment. In the comparison of baseline-to-return-to-baseline managing of people and information, the results varied. Students #3 and #4 showed strong positive differences, indicating a transfer effect of treatment on subsequent behavior. Students #1 and #2, however, showed positive but weak differences, not indicating a transfer of questioning behavior to return to baseline conditions.

Conclusion: It appears that the Problem Approach, as it was implemented in this research, provides conditions which enhance students' opportunities to exhibit managing behavior. However, it appears that when the instructional conditions of the Problem Approach are removed and the more teacher-centered conditions of baseline are restored, students' opportunities to manage people and information are lessened. While some students may demonstrate an immediate transfer effect of the Problem Approach on their managing behavior, others do not. Since the post-treatment observation period was only two weeks in length, it is not known

if transfer effects on managing behavior would vary further over a longer period of time. The overall conclusion is that student-centered instruction, such as that provided by the Problem Approach, is useful for helping students develop managing behavior.

Research Hypothesis #3: It was hypothesized that during and after participating in the Problem Approach subjects would manifest more planning behavior than they did prior to treatment.

Result: All four subjects exhibited much more planning behavior during treatment than they did before and after treatment. In comparison of baseline-to-return-to-baseline planning behavior, the results varied. Three of the four students did not manifest any planning behavior after treatment. Student #4 had not exhibited any planning behavior before treatment. In this case the result of the comparison of baseline to return to baseline was no change. The other two students who had not exhibited planning after treatment and exhibited a few (Student #1 had three; Student #2 had one) planning behaviors before treatment. In these two cases, then, the result of the comparison of baseline to return to baseline was weak negative. Only Student #3 demonstrated a positive difference in planning behavior when return to baseline was compared to baseline. The difference was too weak to indicate a transfer effect of treatment.

Conclusion: It appears that the Problem Approach, as it was implemented in this research, provides conditions which enhance students' opportunities to manifest planning behavior. However, it appears that when the instructional conditions of the Problem Approach are removed and the more teacher-centered conditions of baseline are restored, students' opportunities to plan are lessened. On the variable of planning

transfer effects of treatment were not observed for any of the four subjects. It appears, then, that the teacher-centered conditions of baseline, before and after treatment in this study, were not conducive to students' demonstrating independent planning behavior. With the absence of any transfer effect in this category and with the absence of planning behavior post-treatment in three of four cases, it appears that conditions of teacher-centered instruction may mitigate against student planning. Unlike questioning, managing, and evaluating, planning is not a behavior that students frequently see modeled by teachers. Since the treatment period was only six weeks in the lives of students who had experienced schooling for at least five preceding years, it is not known if the Problem Approach would eventually lead to a transfer effect of planning behavior if it were extended or repeated. The overall conclusion is that student-centered instruction, such as that provided by the Problem Approach, is useful for helping students develop planning behavior during student-centered instruction.

Research Hypothesis #4: It was hypothesized that during and after participating in the Problem Approach subjects would manifest more evaluating behavior than they did prior to treatment.

Result: All four subjects exhibited much more evaluating behavior during treatment than they did before and after treatment. In the comparison of baseline-to-return-to-baseline evaluating behavior, the results varied. Students #2 and #3 showed strong positive differences, indicating a transfer effect of treatment on subsequent behavior. Students #1 and #4, however, showed positive but weak differences, not indicating a transfer of evaluating behavior to return to baseline conditions.

Conclusion: It appears that the Problem Approach, as it was implemented in this research, provides conditions which enhance students' opportunities to manifest evaluating behavior. However, it appears that when the instructional conditions of the Problem Approach are removed and the more teacher-centered conditions of baseline are restored, students' opportunities to question are lessened. While some students may demonstrate an immediate transfer effect of the Problem Approach on their evaluating behavior, others do not. Since the post-treatment observation period was only two weeks in length, it is not known if transfer effects on evaluating behavior would vary further over a longer period of time. The overall conclusion is that student-centered instruction, such as that provided by the Problem Approach, is useful for helping students develop evaluating behavior.

Limitations. When evaluating results of this study in the four independent learning behavior categories, several limitations of this investigation become apparent. First, the data collection schedule provided ten weeks of daily observation of subjects, but it also had limitations. A six-week treatment is a brief period in the lives of students who over several years have become conditioned to the ways of teacher-centered schools. Therefore, the demand on a student-centered instructional approach, such as the Problem Approach, to produce strong transfer effects after treatment is heavy indeed. Furthermore, the return to baseline conditions lasted just two weeks. This limitation of time leads to two questions: (1) If the return to baseline conditions had been longer, would evidence of immediate transfer effects diminish

as subjects' memories of treatment experiences faded? (2) If the return to baseline conditions had been longer, would latent, rather than immediate, transfer effects appear?

Next the data collection instrument used in this study has limitations. Because it is sensitive only to the frequency of behaviors, it does not make any qualitative distinctions. In other words, all of the identified independent learning behaviors are equal in weight. Furthermore, the instrument is not sensitive to sustained independent learning behavior. What occurs in practice, then, is that a student engaged in a sustained independent learning behavior, such as viewing a filmstrip, receives less credit for observed independent learning behavior than another student who verbalizes one question or statement after another. The instrument is, as another limitation, far more sensitive to verbalized behaviors than to any other kind of behavior.

A final limitation to be considered when drawing conclusions from the results is that the small number of subjects precludes any examination of treatment interactions with sample traits. For example, finding transfer effects in post-treatment questioning behavior of the low achievement students (Students #1 and #2) does not indicate a treatment interaction with the low achievement trait. Also, finding transfer effects in post-treatment managing behavior of the middle achievement students (Students #3 and #4) does not indicate a treatment interaction with the middle achievement trait.

The limitations identified here are important considerations when conclusions are drawn from the major findings of this investigation. These limitations are considered again in the implications for further research.

### Directionality (Initiates versus Responds) and Social Contexts

The primary objective of this research was to observe independent learning behaviors in four categories. As the secondary objective additional data were analyzed to enhance the independent learning behavior observations. The directionality (initiates versus responds) and the social contexts of independent learning behaviors were observed.

Directionality. Results of data collected on directionality indicate that subjects took more initiative in learning activities during and after treatment than they did before treatment. It is to be concluded from this finding that the Problem Approach provides instructional conditions in which students learn to take more initiative in their learning. They are, therefore, seen as becoming more actively involved in self-questioning, managing, planning, and evaluating activities.

Social Contexts. Results of data collected on social contexts indicate that small group instructional situations, without the participation of the teacher, maximize opportunities for students to demonstrate independent learning behaviors. It appeared that most independent learning behaviors occurred when subjects communicated with one or two other students. The instructional situation which provided the opportunity for most of the dyadic/triadic peer communication observed as independent learning behavior was peer small groups of 4-6 students. Students were not often observed to be exhibiting independent learning behaviors when they were in direct verbal communication with the teacher.

It is to be concluded from these findings that small group instructional situations provide students with opportunities to demonstrate independent learning behaviors. Moreover, students having opportunities to

communicate in pairs and trios of peers may be more likely to demonstrate independent learning behaviors than students who do not. Within small group instructional situations, students' opportunities to communicate in pairs and trios may be enhanced, as they were in this research. A conclusion of this research is that the Problem Approach is a valuable instructional approach because it places students in direct contact with one another, with all students having responsibilities for both group and individual learning.

### Implications

This research was based on the assumption that developing independent learning behavior is critically important in the educational development of young students. Research findings led to conclusions that the Problem Approach facilitated the development of independent learning behaviors by the subjects in this study. The conclusions described in this chapter lead to implications for theory, further research, and practice.

### Implications for Theory

The broadest implication for theory is the relationship this research has with what Dewey saw as the main responsibility of education, the "training of the mind" (1910, p. 28). Generally, an implication for theory from this research is a further examination of how the use of a student-centered instructional approach, such as the Problem Approach, facilitates the training of the mind.

A more specific way to look at the relationship between the Problem Approach and the main responsibility of education, as seen by Dewey, is to examine how participation in the Problem Approach over time can prepare

students with thinking skills for lifelong learning. Dewey expressed the need for education to result in the capacity for further education. Learning theorists need to examine how experience with Problem Approach instruction can support self-directed development, an educational goal expressed by Beeler (1979), Niebuhr, Jr., (1981) and Treffinger (1975).

An even more specific way to look at the relationship between the Problem Approach and the training of the mind is to see how repeated experiences with Problem Approach instruction provide important practice opportunities. Both Gagné (1980) and Bruner (1973) stress the importance of practice for developing thinking and problem solving skills. Learning theorists need to study the relationship between students' Problem Approach experiences and their development of what Gagné calls an "executive" problem solving strategy. Gagné says that people have many cognitive strategies related to specific types of problems. These strategies can be taught directly. The "executive strategy" is the way people select appropriate cognitive strategies to fit specific tasks. Gagné explains that the "executive strategy" is learned through practice in situations which encourage its development. A question for learning theorists, then, is: Do repeated experiences in Problem Approach instruction lead to the development of "executive strategies?"

Another implication for theory is an exploration of this apparent paradox: Participation in cooperative small group learning leads to greater independent learning behavior. While Aaronson (1972) and Deutsch (1949) identify cooperative behavior as interdependent, Bossert (1979), Sharan and Sharan (1976), Slavin (1981), and Thelen (1960; 1981) focus on cooperative group work as promoting self-reliance. This research supports the latter point of view.

A final implication for theory relates to the categories of Questioning, Managing, Planning, and Evaluating studied in this investigation. The implication is for theorists to explore qualitative differences among these categories of independent learning behavior and to expand upon this list.

### Implications for Research

Conclusions from this research lead to several implications for research. Primarily, replication and partial replication studies are suggested. The following list identifies a number of replication studies:

- a. Replication of procedures with the same students to note differences in independent learning behaviors during and after treatment after experiencing a practice effect with the treatment.
- b. Replication of procedures with different students, having (1) the same general traits as the subjects of this research and (2) different traits, such as grade in school, race, achievement level. The purpose of these replications would be to observe similarities with the findings of this study and to discover differences from the findings of this study.
- c. Replication of procedures using observation techniques which would be sensitive to qualitative differences in independent learning behaviors (e.g., sustained self-assigned reading and note-taking compared to asking a single question).
- d. Partial replication of procedures with increased baseline and return to baseline phases to study transfer effects more thoroughly.

Another suggestion for further research is a deeper examination of the social contexts of independent learning behavior during student-centered instruction which uses cooperative small groups. First, a study could

observe various social contexts in three research phases for comparison of treatment behaviors with pre-treatment and post-treatment behaviors and for comparison of pre- and post-treatment behaviors. Social context data in this study was not analyzed according to the three research phases. Second, the study could observe the social contexts of independent learning behaviors in terms of initiated versus responsive behaviors.

A final suggestion for further research is the expansion of the research design to include a large number of subjects. With an enlarged scope three new directions could be taken: (1) Independent learning behaviors of experimental and control groups could be compared. (2) Treatment interactions with sample traits (e.g., sex, academic achievement level, socio-economic status, age, race) could be studied. (3) Achievement effects of experimental and control groups could be compared.

### Implications for Practice

Classroom Instruction. With the extensive demonstration of independent learning behaviors during treatment, the major implication for practice is for classroom use of the Problem Approach. Wide individual variations within results in the expected direction indicate that the treatment is sensitive to individual differences. Other implications for practice follow.

Even when the Problem Approach is not being used in its entirety, teachers can provide opportunities for students to practice some of the behaviors they develop during Problem Approach experiences. Teachers can facilitate self-questioning, managing of people and information, planning of activities, and evaluating of processes and products by students.

An implication for teachers is to recognize that they are important models of learning behavior. They model questioning, managing and evaluating on an almost daily basis, but perhaps they do not model planning behaviors as often. Perhaps the reason subjects in this study did not demonstrate planning behaviors during the return to baseline as a transfer effect of treatment is that they had not observed planning of learning activities sufficiently. Students require opportunities to observe and to participate in planning if they are to become more involved in learning activities.

To assist students further in learning how to keep records and take notes, teachers can provide record-keeping forms for both Problem Approach meetings, as they were provided here (Appendices E, F, G), and other kinds of student meetings. It appeared in this research that using record-keeping forms during Problem Approach small group meetings facilitated planning and evaluating of learning activities.

To assist students further in learning leadership behaviors, teachers can provide opportunities for students to serve as chairpersons and recorders of class meetings and/or discussions. To improve students understanding of the responsibilities of these roles, teachers will often need to provide instruction in leadership behaviors. The teacher of this class used role-playing and class discussion to improve students' understanding of leadership.

An implication for heterogeneously organized classrooms is for teachers to recognize the value of mixing students according to their differences, not always according to their similarities, for some of their learning activities. The teacher and the researcher observed in

this study that mixed groupings seemed to help students develop self-confidence and leadership.

Students in this research verbalized plans for contacting numerous out-of-school resources. They succeeded in using several out-of-school resources, including a guest speaker who demonstrated the making of arrowheads. They failed, however, to consult as many resources as they had identified, and they failed to travel beyond the school building as a whole class, as they had considered doing. The implication for practice here is that teachers need to use direct and leading questioning to help students remain aware of their suggestions, particularly their suggestions for non-traditional learning experiences. The effective student-centered teacher helps students realize the worth of their own planning.

The teacher in this research stated in her interview that she had been frustrated by groups' "lack of polish," or planning, for their final presentations. When the researcher questioned the teacher about how she could have improved the situation, the teacher said she could have met with each group when they planned their presentations and asked, "What are you planning to do? How are you planning to do it? Can you think of a way you could make it better, more interesting?" The teacher had felt unsure of her role when students planned their group presentations, so she did not assist groups as much as she desired. These questions, articulated by the teacher at the conclusion of the study, are excellent examples of direct and leading questions teachers can use to facilitate students' planning.

Another implication for practice deduced from the classroom observations is that teachers should be aware of the benefit of interdisciplinary

learning activities, particularly for reluctant learners. For a number of students in this research, including all four subjects, opportunities to pursue tasks of choice, particularly in the area of art, led to pursuing tasks by choice which were more often avoided, such as reading and writing.

From the findings about the increased amount of initiative students displayed during and after the Problem Approach, an implication for practice may be drawn. Teachers should use student-centered instructional techniques, such as the Problem Approach, to help students learn to take more initiative in their learning activities.

A final implication for classroom teaching regards the social contexts of instructional situations. Based on findings of this study, helping students have contact with one another during learning activities appears to maximize independent learning behavior. Teachers should plan to use instructional situations which bring students together for instructional purposes.

Professional Development. For classroom teachers to nurture independent learning behavior, they must have appropriate professional development experiences. Two objectives of their professional development are critical: (1) They must be aware of and accept the value to students of developing independent learning behavior. (2) They must learn how to use appropriate instructional methods, such as the Problem Approach. Their training must prepare them for experiencing a movement from teacher-centered to student-centered instruction. Role shifts are often fraught with frustration and anxiety. Since both teachers and students experience

role shifts when students take over more responsibility for their learning, teachers need to be supported during periods of frustration. Teachers need to support their students when they are frustrated. Both trained teachers and students feel personal satisfaction when students become more independent.

### Summary

Implications of the findings for theory, research, and practice have been presented. These implications result from conclusions from research findings regarding independent learning behaviors demonstrated by subjects who had participated in a student-centered treatment known as the Problem Approach.

## APPENDIX A

### Applying the Problem Approach

#### HOW

#### APPLYING THE PROBLEM APPROACH

Bruce W. Brigham

#### ACTIVITIES

1. Ask students what they would most like to learn about  
-record responses on chalkboard in student language (use silence and an expectant attitude to stimulate responses; try for at least one idea from each student)
2. Ask students which ideas seem to go together, which ones include others, which are different from the rest  
-record gradual organization processes of group, developing sets of general topics and individual questions.
3. Ask students what they wish to learn about first, second, etc., and their reason. Votes are taken on their preferences and priorities.
4. Draw from students additional questions they may have about their first choice topic, thereby breaking the main topic into several sub-topics.
5. The master plan is copied from the board, typed and run off. It becomes the material for reading the next day: "Is this just what you decided to do? Is this the best way to do it? Are there ways in which you may wish to change it? How might these ideas be stated more clearly?"
6. The teacher assigns a student committee of either 3 or (preferably) 5 to each sub-topic.

#### PURPOSES AND PROCESSES

- \*1. Explicit use of student interests  
-students practice purpose-setting behavior.  
-students are given responsibility for direction and nature of the content of their learnings;  
-teacher acts as resource person.
- \*2. Students practice categorizing/classifying skills in relation to topical similarities and differences.
- \*3. Decision-making skills, including making judgements, plus explicating justifications and criteria, are being practiced.
- \*4. Students practice analyzing a problem and organizing its components.
- \*5. Students are given practice in evaluating their own organization of their own ideas in their own language. Again, students are asked to responsibly apply their own knowledge without dependence upon the teacher.
- \*6. Committee memberships are made as deliberately heterogeneous as possible to give peer leadership a chance to operate, to break up cliques, and to take advantage of differences in talents, backgrounds and interests in working through and completing a task.

\*In all of these steps, students are being asked to use and apply a wide range of thinking-language skills in an oral situation. They are required to be active, responsible participants in the instructional situations. Implicitly the instructor is indicating belief in the worth of each student in this manner.

7. Each committee elects a chairperson and a recorder, and perhaps a spokesperson for liaison with the rest of the class and the instructor. These positions may be rotated.

8. Chairpersons lead committees to develop Resource Plans. Questions are arranged in logical sequence. New questions are elicited and placed in sequence. Committees develop lists of resources to consult. Assignment of questions: Everyone will work on one or more questions different from others in the group, and each may be responsible for at least one common question.

9. Each committee has its own planning-record folder, with copies of each item for each member. At the beginning of each meeting, work is reviewed by going over the notes of the preceding meeting. These notes have been taken by the recorders, typed exactly as they were written and duplicated by the teacher. Included are the purposes of the meeting, accomplishments, evaluation and remaining questions.

As these steps occur, they demonstrate to students the interdependence of purpose and planning, oral and written language communication, thinking, doing, and evaluation. All planning steps are recorded, as are all activity steps. Gradually, planning and implementation are integrated toward student-meaningful outcomes.

At each stage, thinking-language-organizational skills are developed as (and only as) students evidence a specific need for them. Skills are not developed at the instructor's convenience, but only as obvious student readiness occurs.

10. Resource lists are expanded and resources tapped. Often this will require the development of skills in letter writing, telephoning techniques, interview methods and field trip planning.

11. Each committee decides upon what of its data it will use in what form. Eventually a format must be decided upon for presentation of findings to the rest of the class. The latter may be in the form of one or more of: a "t.v. news report" or other video tape production, a model or construction project, a role-playing skit, a slide-and-audio tape project, etc. The presentations are given.

7. Students practice exercising responsibility in small group organization. Varying their positions allows them to experience diverse social/language roles.

8. It is assumed that some resource information will be available from the student's experiences; this tactic implicitly conveys the expectancy that students have some usable skills and knowledge. Specific practice in planning, decision-making and responsibility-taking is extended.

9. This maintains a record of the organizational structure being used, for use by students and teacher. The minutes are for both review and oral language reading practice. The natural integration of thought, listening, speaking, reading and writing processes is further reinforced.

10. Skills are developed in the service of student problem solving needs.

11. Use of as many interests and skills of the students as possible is encouraged.

12. The whole group evaluates each presentation after it is given, using these questions:

- (1) What have we learned?
- (2) Was it worth learning? Why?
- (3) How might we use it?
- (4) What additional questions do we have?
- (5) What was the best thing about the way the ideas were presented?

12. Critical thinking is further developed. Focus remains on content, skills, and self-responsibility. A questioning attitude is reinforced at the end of the Problem Approach, just as it was aroused in the beginning.

# APPENDIX B

## Behavior Observation Checklist

Observer: \_\_\_\_\_

## BEHAVIOR OBSERVATION CHECKLIST

Description  
of Activity: \_\_\_\_\_

Date: \_\_\_\_\_

Phase (circle one): A B A  
Time (circle one): 9:35 9:55

Explanations: \_\_\_\_\_

Initiates	Responds
-----------	----------

Circle the letter of predominant situation:  
 a = individual d = intermediate (7-15)  
 b = dyad/triad e = whole class  
 c = small group (4-6) f = subject with teacher

During this period, the student voluntarily:		names: S <sub>1</sub> :	S <sub>2</sub> :
<u>Questioning:</u>	1. Verbalizes possibilities beyond the immediate discussion ("Is it possible that...?" Could we say that...?")	I R	I R
	2. Asks "how," "why," "what does it mean" questions.	I R	I R
	3. Asks about alternative solutions to problem situations.	I R	I R
<u>Managing (present tense):</u>	4. Verbalizes decisions when given a choice of events ("I choose the....," "I have decided to...").	I R	I R
	5. Keeps written records of work related to class activities and assignments (lists, charts, notes.)	I R	I R
	6. Facilitates group discussion (clarifies and/or summarizes, attends to order of group processes, elaborates upon or extends group discussion).	I R	I R
<u>Planning (future tense):</u>	7. Proposes short and/or long term goals for completing tasks ("This is what I want to accomplish today," "This is what I intend to accomplish in two weeks.")	I R	I R
	8. Proposes strategies for collecting research data from a variety of sources ("I plan to call, interview, preview, visit, read, etc.")	I R	I R
	9. Proposes strategies for class presentations which exclude and/or go beyond the usual reading/report mode.	I R	I R
<u>Evaluating (past tense):</u>	10. Points out misleading, biased or inaccurate reporting of facts.	I R	I R
	11. Verbalizes opinions and points-of-view based upon justifiable evidence.	I R	I R
	12. Verbalizes judgement of own and/or peers' work ("Your project was outstanding because...").	I R	I R

# APPENDIX C

## Parental Permission Letter

September 26, 1983

Dear Parent/Guardian:

I am a \_\_\_\_\_ Elementary School parent. For the past two years I have been a Mother-Volunteer in the primary grades. This fall, with the permission of the Board of Education and \_\_\_\_\_ I will be conducting research in Mrs. \_\_\_\_\_ sixth grade language arts class.

The research is for my doctoral dissertation in education at the University of Maryland. The experiment is an observation study. The data to be analyzed will derive from classroom observations. The research will last approximately ten weeks.

I should like your youngster to participate in the study and am herewith requesting permission from you for your son/daughter to participate. With your permission, I will have access to your son/daughter's fifth grade California Achievement Test score. Participants in the study will not be identified, nor will the school, and all results will remain anonymous.

Please complete the form at the bottom of this letter and return it to me in care of Mrs. \_\_\_\_\_ by September 30. To discuss questions you may have about the research, you may reach me at my home phone \_\_\_\_\_.

Sincerely,

*Virginia H. Pilato*

Virginia H. Pilato

APPROVED:

Principal

\*\*\*\*\*  
(Place a check in one of the boxes, sign your name, and date your signature.)

My son/daughter \_\_\_\_\_

☐

may

participate

☐

may not

in Ms. Pilato's research.

☐

Yes

☐

No

I would like a copy of the dissertation abstract.

Signature, Parent/Guardian

date

## APPENDIX D

Raw Frequency Counts of Observed Independent Learning Behavior

Baseline			Treatment		Return to Baseline	
Initiates	Responds		Initiates	Responds	Initiates	Responds
<u>Student #1</u>						
Q	3		30	24	14	3
M	1	3	49	47	5	5
P	2	7	24	7	0	0
E	0	1	20	27	5	0
		3				
<u>Student #2</u>						
Q	0		57	10	9	0
M	1	1	42	28	6	9
P	1	10	15	1	0	0
E	0	0	26	17	12	4
		1				
<u>Student #3</u>						
Q	3		44	33	9	2
M	1	4	61	84	8	11
P	0	6	35	17	2	2
E	1	0	31	44	6	3
		1				
<u>Student #4</u>						
Q	4		38	14	5	0
M	0	0	49	50	5	10
P	0	4	11	7	0	0
E	0	0	28	12	6	0
		2				

Q = Questioning

M = Managing

P = Planning

E = Evaluating

## APPENDIX E

## Committee Planning: How to Analyze Our Subtopic

Topic: \_\_\_\_\_

Subtopic for our group: \_\_\_\_\_

Question:

Where to get answer:

[illegible]

## APPENDIX F

Individual Sign-up Sheet

Topic: \_\_\_\_\_ Date: \_\_\_\_\_

Recorder's Name: \_\_\_\_\_

Subtopic group is responsible for: \_\_\_\_\_

Question	Source: (Tell <u>where</u> you will look and <u>when</u> you will do it.)	Date for Reporting to Group	Member's Name	Initial When Completed
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1.	where: when:			
2.	where: when:			
3.	where: when:			
4.	where: when:			
5.	where: when:			
6.	where: when:			
7.	where: when:			

## APPENDIX G

Committee Work

(filled in by recorder)

Date: \_\_\_\_\_ Our Subtopic: \_\_\_\_\_

Members present: Chairperson: \_\_\_\_\_

Recorder: \_\_\_\_\_

I. Meeting Checklist:check when  
completed:Activity:

- \_\_\_\_\_ 1. Review last meeting (using Part II of work sheet from last meeting)
- \_\_\_\_\_ 2. Plan today's meeting
- \_\_\_\_\_ 3. Follow today's plan
- \_\_\_\_\_ 4. Evaluate today's meeting (What worked? What didn't work so well?)
- \_\_\_\_\_ 5. Plan our next meeting

II. Minutes:

Today we plan to: \_\_\_\_\_.

Here is what we have accomplished today:

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In our next meeting we plan to: \_\_\_\_\_.

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