ABSTRACT

Title of Document:	THE DEVELOPMENT OF CRITICAL THINKING SKILLS AND DISPOSITIONS IN FIRST-YEAR COLLEGE STUDENTS: INFUSING CRITICAL THINKING INSTRUCTION INTO A FIRST-YEAR TRANSITIONS COURSE
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This study examines whether infusing explicit critical thinking instruction into a first-year transitions course can accelerate the critical thinking development of first-year college students. The focus of this study was critical thinking pedagogy and the impact of this instruction on a class of students. Employing action research, the instructor-researcher developed a quasi-experimental design with a control and an experimental section of the same course. The control class followed the standard content and format of a transitions course; the experimental class covered the same content as the control section using critical thinking activities aimed at developing both skills and dispositions. In addition to examining differences between the two sections, the effect of the experimental pedagogy was also examined across gender.

Students in both sections were administered the California Critical Thinking Skills Test (CCTST) as well as the California Critical Thinking Dispositions Inventory (CCTDI) in a pre-test posttest design during the second and final class meetings. Independent samples and paired samples t-tests were used to compare total scores as well

as subscale scores for each instrument (five for the CCTST, seven for the CCTDI). Due to the small sample size (n=39) most of the results are not statistically significant, and therefore not generalizable to larger populations. Gender comparisons were also conducted using t-tests as well as ANOVA to test for interaction between gender and the "treatment," participation in the experimental section.

The most meaningful analyses were those comparing difference scores – increase or decrease in score – from pre-test to post-test. On the CCTST, the total difference score for the experimental group was significantly higher than that of the control group. The findings for the CCTDI were inconclusive. These findings are consistent with the literature on the impact of critical thinking instruction. For the gender comparisons, females and males in the experimental group outperformed their peers in the control group, particularly on the CCTST. On the CCTST, there was some indication that females in the experimental group might have benefited from the "treatment" more than the males; this did not hold for the CCTDI.

THE DEVELOPMENT OF CRITICAL THINKING SKILLS AND DISPOSITIONS IN
FIRST-YEAR COLLEGE STUDENTS: INFUSING CRITICAL THINKING
INSTRUCTION INTO A FIRST-YEAR TRANSITIONS COURSE

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Chapter I: Introduction

Critical Thinking and Higher Education

Since their beginnings, colleges and universities have sought to develop in their students thinking abilities that would be applicable in their lives as students and far beyond. Nationwide institutions large and small, private and public are committing to the development of responsible learners, capable of independent and cooperative knowledge construction, both inside and outside the classroom. Since the early 1980s there has been a lasting surge in placing continued emphasis on critical thinking instruction. Fostering "students' ability to think critically, to reason, and to use judgment in decision making" (McMillan, 1987, p. 3) has become a primary goal of a college education. The ability to think critically enables students to successfully adapt to an ever-changing world. According to Wright (1992), there is so much interest in postsecondary education on developing students' abilities to think critically that it can be called a "critical thinking movement." (p.37). Due to the importance placed on critical thinking, and research showing that students often do not develop the skills and attitudes associated with critical thinking on their own, colleges and universities have begun to deliberately teach critical thinking throughout various level of the curriculum (Weiten, 2004). Institutions are creating courses, as well as entire programs around critical thinking development and faculty members within the disciplines are giving critical thinking more attention in the classroom. In addition, conferences focusing on specific aspects of critical thinking development are on the rise (Wright, 1992).

The assessment of students' ability to apply the thinking skills that they learn in college to their everyday lives, is important for both institutions and public policy as higher education is increasingly accountable for student outcomes. The use of actuarial data (objective measures such as graduation rates, faculty/student ratios, levels of endowment), participation in college rating systems (such as that published by *U.S. News and World Report*), and the administration of large-scale student self-assessment surveys are a few ways that institutions can assess the college learning experience, in terms of institutional quality. However, these forms of assessment cannot capture the college learning experience, in terms of institutional effectiveness. For this, more in-depth research, in the form of direct assessment - such as analyzing course grades, administering standardized tests, and/or assessing general or subject-specific academic skills by way of testing, projects, or portfolios – is necessary (Chun, 2002).

For decades researchers in higher education have been attempting to assess the academic outcomes of college students, particularly in the area of critical thinking. The research shows that critical thinking skills increase as a result of attending postsecondary education, beyond the effects of natural maturation (Pascarella, 1999; Pascarella & Terenzini, 1991; Terenzini, Springer, Pascarella, & Nora, 1995). Perhaps the greater issues in assessment of critical thinking are establishing a concrete definition of what is being assessed (Chaffee, 1999; Ennis, 1985; Facione, 1990; Facione, Sanchez, & Facione, 1993; Jones, Hoffman, Moore, Ratcliff, Tibbetts, & Click, 1995; Paul, 1992), and determining the best instrument to use for assessment (Daly, 1995; Ennis, 1993; Erwin & Sebrell, 2003).

In addition to critical thinking skill development, and the assessment thereof, educators and researchers are also interested in critical thinking dispositions (Facione, 1990; Giancarlo & Facione, 2001; Halpern, 1996; Norris, 2003; Paul, 1990,1992) – the necessary attitudes that enable the thinker to apply particular skills when a situation calls for their use. The connection between critical thinking skills and critical thinking dispositions can be traced back to the Greeks, whose emphasis on habits of the mind held parallel importance with physical, moral, and social habits (Facione, 1997). The idea that the intellectual character of students - their willingness and intention to think and learn - must be nurtured simultaneously as they are taught skills and information, is an idea whose importance should not to be underestimated.

Dewey (1910/1997) addressed this issue in an analogy to a "fork in the road," a situation presenting a dilemma with multiple alternatives. Here, the critical thinker must be willing to "climb a tree" in order to "get a more commanding view of the situation" (p.11). By collecting additional facts and seeing how they fit together, the thinker can decide which road to pursue. Dewey refers to a process of "reflective thinking," a willingness to be uncertain, to suspend judgment. He acknowledges that this is, at times, quite uncomfortable, but rather necessary for critical inquiry. Dewey recognizes that other traits, such as carefulness, thoroughness, and continuity, are also necessary in order to evaluate evidence and make judgments, and he argues that these must be cultivated early in the learning process. Information and knowledge alone are not enough; for an individual to be considered "intellectually educated," (p. 28) these must be accompanied by a necessary training of the mind (Dewey, 1997).

Overview

In the present study, two groups of the same first-year transitions course, *Introduction to the University*, were taught at the same institution, at the same time of day (on two different days), by the same instructor. The content of the course focused on aiding students' transitions to college life – academically and socially. The topic areas covered included, but were not limited to: time management, general education requirements, academic policy, responsible decision-making, campus resources, and diversity. The experimental and control groups covered the same topic areas; the variation was in the pedagogy. The control group was taught in the manner in which this course is traditionally taught: relatively informal with emphasis on discussion. Students were provided with a text, *Your College Experience: Strategies for Success* (Gardner & Jewler, 2004). With a great deal of peer-to-peer and instructor-peer interaction, the activities emphasized the topic area being covered. The experimental group was infused with explicit critical thinking activities aimed at developing both skills and dispositions. Peer-to-peer interaction, as well as instructor-peer interaction, was aimed at both the topic area and the thinking abilities being emphasized within the context of the activity. Students in this group worked with a textbook, *The Thinker's Guide to College Success* (Chaffee, 1999).

The California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI) were both administered by the instructor/researcher in a pre-test post-test design. Descriptive statistics and t-tests are used to examine that data that results from these instruments. In addition, a student questionnaire was administered instructor/researcher on the day of the post-tests, in order

to collect data on students' self-assessed growth as a consequence of taking the course. The questionnaire was coded and then analyzed for themes that emerged among the control and experimental groups. This qualitative analysis was used as an additional lens with the quantitative results.

Given that there exist several types of measures created to assess the thinking of college students, it is necessary to put forward a rationale for selecting the CCTST and the CCTDI. The CCTST is a 34-item multiple-choice test that evaluates the skills of analysis, interpretation, inference, and evaluation through the use of diagrammatic and text-based contexts. Six scores are obtained from the CCTST: an overall score, along with five sub-scales (analysis, evaluation, inference, deductive reasoning, and inductive reasoning). Multiple-choice tests, as oppose to open-ended questions or essay tests are easier and less costly to administer and score. In addition, multiple-choice tests allow a greater range of material to be covered, relative to other formats. The CCTDI is a forced choice Likert-scale instrument that prompts students to reflect on their level of agreement with statements presented. Like the CCTST, the CCTDI results in an overall score as well as a group of sub-scale scores (in this case, there are seven: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity), as measures of internal motivation.

Again, even within the smaller context of multiple-choice instruments, there are many options in selecting one to fit a given study. The CCTST and the CCTDI were selected for this study because the primary author of both instruments, Peter Facione, also worked with the American Philosophical Association, on a Delphi study (Facione, 1990) to define the terms "critical thinking skills" and "critical thinking dispositions," as they

will be employed throughout this study. These terms are elaborated upon in Chapter 2, the Review of the Literature.

As an example of CCTST and CCTDI research application, Rimiene (2002) used the instruments together in an experimental study to evaluate how students' skills and dispositions change under the influence of a critical thinking program. As in this dissertation, Rimiene purposefully choose methods of learning to use with the students in the experimental group, paying attention to the processes of thinking, not just the outcomes. Rimiene used paired samples t-tests to compare students' pre-program and post-program scores. For the experimental group, statistically significant increases (α = .05) were revealed on the means of each of the five CCTST subscales as well as on the overall score. The means of each of the seven CCTDI subscales increased (α = .05), five – as well as the overall score – with statistical significance. For the control group (students that did not participate in the critical thinking program) no statistically significant differences were found between pre-test and post-test scores. Rimiene used the Student's T-test to compare the post-tests of the control and experimental groups. Statistically significant score increases were found on all subscales of the CCTST as well as on the overall score. With regard to the CCTDI, statistically significant score increases were found on four of the seven subscales as well as the overall score. Rimiene's study provides support for use of the CCTST and CCTDI in this dissertation. Using instruments used by others in similar studies enables construction of further knowledge about whether and how critical thinking development is influenced by critical thinking instruction.

For the current study, analyses were also conducted in two qualitative forms. Throughout the semester the instructor/researcher maintained a teaching log, reflecting the class activities and follow-through for each group. When the semester of teaching ended, the teaching log provided a retrospective picture of which instructional techniques, critical thinking skills, and critical thinking dispositions students were learning effectively. This log was coded for themes to compare the two groups. In addition, as mentioned above, students completed a questionnaire, with several open-ended questions, focusing on their experiences with the course and self-assessment of their potential growth in critical thinking as a consequence of taking UNIV101. Student responses were coded and used as an additional means of comparison between the groups.

Just as a number of valid, reliable critical thinking tests are available, a myriad of critical thinking textbooks are available as well. The Chaffee text was selected for a number of reasons. One reason is that is brings together critical thinking and first-year transitions courses in a way that is manageable for a 2-credit hour, semester-long course. In addition, Chaffee was instrumental in the creation of a well-known critical thinking program at LaGuardia Community College. The program includes both a keystone critical thinking course as well as infusion of critical thinking skills development throughout the curriculum. This philosophy of not choosing either a course or infusion but rather, incorporating both into a curriculum, coincides with the philosophy of the researcher for this study. Both Chaffee and the stated purposes of this research acknowledge that one course in critical thinking will have a limited effect on student development if there is no follow through in other coursework. However, if taught

effectively, a critical thinking course can accelerate the development of students' abilities (Chaffee, 1992).

Research Questions

1) Do students who participate in a transitions course infused with critical thinking instruction score higher on tests of critical thinking skills and dispositions than students that participate in a transitions course without critical thinking instruction?

2) Does the relationship between participation in a first-year transitions course infused with explicit critical thinking and scores on tests of critical thinking skills and dispositions vary between men and women?

3) Do students attribute self-growth in the areas of critical thinking skills and critical thinking dispositions to taking a first-year transitions course? Are these changes different for students in the group infused with critical thinking instruction than they are for students in the group without critical thinking instruction?

Framework

Critical thinking is a complex concept in terms of its definition, place in the curriculum, and measurement. The literature review for this study, Chapter 2, places critical thinking into the appropriate context for the purposes of this study. The chapter begins by noting the multiple definitions of critical thinking provided by various experts (Brookfield, 1987; Chaffee, 2002; Ennis, 1985; Facione, 1990; Paul, 1990). The definition employed for this study is one that was developed though an intensive

qualitative study, the Delphi Project, initiated in 1990 by the American Philosophical Association (APA). The APA defined critical thinking to be "purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference…" (Facione, 1990, p. 3). This definition focuses primarily on critical thinking skills. However, many experts agree that there is more to critical thinking than skill; there is a necessary attitude, dispositions, that reflect the decision to apply critical thinking abilities in various situations (Facione, 1990; Facione, Facione, & Giancarlo, 1996; Giancarlo & Facione, 2001; Halpern, 1996; Norris, 2003; Paul, 1990,1992; Case, 2004). The APA Delphi Study also provides the definition of critical thinking dispositions that is employed for this study. A set of characteristics is set forth defining the "ideal critical thinker" that includes, but is not limited to being "habitually inquisitive, well-informed, trustful of reason, open-minded, flexible…" (Facione, 1990, p. 3). Facione (1990) authored both the definitions published by the APA as well as the CCTST and CCTDI thereby ensuring that the test is measuring what is intended to measure (content validity). Further, the selected definitions and corresponding instruments are consistent with the purposes of this research study.

Having established the appropriate definitions for critical thinking abilities and dispositions, clarification is provided regarding what makes critical thinking different from two other familiar concepts: logic and problem-solving. With regard to the former, the areas within the domain of informal logic, particularly language and fallacies, are explained (Bluedorn & Bluedorn, 2003; Case, 2004). With regard to the latter, the specificity of problem-solving, and the emphasis on finding a particular solution (Woods,

1987; Bell, 2003) are contrasted with the more creative nature of critical thinking (Dougherty & Fantaske, 1996).

Next, the impact of the college environment on critical thinking development is reviewed in both broad and specific terms. The extent to which critical thinking is a result of maturation or can be attributed to college attendance is examined (Facione, 1990, 1997; Hagedorn, Pacarella, Edison, Braxton, Nora, & Terenzini, 1999; Pascarella & Terenzini, 1991; Pascarella, 1989). Given that critical thinking is part of cognitive development, the influence of the classroom experience – the role of the instructor, peers, activities – are of primary importance (Facione, 1990b). The interaction between the instructor and the students is crucial in the process of developing both the abilities and the dispositions associated with critical thinking (Brookfield, 1987; Browne & Freeman, 2000; Clark & Biddle, 1993; Crow, 1989; Paul, 1990). Specific suggestions are made to clarify the types of activities and interactions that help students and instructors to achieve the desired outcomes (Astin, 1993; Brookfield, 1987; Clark & Biddle, 1993; Paul, 1990; Tsui, 2001). Other academic factors are also considered such as GPA, time spent studying, and various types of courses (Astin, 1993; Pascarella & Terenzini, 2003). Finally, factors beyond intellectual development are considered, and the college experience, as a whole, is shown to impact the development of critical thinking (Inman & Pascarella, 1998; Pascarella, 1989; Pacarella & Terenzini, 2003; Terenzini, Springer, Pascarella, & Nora, 1995).

The critical thinking development that takes place within a classroom, or even outside the classroom, between instructors and students or among peers, is the micro-level of the potential college influence in this area of development. On the macro-level is

the institutional decision of how critical thinking will be taught. From one perspective, critical thinking can and should be taught as a separate course, as both content and process (Chaffee, 1993; Costa, 2003; Facione, 1986; Fitzegerald, 2001; Jones, 1996; Halpern, 1998; Reed & Kromrey, 2001). Alternatively, others argue that critical thinking should be taught within the context of discipline-specific courses. This line of reasoning is backed by the beliefs that thinking must always be about something and that the way to think through and analyze problems and decisions is highly context-based (Brookfield, 2003; Case, 2004; Cromwell, 1992; Litecky, 1992; Weinstein, 2003). Critical thinking dispositions are also part of this debate (Angeli, 1999; Cromwell, 1992; Giancarlo & Facione, 2001). Many scholars assert that institutions should not necessarily choose to either connect critical thinking to the disciplines or keep it as a separate course; they argue that doing both would likely be most effective (Case, 2004; Chaffee, 1992; Cromwell, 1992; Ennis, 1989; Halpern, 1998, 1999; Paul, 1990).

As mentioned previously, critical thinking is part of cognitive development. Therefore, it is important to understand where it fits in this scheme, especially with regard to college freshmen (since they will be the participants in this study). To this end, Bloom's (1956) Taxonomy is reviewed (Case, 2004; Eljamal, Stark, Arnold, & Sharp, 1997; Huitt, 1998), as is Perry's (1981) Scheme of Intellectual Development (Warhurst, 2001; Evans, Forney, & Guido-DiBrito, 1998). In addition, differences in the development and use of thinking skills according to gender (Alston, 1995; Baxter-Magolda, 1993; Belenky, Clinchy, Goldberg, & Tarule, 1986; Case, 2004; Clinchy, 1996; Erickson & Strommer, 1991; Giancarlo & Facione, 2001; Mansfield & Clinchy, 1992; Rudd, Baker, & Hoover, 2000; Wheary & Ennis, 1995), race (Gadzella, Masten, &

Huang, 1999; Fleming, 1984; Flowers & Pascarella, 1999; Flowers, 2002; McEwen, Roper, Bryant, & Langa, 1990), cultural bias (Case, 2004; Cogan & Derricott, 1998) and exposure to diversity (Bennett, 1984; Kakai, 2000; Pascarella, Palmer, Moye, & Pierson, 2001) are considered.

Finally, the literature review focuses on the use of First-Year Transitions courses to aid in the academic and social transitions to college. The history of these courses is reviewed (Gahagan, 2002; Tinto, 1993, National Resource Center, 2002, Gordon, 1989) as well as their current status on college campuses (Barefoot & Fidler, 1996; Skipper, 2002, National Resource Center, 2003), and student outcomes associated with participation in such programs (Dooris, 2001; Fidler & Hunter, 1989; Henscheid, 1999; Hunter, Skipper, & Linder, 2003; Pascarella, 2001).

In Chapter 3, the various methodologies that are employed for this study are explained in greater detail. Following a brief introduction, the chapter begins with a description of the first-year program at the University of Maryland, since it is from this program that the two groups of UNIV students used in this study are drawn. The goals of the program are described and examined relative to other similar programs across the country (Skipper, 2002; Reynold & Nunn, 1998). Next, the idea of infusing critical thinking instruction into a first-year program is discussed (Chaffee, 1999). Prior to the discussion of the instruments and analyses that will be employed, the dual role of the researcher also being the instructor of the two course groups being used in this study is explored. Action research, teacher research, and practitioner research are all ways in which to refer to this type dual role (Angelo & Cross, 1993; Hopkins, 2002; Jacobson, 1998; McLean, 1995; McMillan & Schumacher, 1997; van den Berg, 2001; Walker,

2001; Zeni, 2001). The history of this type of research (Hopkins, 2002; McClean, 1995; Walker, 2001), as well as its applicability for this particular study is examined (Facione, 1986; Walker, 2001). Action research is considered as a means to connect theory and research and to gain additional perspective on the classroom (Angelo & Cross, 1993; Brew & Boud, 1995; Jenkins, Breen, & Lindsey, 2003). Finally, the various forms of analysis that are part of this research (Zeni, 2001) and the ethical considerations that are implicit with a dual role of instructor and researcher (Hammack, 1997; Hopkins, 2002; Jacobson, 1998; Zeni, 2001) are reviewed.

The sample population, the distinctions between the control and experimental groups, the procedure employed, and the treatment are described respectively. Regarding the latter, examples are provided of class sessions wherein the pedagogy was clearly different for the control and experimental groups. The analyses conducted with the data are described in greater detail (t-tests and descriptive analyses) and placed in the context of the initial validation studies performed on the instruments. Both standardized z-scores and actual scores are used in the analyses to provide a more complete picture.

The selection of the critical thinking instruments used in this study is described briefly before focusing more specifically on those that were selected - the CCTST and the CCTDI. Each instrument is described in further detail in terms of the time needed for completion, validity and reliability, the meaning of the subscales, the way in which each instrument is scored. The student questionnaire and the teaching log are also described in further detail.

The results of this study are presented in Chapter 4. The chapter begins with the results of the student questionnaire to provide more information about the sample of

students employed in this study. The first research question, comparing the experimental group (infused with explicit critical thinking instruction) and the control group (without critical thinking instruction) is answered based on the results of the California Critical Thinking Skills Test and the California Critical Thinking Dispositions Inventory. T-tests, both between group and within group, as well as graphic depictions, show the changes that occur between the pre-tests and post-tests of the two instruments. The second research question, comparing males to females, is answered in the same way, again using t-tests and graphic depictions, to examine pre-test to post-test changes. The final research question, focusing on students' self-assessments, is answered based on the results of a student questionnaire. In addition, the teaching log, kept by the instructor/researcher during the semester in which the study was conducted, is analyzed in terms of themes and, where appropriate, in relation to the responses from the student questionnaire.

The final chapter, Chapter 5, provides a review and synthesis of the study. Conclusions are drawn based on the results of the analyses, presented in Chapter 4, together with the perspective of the researcher/instructor, regarding the process of conducting this study. Finally, ideas for future research are proposed. Critical thinking development is becoming an increasingly recognized goal among institutions of higher education. As such, more research is necessary to better understand the pedagogy that guides this development.

Summary

This study examines whether the infusion of explicit critical thinking instruction into a first-year seminar class impacts critical thinking development as measured by three

critical thinking instruments, as well as student self-reports. The emphasis of this study is on how pedagogy (i.e., the critical thinking instruction) impacts a class of students. By placing critical thinking in the context of a first-year transitions course, this study takes student engagement to a level wherein the instructor fosters the development of both attitudes and skills that will enable students to gain success in college and in life; this is done based on the understanding that *how* students are engaged is at least as important as student engagement alone.

As will be addressed throughout this study, practitioners and researchers in higher education agree that critical thinking should be incorporated in the college curriculum. They do not necessarily agree on how, exactly, it should be defined, or where it fits in, but they agree on its importance. Faculty members support the goal of developing students' critical thinking abilities yet, they are not clear on what those abilities are, the theories they come from, or how they are exemplified in a classroom (Paul, Elder, & Bartell, 1997). In order to reach greater clarity on issues that are, at this point, ambiguous and, in order to substantiate the importance of critical thinking in the college curriculum, there is a need for more research on critical thinking as well as the courses that aim to promote it; this study addresses that need.

Chapter II: Review of the Literature

Introduction

This study focuses on whether the development of critical thinking skills can be fostered by participation in a critical thinking course. The term "critical thinking" appears in mission statements and reports published by colleges and universities nationwide. The purpose of this chapter is to operationalize the term based on review, synthesis, and critique of the literature regarding the critical thinking development of college students, so that the use of the term is clear with regard to this study. In addition to defining the term, the literature on dispositions toward critical thinking, the influence of the college environment on critical thinking development, the differences between discipline-based and free-standing teaching of critical thinking, where critical thinking fits in to cognitive development, differences among student populations, and the use of diversity to bolster critical thinking. In addition, there is a brief review of the literature on first-year transition courses in order to set a context for this study.

Critical Thinking

Defining the concept

Perhaps one of the greatest areas of contention in the research on critical thinking is locating a common definition. Critical thinking can be conceived of as both a skill/method and as a disposition; it can be conceived of as a stage in a student's cognitive development as well as a goal of that student's education.

The theoretic task for critical thinking is to offer a frame that is open-textured

enough to accommodate the various disciplinary particulars, while offering

enough of a unique framework to point the direction in which critical thinking

instruction must look to identify appropriate curriculum content and classroom

methodology. (Weinstein, 2003, p. 281.)

One common theme that emerges throughout the literature on definitions of critical

thinking is an emphasis on the link from theory to practice. More specifically, critical

thinking is defined in terms of particular skills and dispositions that students can acquire

as a result of attending postsecondary education. The literature reveals that the term can

be difficult to conceptualize (Cromwell, 1992; Ennis, 1985; Facione, Sanchez, &

Facione, 1994, Paul, 1990), relying on various notions of both what it means to think

critically as well as various perspectives regarding the impetus for critical thought. While

the definitions of critical thinking are backed by common theoretical perspectives, the

differences lie in the clarity of the connection between these perspectives and their

associated skills and abilities. They also exhibit a wide range in the level of complexity.

Chaffee (2002) clearly and concisely defines critical thinking as an educational

philosophy, a field of academic study, and as a method of epistemological inquiry.

Chaffee argues that critical thinking is an ideal, with its own theoretical framework, used

to "organize experience, construct knowledge, and develop a philosophy of life"

(Chaffee, 2002, p. 4). Almost twenty years prior to this definition, Ennis (1985) defined

critical thinking as "reflective and reasonable thinking that is focused on deciding what to

believe or do" (p. 45). Over a number of years of researching this area, Ennis came to

associate four sets of abilities with critical thinking: those related to making inferences,

establishing a basis for inference, decision-making, and problem solving. These abilities

enable individuals to decide what to believe or do. Brookfield (1987) also identifies four

components of critical thinking: identifying and challenging assumptions, challenging the

importance of context, identifying and exploring alternatives, and reflective skepticism.

Paul (1990) distinguishes between sophistic/weak critical thinking (also referred to as

uncritical thinking, wherein thinking is directly connected with self-interest, and fair-

minded/strong critical thinking, wherein thinking is open to diverse truths and

viewpoints. It is the latter that enables students to become comfortable adjusting their

thinking in various contexts. These similar ideals, of Chaffee, Ennis, Brookfield, and

Paul, bring together the skills and the philosophy associated with critical thinking that is

embraced by this study.

A report on the national assessment of college student learning provides the most

recent, and perhaps the most comprehensive definition of critical thinking (Jones,

Hoffman, Moore, Ratcliff, Tibbetts, & Click, 1995). This definition is the outcome of an

empirical study that used dialogue to form a consensus definition among stakeholder

groups - including college and university faculty members, employers, and policy-makers

representative of all geographic regions in the U.S. - that have various interests with

regard to the development of critical thinking skills as a part of undergraduate education

(Jones, et. al., 1995). The authors of the report identify seven categories within the

construct of critical thinking: Interpretation, Analysis, Evaluation, Inference, Presenting

Arguments, Reflection, and Dispositions. Each category is then defined by a set of skills.

While this level of specificity is beyond the scope of this study, this national assessment

serves as a useful resource for curriculum development, as it is the first formal study to

include employers, policymakers, and faculty in a dialogue regarding how to define as complex a skill set as critical thinking.

Another comprehensive definition was published seven years prior to the above-mentioned national assessment. In 1990, the American Philosophical Association (APA) sponsored a Delphi study composed of a cross-disciplinary panel of teachers and researchers to gain insight on college level education. The APA sought to bring together experts from multiple areas of education in order to achieve consensus regarding expectations and outcomes of college level education. This study was known as the Delphi Project (Facione, Sanchez, & Facione, 1994). The name of the project reflects the methodology implemented for the study. The Delphi method, which originated in the United States in the 1950's and was tested for validity and reliability by Rand in 1968, offers researchers a systematic tool for exploring problems that do not lend themselves to "precise analytical techniques" (Cogan & Derricott, 1998, p. 77). Through the solicitation and synthesis of expert opinion (using pre-determined explicit criteria to define and select the "experts"), and the use of multiple iterations with controlled feedback, collective judgment is formed (Cogan & Derricott, 1998). One outcome of the APA Delphi Project was a broad conceptualization of critical thinking as follows:

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in

one's personal and civic life. While not synonymous with good thinking, CT is a

pervasive and self-rectifying human phenomenon. (Facione, 1990, p. 3.)

It was according to this definition that Facione developed the California Critical Thinking

Skills Test (2000) used in this study.

Critical thinking dispositions

Critical thinking is more than knowledge acquisition and the application of skills.

"Critical thinking is both a systemic inquiry and a mental attitude, a complex set of

abilities and a process of dealing with ideas" (Cromwell, 1992, p. 39). After all, an

individual can have the ability to think critically and not exercise it under certain

circumstances (Norris, 2003). Just as individuals know about staying healthy through

exercising and eating right, they do not always choose to act in this way and/or they have

yet to form a habit of a healthy lifestyle. Similarly, individuals may choose to not

exercise their thinking abilities, or may have not yet acquired the habit to use these

abilities. "No amount of 'skill' will overcome the limitations of closed-minded,

prejudicial thinking" (Case, 2004, p. 4). Intellectual humility, intellectual courage,

intellectual empathy, intellectual good faith/integrity, intellectual perseverance, faith in

reason, and intellectual sense of justice are all traits of mind that educators can cultivate

in their students to foster a disposition toward critical thinking (Facione, Facione, &

Giancarlo, 1996; Paul, 1992; Case, 2004). These habits imply that critical thinking must

be grounded on epistemic and ethical bases; there is more to teaching/learning critical

thinking than improving test scores (Norris, 2003).

Referring once again to the Delphi project, the panel found that there is a necessary attitude, a disposition, toward critical thinking. In other words, critical thinking is more than an outcome or set of thinking abilities, it is a process or a mode of thinking. For this reason a definition of the "ideal critical thinker" was also published:

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in selection of criteria, focused on inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. American Philosophical Association, 1990, p. 3.

Again, this is the definition Facione considered when creating the California Critical Thinking Dispositions Inventory (CCTDI) (1992) used in this study.

According to Giancarlo and Facione (2001), seven dispositions have been directly connected with critical thinking: Truthseeking – a measure of intellectual honesty; Openmindedness – a measure of tolerance for new ideas and viewpoints different from one's own; Analyticity – a measure of awareness to potential problems; Systematicity – a measure of the tendency to be organized, focused, and motivated; Thinking Self-Confidence – a measure of trust in one's own thought processes and the ability to lead others in decision-making; Inquisitiveness – a measure of intellectual curiosity; and Maturity of Judgment – a measure of one's ability to recognize the complexity of problems and make timely decisions, even when the outcome is uncertain. In a four-year

longitudinal, pre-test post-test study of 147 students from a private, Catholic comprehensive university, Giancarlo and Facione (2001) found statistically significant increases in CCTDI overall mean scores as well as in the subcategories of Truthseeking, and Critical Thinking Self-confidence. This study also indicated that a substantial number of students that took part (75%) entered college with positive (scores of 40 or above) or ambivalent (scores of 30 or above) dispositional endorsement toward Inquisitiveness, Openmindedness, and Maturity of Judgement. Given the positive predisposition to critical thinking prior to college, modest, rather than dramatic, shifts occurred indicating that the university does provide a nurturing environment for students whose intellectual curiosity is strong.

Facione, Sánchez, Facione, and Gainen (1995) hypothesized three possible ways that critical thinking skills and dispositions toward critical thinking might interact. First, overall disposition toward critical thinking may nurture a student's decision to attempt the use of critical thinking skills. In turn, successful use of critical thinking skills will then reinforce the student's disposition toward critical thinking. Second, there may be relationships between specific combinations of dispositions toward critical thinking and specific critical thinking skills. Third, there may be a one-to-one connection between each disposition toward critical thinking and each skill associated with critical thinking.

Halpern (1996) also addresses the necessity of having the appropriate attitude in order to become a critical thinker. Halpern describes a "performance-competence distinction" (p. 25) that becomes pronounced when students learn critical thinking skills but do not use them. A strong critical thinker must exhibit the following six characteristics: Willingness to Plan – the habit of thinking through responses before

answering questions; Flexibility – a willingness to be open to new option and suspend

judgment in order to gather pertinent information; Persistence – the motivation to keep

working when answers do not come quickly or easily; Willingness to Self-Correct – the

openness to acknowledge and learn from mistakes; Being Mindful – a habit of

monitoring one's own comprehension and progress; Consensus-Seeking – the ability to

use communication and compromise to achieve agreement with others.

Paul (1990) too recognizes that critical thinking is not limited to skill

development. Strong critical thinking is associated with "traits of mind: intellectual

humility, intellectual courage, intellectual perseverance, intellectual integrity, and

confidence in reason" (p. 33). Paul further argues that the development of these habits

among weak critical thinkers is restricted to their own self-interest. Intellectual discipline

and intellectual values together, according to Paul, constitute "genuine education,"

enabling students to truly transform their thinking.

Each of these authors recognizes that the tendency to think critically is a

combination of both skills and dispositions. In addition, due to the rapid pace of change

in all professional fields and the ever-increasing sources of information, individuals with

internal motivation to think critically as a matter of habit, in addition to their level of skill

in critical thinking, will be better prepared to deal with complex, ill-defined problems.

"Education is learning to know whether and why, not just what, how, and when. As

uncomfortable as this may be for some learners who think that good teaching is telling

exactly what will be on the test, the development of professional, disciplined practice

demands more" (Facione, Facione, & Giancarlo, 1996, p. 75). For this reason, critical

thinking experts include both skills and dispositions in their definitions of critical

thinking; advocating an understanding of why critical thinking is important, why acquiring a set of beliefs/values and a set of skills will be useful as they continue the pursuit of knowledge both in college and beyond (Facione, Facione, & Giancarlo, 1996; Norris, 2003).

The difficulty that faculty have with understanding these concepts is apparent in a study by Paul, Elder, and Bartell (1997), in which they found that while half of the faculty interviewed could identify what was a critical thinking skill and what was a critical thinking disposition, only 8% were able to provide an explanation of the critical thinking skills they thought were most important for their students to develop and 75% had either a vague idea or no idea at all regarding specific traits of mind that needed nurturing.

The relationship between logic, problem solving and critical thinking

The previous two groups focused on what specifically is being researched in this study, namely, critical thinking skills and critical thinking dispositions. Before moving forward, this group is a slight digression to clarify what is not being focused upon in this research.

Logic, problem solving, and critical thinking are all processes by which individuals organize thoughts and make decisions. The three are connected in the following manner: problem solving is a component of critical thinking, which is a form of logic (Bluedorn & Bluedorn, 2003). By definition there are two branches of logic: formal and informal. The former is a more topic-neutral method of examining arguments, using mathematical structures and symbols in primarily deductive reasoning.

The latter relies more heavily on background knowledge, focusing on the language and natural setting of arguments (A. Stairs, personal communication, July, 6, 2004). Informal logic is sometimes considered the "technical name" for critical thinking (Bluedorn & Bluedorn, 2003). However, there are also specific areas of emphasis within the domain of informal logic that are, due to the nature of the study, not part of this research. For example, the role of language is considered "fundamental" (Bluedorn & Bluedorn, 2003) to informal logic. While language is also important to critical thinking, it is not emphasized in this study, in the way it would be if the focus were on informal logic. While language also plays a role in critical thinking, it is not "fundamental." Language includes "concepts such as argument, validity, credibility, truth, soundness, induction, deduction, and various informal fallacies" (Case, 2004). Among these elements "argument," including the breaking-apart, analyzing, and understanding of arguments, is a primary element of both informal logic and critical thinking, and will be an important part of this research. Therefore, critical thinking might be considered to be a part of informal logic. In follows, that a course on critical thinking and a course on informal logic would likely cover similar materials, perhaps with different areas of emphasis. Aside from arguments, the other elements of language are touched upon throughout the semester, but not emphasized.

Problem solving is a method of arriving at the "best" answer; this is similar to critical thinking. However, problem solving is more confined (Woods, 1987), focusing on a specific problem and a specific type of solution, whereas critical thinking focuses on analysis and critique of a problem. There are two types of problem solving: routine and creative (Bell, 2003). In the case of the former, the answer is already available and can

easily be connected to the solution. In the case of the latter, the answer may or may not

be clear and bridging the gap between problem and solution is not obvious. Creative

problem solving incorporates critical thinking; when there are multiple possible solutions

to a problem, critical thinking is applied to determine which solution is likely to be the

best (Bell, 2003).

Unlike critical thinking or informal logic, problem solving is not easily separated

from disciplinary subjects since the "problems" are often situated within a frame of

knowledge (Woods, 1987) and familiarity with the solution is likely to depend on

background knowledge. The centrality of problem-solving in math, the sciences, and

engineering is readily apparent in the emphasis placed on teaching students in a way that

integrates algorithms, for use with well-defined problems, with heuristics and domain

knowledge, for use with ill-defined, complex problems (Dougherty & Fantaske, 1996).

However, other disciplines wherein the importance of problem-solving is less apparent,

also deserve recognition. For example, in the arts, students often express their own inner

conflicts in their work. The work therefore is a culmination of identifying a problem and

then interacting with others in the form of critiques, before producing the final piece

(Dougherty & Fantaske, 1996). Similar to critical thinking and informal logic, problem

solving is most effectively taught when placed in the context of real-world problems

(Woods, 1987). This is the case no matter what discipline is being studied because

effective problem solving is a requirement in all realms of the workforce.

Informal logic and complex problem solving both encompass critical thinking.

Critical thinking, as a skill in gaining a better understanding in order to draw the best

conclusions, is applied to the natural setting of informal logic as well as to the creative

aspects of problem solving. However, both informal logic and creative problem solving also cover additional areas of thinking that will not be focused upon in this research.

Influence of the college classroom environment

Critical thinking development is not a matter of maturation alone but rather, according to Pascarella and Terenzini (1991), is enhanced by participation in higher education. This conclusion was drawn following a review and synthesis of critical thinking research. Pascarella and Terenzini examined studies that employed a variety of instruments including an essay test administered to matched cohorts of freshmen and seniors, and a cross-groupal multiple-choice assessment. Also included in the synthesis of research by Pascarella and Terenzini was the longitudinal quasi-experiment of Pascarella (1989) who, controlling for background characteristics, compared two groups of high school students in terms of critical thinking (using the Watson-Glaser Critical Thinking Appraisal) one year after graduation. One group had spent the year in college, while the other had not. In addition, the study examined whether specific college experiences – curricular emphasis, study time, amount of non-assigned reading, and extra-curricular involvement – affected the development of critical thinking. Pascarella found that attending college for one year corresponded with a 17% greater score in critical thinking beyond the effects attributable to maturation (Pascarella, 1989).

Others authors have also questioned the enhancement of critical thinking by virtue of college attendance. Facione (1997) presented a longitudinal aggregate study of undergraduate nursing programs wherein students demonstrated gains on the CCTST with each year of college. Changes were examined between freshmen and sophomores,

then freshmen and juniors, then freshmen and seniors; the largest gains occurred between the freshmen and sophomore years; these results conflict with Facione's (1990b) initial finding that critical thinking development is not a "natural outcome" of a college education.

According to Astin's (1993) longitudinal study of college outcomes, the particular institution that students attend also impacts critical thinking development. Characteristics such as faculty involvement in general education programs, use of essay exams, and the socioeconomic status of the peer group have a direct positive relationship with the enhancement of critical thinking skills. Hagedorn, Pascarella, Edison, Braxton, Nora, and Terenzini (1999) found that the average level of critical thinking ability of an institution's student body influences individual critical thinking development. This study used the National Center on Education Statistics (NCES) Integrated Postsecondary Education Data System (IPEDS) and implemented a sampling technique, resulting in a representative population of students from 23 institutions. The authors controlled for 15 variables including individual pre-college critical thinking ability. Hagedorn et al. note that this effect is limited to students in their first year, and further, that the effect is modest when all of the other variables are taken into account.

Classroom experiences in particular can contribute to critical thinking development, especially if faculty put forth a conscious effort with regard to their pedagogy. According to Facione (1990b), based on the Delphi Report, it matters not whether the instructor is tenured or non-tenured, full-time or part-time, has a doctorate or does not, is male or female. Critical thinking development is a combination of what is taught and how. Based on Facione's research, the only two instructor factors that have

been found to impact students' development are, the number of years spent teaching college and the number of critical thinking courses taught in the past three semesters.

Various authors address particular teaching strategies intended to target critical thinking development. Clark and Biddle (1993) assert, "…thinking strategies cannot be taught by a teacher standing at the front of the room" (p. 1). There must be active interaction between the students, the instructor, and instructional materials (Paul, 1990). Browne and Freeman (2000) emphasize the necessary partnership that must exist between teachers and students in order for learning to take place. Both parties are asked to take risks thereby changing the nature of many classroom interactions (Browne & Freeman, 2000). Browne and Freeman, based on a review of the literature, further assert that there are four primary elements to a classroom that promote critical thinking: frequent student questions, developmental tension, contingency of conclusions, and active learning. One of these characteristics alone does not promote critical thinking; it is the combination of all of them that fosters such development. Similarly Crow (1989), based on research conducted through the Society for College Science Teachers, suggested that students must be given ample opportunity to practice critical thinking skills. For example, instructors can foster critical thinking through persistent questioning and encouraging students to do the same. Constantly eliciting responses helps students to develop an "investigative nature" that is a key component of critical thinking. Paul (1990) and Brookfield (1987) also point to probing questions as an effective tool in stimulating independent thinking. But, the instructor must listen carefully to students' responses in order to draw out reasons, evidence, connections, and examples. The instructor should be as specific as possible, relating questions to current events and

familiar situations. Further, the instructor must be comfortable playing "devil's advocate" (Paul, 1990, p. 60), as well as encouraging students to object and propose alternate points of view in response to their peers. Astin (1993), in his analyses of data from the Cooperative Institutional Research Program (CIRP), also suggested that there are teaching strategies that can be employed to encourage the development of critical thinking, such as emphasizing writing, interdisciplinary study, discussion, debate, and oral presentations by students. In addition, science and history content, and thinking about post-college plans should be encouraged. Tsui (2001) employed qualitative methods to focus more specifically on what instructors can do to encourage critical thinking in their classrooms. Tsui found that professors are more likely to engage in active learning methods, rather than lecturing, when they are confident that students can contribute to their own learning. In turn, these active methods encourage greater use of critical thinking skills by students (Tsui, 2001, p. 21). Teachers can display confidence in their students' abilities to execute higher-order thinking, and thereby prompt development in this area, by promoting creativity and experimentation in the classroom. Brookfield (1987) emphasizes that critical thinking can be an emotional experience for students as previously unquestioned assumptions become the subject of skepticism. Instructor support, as well as peer support, is necessary elements of exercises in critical thinking.

Clark and Biddle (1993) summarize the ideas of several authors with the assertion that teaching critical thinking goes beyond the role of conventional teaching. Teaching critical thinking requires that the teacher take on the role of "researcher," to guide students through the use of information; the role of "designer," to carefully guide students

from questions posed to potential answers; the role of "consultant," to provide methodological direction for students during inquiry; the role of "referee," to settle disagreements that may arise among students and to know when questions continue/seize to drive inquiry; the role of "analyst," to encourage thinking as a subject of study; and the role of "judge," to evaluate the students' growth and level of knowledge (p. 2).

Other academic factors showing a statistically significant impact on critical thinking at the end of the first year of college include the number of courses taken that emphasize the development of writing skills, the number of hours per week spent studying, the number of non-assigned books read, and level of academic involvement (including activities such as taking detailed notes in class and class participation) (Astin, 1993; Pascarella, in press). Grade Point Average (GPA) is strongly correlated with both the development of critical thinking skills (Astin, 1993) and the development of critical thinking dispositions (Walsh, 1996). For this reason, in studies on critical thinking, GPA is generally controlled for.

Pascarella (1989) found, based on ACT score, high school grade point average, socioeconomic background, or educational aspirations, that no one experience affected critical thinking development. However, student intellectual and social involvement as a whole did affect critical thinking, leading him to conclude that it is the total college experience, rather than isolated experiences, that influence college critical thinking (Pascarella, 1989). Two other studies expanded upon the latter finding. Terenzini, Springer, Pascarella, and Nora (1995) applied a one-year, longitudinal, panel study design to a group of freshmen, at a large research university, to examine students learning and intellectual development. Using two "reduced model" multiple regression analyses

they found that experiences both inside and outside the classroom made significant contributions to critical thinking development. In addition, Terenzini et al. supported the notion that multiple experiences, taken together, cause the greatest gains in critical thinking. Further support for experiences outside the classroom comes from Inman and Pascarella (1998), who performed a series of regression analyses to compare resident and commuter cohorts of freshmen from more than 20 institutions. They found that while residence (on campus versus commuter) may not impact cognitive development, non-classroom experiences do impact cognitive development for freshmen. Pacarella and Terenzini (2003) provide further support for this. In their synthesis of studies, they found many elements of involvement contribute to cognitive development, including critical thinking. These elements range from socializing with peers and discussing current issues outside of class to participation in extracurricular and co-curricular activities. There is also evidence suggesting that students have an appreciation for their ability to take what is learned in the classroom and apply it outside the classroom.

Discipline-based versus independent courses for teaching critical thinking

The type of instruction and classroom activity is one factor to consider with regard to classroom experience; another factor is the discipline in which the class is taught. While the number of courses taken in a given discipline such as arts and humanities, physical science, or social science may have a positive impact on the development of critical thinking skills, college major does not appear to have an effect **(**Pascarella, in press**)**. However, major may have an effect on the development of critical thinking dispositions. Walsh (1996) used the CCTDI in an exploratory study to examine

whether the disposition to think critically varied across majors. In a one-way MANOVA statistically significant differences were found among English, psychology, business, and nursing majors on overall score as well as in the subscale scores of Truth-seeking, Open-mindedness, Confidence, Inquisitiveness, and Maturity.

A divide exists between proponents of critical thinking who believe the dispositions, skills, abilities, etc., associated with critical thinking are best developed within the context of the students' major discipline, and those who believe a course aimed specifically at nurturing critical thinking is the best way to establish development; this tension is known in the critical thinking community as that between "content" and "process" (Case, 2004). The former can take two forms: infusion, wherein students are explicitly encouraged to think critically, developing dispositions as well as abilities, about well understood subject matter; and immersion, wherein the same subject matter depth is explored, however critical thinking skills are not made explicit (Ennis, 1989; Paul, 1990). The latter is what Ennis (1989) refers to as the "general approach," teaching critical thinking skills and dispositions "separately from the presentation of the content of existing subject matter offerings, with the purpose of teaching critical thinking" (Ennis, 1989, p. 4).

While infusion and immersion may in fact be useful techniques, Ennis argues that the perspective gained through general education is essential to avoid some of the problems – such as inflexibility in applying thinking skills from one area to another - that are created when students' only exposure to critical thinking is through a particular discipline (Ennis, 1989). According to Facione (1986), it is assumed that advanced students can be taught, and tested on, argument construction within the context of their

disciplines. However, this approach "obscures the commonalities evident across disciplines" (Facione, 1986, p. 226), making transferability of these skills from one discipline to another, or to real world scenarios, more difficult. Students, as well as employers, seek mobility. Individuals entering the job market must be able to adapt to new positions and the challenges that accompany them. Generic critical thinking skills – including "a willingness to reflect on problems and issues, a knowledge of different methods of reasoning and critical inquiry, and the ability to apply those methods" aid in students' career readiness as well as their preparation for citizenship (Jones, 1996, p. 8).

Halpern (1998) also argues that the methods used for teaching content in subject-specific courses are not ideal for teaching critical thinking due to the lack of transferability often associated with content-specific skills. In addition, courses within the disciplines are already covering such a great amount of material that it is not realistic to expect faculty to cover thinking processes in addition to their course content (Chaffee, 1993; Reed & Kromrey, 2001). In fact, based on a multi-institutional study of public and private institutions in California, Paul and colleagues (1997) found that while the majority of faculty (89%) believe critical thinking should be a primary goal in higher education, more than 75% cannot conceive of how to cover their course content while fostering critical thinking. Costa (2003) argues that teaching the process thinking should be considered the content of class instruction. "When teaching a thinking skill directly, the content becomes the vehicle for thinking" (p. 59). A critical thinking course in the first year of college can foster students' awareness of the skills, abilities, and dispositions that they will be exposed to in subsequent semesters of study. Further, students can begin the process of objective self-evaluation their learning (Fitzgerald, 2001). As with other

skills, critical thinking requires explicit instruction, practice, and application to situations outside the conditions under which it is learned; one of these alone is not sufficient for optimal development.

Other scholars contend that critical thinking development is best fostered within students' major discipline. From this perspective, critical thinking is defined as "the ability to apply disciplinary frameworks in personal, academic, and professional settings and to monitor and evaluate that activity" (Cromwell, 1992, p. 40). The foundation of the argument for critical thinking to take place within the disciplines is that each discipline has unique characteristics, methods, and goals. It is within the context of these disciplines that students are introduced to reliable context based information as well as to the methodologies that support this information. By making critical thinking a more overt part of the curriculum, institutions can emphasize the attainment of higher-order thinking skills, and student comprehension (Litecky, 1992; Weinstein, 2003). Brookfield (2003) speculates that the conception of critical thinking as an instructional module – as both the content and the process of instruction - in university courses, is "conceptually and empirically absurd" (p. 159) based on his belief that "one can only be critically reflective about something" (p. 159). Case (2004) too disapproves of the generalized approach, referring to it as not only ineffective but as possibly harmful, as it may reinforce a habit of mind of making judgments in a hasty or uniformed manner.

In addition to critical thinking skills, critical thinking dispositions have also been studied to determine their relationship with various disciplines. In a university-wide longitudinal study that assessed a group of in-coming freshmen and the same group of students four years later as seniors using the California Critical Thinking Dispositions

Inventory (CCTDI), Giancarlo and Facione (2001) found that for the scales of Analyticity, Systematicity, and Critical Thinking Self-Confidence, there were no differences between the discipline clusters (Natural/Physical Sciences; Mathematics, Computer Science, Engineering, Decision Information Sciences; Business Administration and Communication; Humanities, Letters, and Languages; Social/Behavioral Science and Liberal Studies; Undeclared). The findings did show differences among discipline "clusters" on four of the CCTDI scales (pp. 48-49). On the Truthseeking scale, scores for the Business Administration and Communication students were more concentrated in the negative range than the other disciplines; scores for the Humanities, Letters, and Languages students were more concentrated in the positive range than the other disciplines. On the Openmindedness scale, the Business Administration and Communication students scored more heavily in the ambivalent range than the other disciplines; again, scores for the Humanities, Letters, and Languages students were more concentrated in the positive range than the other disciplines. On the Inquisitiveness scale and the Maturity of Judgment scale, Business Administration and Communication students again had scored more heavily concentrated in the ambivalent range than any other discipline cluster. However, the authors caution that, because clusters were studied, as opposed to individual disciplines, these results should not be over-interpreted.

When different types of critical thinking, and/or dispositions toward critical thinking, are associated with particular disciplines, students, through general education programs, can be exposed to how people that specialize in each of those disciplines think (Cromwell, 1992). This permits students an appropriate context. In an experimental study Angeli (1999) found that students enrolled in context-situated courses wherein

critical thinking was taught though either infusion or immersion outperformed students in a control group, wherein there was no critical thinking instruction at all, with regard to scores on a measure of critical thinking.

Some critical thinking experts (Ennis, 1989; Paul, 1990) do not believe teachers or institutions must necessarily choose between either teaching critical thinking through general education or teaching it within the disciplines, but rather when possible, apply both. The "mixed approach" (Ennis, 1989) is a result of combining the general approach with either infusion or immersion; a separate course teaches the general principles of critical thinking while students are simultaneously receiving subject-specific critical thinking instruction throughout their courses. Based on a review and synthesis of the relevant literature, Ennis (1989) asserts that there are three versions of subject-specific critical thinking: domain specificity, epistemological subject specificity, and conceptual subject specificity. Domain (used in place of, but with the same meaning as "subject") specificity requires background knowledge and does not emphasize the transferability of thinking skills from one area to another. Epistemological subject specificity also requires background knowledge and holds in principle the ideal that, due to differences among fields of study, critical thinking skills too must vary. Conceptual subject specificity holds that critical thinking cannot even take place without subject matter therefore there can be no such thing as general critical thinking. Ennis argues that the problems with these approaches, and their reliance on background knowledge, lie in the difficulty for introductory students to engage in disciplinary critical thinking, the likelihood that the experienced student can come to identify with a way of disciplined thinking to the extent

of becoming inflexible to alternate perspectives, and the question of whether discipline-based critical thinking is likely to lead to critical thinking in everyday life.

Ennis does not deny the importance of background knowledge. He argues that being well-informed regarding a subject area is an acceptable prerequisite for any type of critical thinking. Bloom (1956) would agree, arguing "thinking cannot be carried on in a vacuum," (p. 33) but rather, its basis is in previously acquired knowledge. Even attitudes and dispositions are based in some form of knowledge or acquired information. However, it is the knowledge that is learned in one course and then used in another that is most likely to be retained. Further, knowledge that is organized and relates to previously acquired knowledge is learned and retained more easily. In contrast, learning that is isolated and specific is less likely to be retained and thereby less transferable for use in new situations. Bloom believed it was reasonable to expect that generalized learning, applied throughout a student's education would have greater permanence than learning which was more specific and applied sporadically (Bloom, 1956).

This relates to another argument made by Ennis against subject specificity: different disciplines generate different reasoning, such that critical thinking varies from discipline to discipline. While this may be important for disciplinary success, it makes the transfer critical thinking dispositions and abilities between disciplines rather difficult. On the other hand, providing more general critical thinking instruction is not likely to be effective – in terms of enhancing students' thinking and reasoning abilities - in discipline-based courses because the skills are being treated as "add-ons" (Ennis, 1989, p. 7) to what is being taught in the course. Therefore, students' exposure to broad conceptions and application of critical thinking will be non-existent. Some scholars, including Mortimer

Adler, argue that this is perfectly reasonable given that critical thinking is always set in a specific context (Ennis, 1989). Ennis holds that subject specificity in critical thinking can be confusing because there are many distinctions to be made in how it is best done. Still, he argues, with deliberate teaching, it can be an important component in improving critical thinking abilities.

From a more general, philosophical perspective, Paul (1990) argues that knowledge in all disciplines exists through critical thought. Case (2004) joins Paul in the contentions that the division between content and process is a "false dichotomy: thinking without content is vacuous and content acquired without thought is mindless and inert" (Case, 2004, p. 1). In each discipline, students must learn to discipline their thinking according to unique standards and values. However, while each discipline has its own frame of reference, to some extent, what is learned within one discipline should be transferable to other disciplines, as well as to students' daily lives. Therefore, both Paul and Case would reject sole reliance on any form of subject-specific critical thinking. When students are able to qualify knowledge of one discipline with another, and/or qualify knowledge in any discipline with experience, they have gained a capacity to synthesize that is directly related to critical thinking. Based on his work authoring critical thinking textbooks, Paul also argues that schools and educators need not take an either/or approach to how critical thinking is taught. He makes the analogy that such a decision is like choosing between requiring a composition course and teaching writing across the curriculum. Rather than choosing between discipline-based critical thinking instruction and the creation of a critical thinking course, Paul proposes that both be used at all levels of education. Paul's argument is not that critical thinking cannot be taught

within the disciplines or without discipline-based knowledge. Rather, Paul's argument is that disciplines should be used to help students learn to reason, to think more logically and clearly, and to be more open-minded. Such thinking, while learned in one domain, can, in time, be transferred to other domains. The first step in achieving this, according to Case, is a more clear understanding of what critical thinking is and how it is comprised.

Other scholars (Cromwell, 1992; Halpern, 1999) also suggest that it is the transferability of critical thinking that should be the focus of its attainment further contending that critical thinking does not have to be discipline-based but that it should be acquired across the curriculum. In this way, students gain a better understanding of how people think – organize and understand ideas, facts, texts – in each discipline (Cromwell, 1992). Halpern (1999) asserts that thinking skills can be taught using examples from various disciplines, thereby helping students to improve their thinking in a way that is transferable across disciplines. She also suggests using materials that simulate real-world situations (1998).

Halpern (1998), based on a review of literature regarding transferability, proposed a four-part model for the teaching and learning of critical thinking skills. The model includes: developing critical thinking skills (analysis, problem solving, decision-making, etc.), fostering dispositions toward critical thinking (learning to recognize when a skill is needed and being willing to put forth the necessary effort), structure training (using cues from a problem to determine what particular thinking skill is needed), and metacognitive monitoring (learning how to use knowledge to improve the processes of thinking and learning). According to Halpern (2003), there are pedagogical practices that can help

students to improve their critical thinking skills as well as their ability to transfer these skills across disciplines. For example, Halpern suggests that one of the most important elements in teaching and testing for critical thinking development is posing questions that allow students to freedom to respond using various types of information.

Halpern (1999) also discusses new courses that are being developed, and older courses that are being altered, to emphasize critical thinking instruction, noting that many institutions now offer courses specifically designed to foster critical thinking dispositions and skills among their students. Halpern argues that in the face of constantly changing technologies and increasing complexity in the workplace, such courses are an increasingly important component in college curricula. John Chaffee is well-known for his work on developing courses in critical thinking aimed at developing the thinking and literacy abilities that students need for both academic and career success. Chaffee (1992) argues that while these courses have been successful in fostering critical thinking, these abilities and dispositions must be continuously reinforced through other coursework in order to have the greatest impact on overall development of thinking activity.

This study will add to the literature in this area as it is somewhat of a bridge between teaching within the context of subject matter and teaching a specific course focused on critical thinking. This study places critical thinking instruction within the context of a first-year transitions course, aimed at helping students make the transition from high school to college. Students are not taking this course within the domain of a discipline, nor are students registering for a "critical thinking" course; they are signing up to learn more about University resources and adjusting to college, while thinking critically about campus issues. Bloom (1956) would likely support this endeavor, as he

believed, "Even the objectives involving personal adjustment are quite frequently based on the notion that a person must have knowledge about himself before he can proceed to resolve his conflicts, anxieties, or other individual difficulties" (p. 33). The course being used in this study relies on background knowledge that the students have about themselves, which will in turn aid in their transitions to living and thinking as college students. This study uses students' knowledge of themselves to build on their thinking skills and create a foundation for learning in subsequent courses throughout their college careers. Based on a comprehensive review of the literature, no other research exists on the outcome of combining a first-year transitions course with critical thinking instruction.

Critical Thinking and Student Development

Cognitive development

Bloom's Taxonomy (1956) is among the most well known documents for mapping the "cognitive domain" and establishing expected education outcomes. According to Bloom, there are six levels in a successive hierarchy: knowledge, comprehension, application, analysis, synthesis, and evaluation. While the first four levels are understood to be a "true hierarchy," it is possible that levels five and six are equally difficult (Huitt, 1998, p. 2). Critical thinking is likely part of level six, evaluation, as it is this level that "focuses on making an assessment or judgment based on an analysis of a statement or proposition" (Huitt, 1998, p. 2). According to this categorization, creative thinking is part of level five, focusing on the parts of relationships in order to put them together in unique ways. Creative thinking is often contrasted with critical thinking as the former is associated with use of intuition,

sensitivity, impulse, and imagination while the latter is associated with logic, deliberation, and rationality (Case, 2004). For some critical thinking experts, this divide between critical and creative thinking is inaccurate (even if they are considered equivalent) because creative thinking is a part of critical thinking (Huitt, 1998; Case, 2004). Speculation about potential implications, viewing things from varying perspectives, and the generation of original ideas, all considered elements of creative thinking, are all necessary for critical thinking.

According to Eljamal, Stark, Arnold, and Sharp (1997), there are five primary goals of cognitive development: general skill development, knowledge acquisition, effective thinking, intellectual development, and future preparation. Critical thinking falls into the "effective thinking" category, which also includes creative thinking, synthetic thinking, deductive reasoning, and problem solving. At times, the terms "critical thinking development" and "intellectual development" are used interchangeably due to common goals, such as exposing students to new ways of thinking, increasing students' tolerance of/comfort with ambiguity, and developing intellectual curiosity. However, according to Eljamal, Stark, Arnold, and Sharp (1997), content knowledge is also part of intellectual development and, while there may be a connection between the two, intellectual development is distinct from critical thinking.

Perry's (1981) Scheme of Intellectual and Ethical Development is perhaps the most widely recognized model of cognitive development. According to Perry, there are nine positions that individuals go through as they develop cognitive abilities. Most college students are beyond the first stage when they enter, and stages seven through nine deal with the development that generally takes place beyond the traditional years of a

college education. This leaves positions two through six. Applying Perry's scheme to critical thinking, the abilities and skills associated with critical thinking are not fully being used until students are in the transition from Position 4, late multiplicity or "Relativism Subordinate," to Position 5 "Relativism" (Perry, 1981, p. 87). It is here that students are able to employ what Piaget called "vertical décalage" (Perry, 1981, p. 88), applying what is learned from experience to more abstract situations, and begin to compare interpretations and ways of thinking, and begin to develop "meta-thinking," the capacity to examine thought, including one's own" (Perry, 1981, p. 88). Students in this stage of development are comfortable questioning a practice, as well as information that comes from an authority; they will evaluate new information rather than passively accepting it; they recognize that they themselves are capable of contributing to the development of knowledge (Warhurst, 2001).

Many college freshmen, especially during their first semester, are in Perry's Position 2, late dualism. Here, students recognize diversity and uncertainty but discount ambiguity in the belief that the "Authority," or source of information being transmitted, is not well qualified (Perry, 1981, p. 82). Many freshmen equate knowing with memorizing. The teacher gives students information that they memorize and feed back. As students move into and through Multiplicity (Positions 3 and 4 of Perry's Scheme), "the role of the student [shifts] from that of one who learns how to learn and works hard to one who learns to think more independently" (Evans, Forney, & Guido-DiBrito, 1998, p. 131).

However uncomfortable these positions appear to be, it is necessary for students to get through them to continue their development and to become critical thinkers. As

discussed in a previous group of this paper, critical thinking experts propose that instructors who teach freshmen can create conditions that stimulate critical thinking development, in turn helping students to move from Dualism into Multiplicity, and in some instances, on through Multiplicity. However, the student must be developmentally ready in order to progress. The instruction that will occur in the experimental group of this study aims to broaden students' minds by encouraging them to listen and try to understand alternate perspectives, helping them to place those perspectives in context, and motivating them to construct arguments that support their own views.

Differences among student populations

A major weakness of Perry's Scheme is that his research subjects were all White males. Researchers have found, in some instances, that men and women approach knowledge differently. Belenky, Clinchy, Goldberger, and Tarule (1986), through a qualitative study with all female subjects, created a framework that included four epistemological positions, among which is the position of "procedural knowledge." In the position of procedural knowledge individuals are able to understand multiple perspectives. The two types of procedural knowledge are: separate knowing and connected knowing. The former is characterized as objective and impersonal, while the latter is characterized as empathic and understanding. Through their extensive interviews, Belenky, Clinchy, Goldberger, and Tarule (1986), determined women tend to be "connected knowers." Mansfield and Clinchy (1992) designed a qualitative study to determine how men and women define separate and connected knowing. Through this research, as well as a review of other studies on various populations, Clinchy (1996)

purports that men are more likely to be separate knowers and women are more likely to be connected knowers – although this is not an exclusive distinction.

According to Wheary and Ennis (1995) separate knowing is often considered the preferred mode for critical thinking, leading, in part, to some scholars' belief that critical thinking is biased to males. Thinking that is "confrontational, argumentative, detached, and unemotional" is also considered "masculine" whereas thinking that is "consensual, supportive, contextual, and caring" is considered feminine (Case, 2004, p. 12). This is an important consideration in assessing female versus male freshmen comfort level, especially as they move into Perry's Multiplicity Position. Drawing on the work of Belenky, Clinchy, Goldberger, and Tarule, Erickson and Strommer (1991) state that as separate knowers, men are more likely to "respond to freedom from authority with vigor, proclaiming their rights to their own opinions, and later justifying them with reason and evidence" (p. 51). Women tend to be less assertive, rely more on their own opinion than objective evidence, hold back on expressing views that might harm a relationship, and listen (as opposed to actively participate in class discussion). "Because thinking skills develop through practice and feedback, the tendency to keep their thoughts to themselves may prevent some freshman women from profiting from classroom activities unless they are specifically drawn in" (Erickson & Strommer, 1991, p. 51).

However, the research is not conclusive. A study by Rudd, Baker, and Hoover (2000) actually found that woman score higher than men in the area of critical thinking dispositions. In a study of students from the College of Agriculture at the University of Florida, female students scored significantly higher than their male peers on the CCTDI total score as well as in three of the measure's subscales: Truth-seeking, Open-

mindedness, and Maturity of Judgement. Giancarlo and Facione (2001) found similar

results in their longitudinal pre-test post-test study, described in the group on critical

thinking dispositions. Here again, employing the CCTDI there were statistically

significant differences between female and male subjects. Females scored higher overall,

as well as in two of the measures' subscales: Openmindedness and Maturity of

Judgement. Therefore, while the research does show differences between males and

females, the direction of the difference is ambiguous.

Further support for the proposition that there are differences between the thinking

of males and females can be found in Baxter-Magolda's (1993) Epistemological

Reflection Model. This model has four stages: absolute knowing, transitional knowing,

independent knowing, and contextual knowing. Like the Dualism stage of Perry's (1981)

model, absolute knowing holds knowledge as certain. However, while Perry did not test

for differences between males and females, Baxter-Magolda found that there are

differences in between men and women in their ways of thinking. Men follow a pattern

of "mastering knowledge," characterized by public acquisition of knowledge, interchange

with teachers and with peers, using evaluation to improve mastery, and looking to

authority to resolve perceived inconsistencies in knowledge. Women, on the other hand,

follow patterns of "receiving knowledge," characterized by private acquisition of

knowledge, limited interaction with instructor and peers, using evaluation to demonstrate

knowledge, and relying on themselves to resolve perceived inconsistencies in knowledge.

Like the Multiplicity stage of Perry's (1981) model, transitional knowing holds some, but

not all, knowledge as absolute. However, again unlike Perry, Baxter-Magolda found

differences between men and women. Men followed an "impersonal pattern,"

characterized by interest in debating peers and being challenged by instructors, resolving uncertainty with logic and research, and valuing fair, practical evaluation. Women followed an "interpersonal pattern," characterized by learning through the ideas of others, a desire for rapport with the instructor, resolving uncertainty with personal judgment, and valuing evaluation that accounts for personal difference (Baxter-Magolda, 1993).

Scholars debate whether the goals of critical thinking are inherently biased toward men. Wheary and Ennis (1995) examined three areas wherein they suspected critical thinking to reflect male bias. The first area focused on possible discrimination against females in educational settings, due to lower levels of active participation among females in classes where critical thinking skills were emphasized. Wheary and Ennis contend that female college students lack opportunities to strengthen their critical thinking skills, in part due to the tendencies of male students to be more vocal in class discussions, in part due to the use of male biased course materials (such as textbooks that picture boys significantly more frequently than girls), and in part due to traditional stereotypes of women as incompetent thinkers. Therefore, Wheary and Ennis argue, educators should make a conscious effort to provide male and female students equal opportunities in the classroom to develop critical thinking. The second area of suspected male bias was the neglect of women in research on thinking. Based on their review and synthesis of the literature, Wheary and Ennis assert, not that females have been left out entirely, but rather, that research by and on women is often overlooked by other authors' works on critical thinking. The argument further focuses on the predominant use of male subjects in research on thinking, but again, does not deny that there is progress being made to this end. The authors emphasize however, that simply including women in such research

does not eliminate the problem of bias, especially if female subjects are examined within the context of a male standard of thinking. Finally, Wheary and Ennis discuss the "typically male characteristics" (p. 218) of critical thinking, asserting, "traditional conceptions of critical thinking ignore female ways of knowing" (p. 218), namely, emotion, attention to context, the link between self and object, and attention to personal voice. Traditional conceptions of critical thinking characterize critical thinking with such terms as objective, rational, and judgment-based; characteristics traditionally associated with male ways of thinking.

Taking a different perspective, Alston (1995) does not deny the arguments made by Wheary and Ennis but rather, questions their examination of what critical thinking is, and the way in which it is developed as a biased mode of teaching. She criticizes some of the literature that Wheary and Ennis use to make their arguments as well as their motive (and their legitimacy). For example, Alston argues that the observation that boys talk more than girls in the classroom could have nothing to do with critical thinking. Alston acknowledges the existence of male bias throughout education systems but proposes such bias is much more complex than Wheary and Ennis have made it out to be. Therefore, she encourages further research on the formulation of critical thinking skills, offering the possibility the best approach to assessment may depend on multiple curricular and environmental factors. In the end, Alston believes that only with greater consideration of what critical thinking really is, "an element in the world of connection, meaning, politics, ethics, communication, problems, and people" (p. 233), can it be determined whether a gender bias exists.

Less literature is available regarding the differences in critical thinking development according to race. The literature in this area is broad, focusing on differences across race with respect to overall cognitive development. Gadzella, Masten, and Huang (1999), in a small single institution study, found Caucasian college students scored significantly higher than their African American peers on the Watson-Glaser Critical Thinking Appraisal. The researchers believe the differences in scores indicate that African American students struggled to understand the test itself, causing the researchers to question whether the particular standardized test used in this study was biased toward White individuals. Given these concerns, and the small size of the sample, the results indicating differences by race should not be generalized to the greater population of African American students. However, the question that Gadzella et al. posed that continues to be of great importance is, "whether all students are taught and whether the students profit from instruction on critical thinking…" (Gadzella et al., 1999, p. 1).

Research shows that African American college students, particularly those attending predominantly White institutions, face additional challenges in the cognitive development process. Fleming (1984) found that the cognitive/intellectual growth of African American students at White colleges was severely lacking. She hypothesized that the reasons for this were to be found in the "absence of relationships with faculty, …[absence of] informal contact with instructors, …[and] lack of positive role models on these campuses…socio-emotional development becomes a defense against the feelings of inadequacy engendered by thwarted cognitive development" (Fleming, 1984, p. 79).

McEwen, Roper, Bryant, and Langa (1990) found that Black students face greater challenge than their Caucasian peers in developing "the most basic intellectual competence, which is necessary for survival on the college campus" (p. 433). The authors named "surviving intellectually" among the nine factors that relate to the developmental tasks of African American students, further noting that many Black college students are aware that their focus on academics impedes their development in other areas. In a study on the relative effects of African American students' attendance at Historically Black Colleges (HBCs) versus Predominantly White Institutions (PWIs), Flowers and Pascarella (1999) found that attending a HBC had a significant positive effect on the critical thinking development of men; but significant negative effect for women. However, in general, attendance at a HBC was found to have a significant positive effect on overall cognitive development among African American students. In a follow-up study Flowers (2002) confirmed that African American students who attended HBCs demonstrate enhanced learning outcomes. Students also attributed self-reported academic and social gains to attending an HBC.

Finally, cultural bias, in a more general sense, can enter into debates about critical thinking, in considering the differences among cultures when it comes to the questioning of ideas. For this reason, it might be argued that critical thinking has a Western liberal bias. Not all cultures openly promote questioning and flexibility in thinking. As critical thinking is contextually bound, individuals of different cultures will vary in what, when, and how they exhibit critical thinking. Yet, according to a 1998 international study (Cogan & Derricott, 1998) of 182 experts in various fields, critical thinking is an integral part of preparing citizens for the 21st century. Using Delphi methodology, 16 consensual

recommendations were reached on education policy. Only two were ranked as "very highly recommended": the teaching of subject matter in a way that encourages critical thinking, and an emphasis on students' ability to critically assess information.

Exposure to diversity

A large amount of literature attests to the importance of exposure to, and experiences with, diverse populations in terms of overall college experience and preparation for life after college. The study by Cogan and Dericott (1998), discussed in the preceding paragraph, concluded that critical thinking is best fostered when "actual," real-world ethical problems serve as the framework for learning. The discussion of complex and controversial topics, dealing with "multidimensional citizenship," along with the posing of ill-structured questions, with no particular answers, to students with respect to this discussion, promotes critical thinking. This can take place within or outside of a discipline; the background knowledge needed as reference for critical thinking is found in pedagogy focused on the worldwide ethical dilemmas being addressed. According to Cogan and Dericott (1998), students from various nations addressing the same questions and then discussing them together would enhance student understanding, and thinking, dramatically. Gurin, Dey, Hurtado, and Gurin (2002) add that these discussions need not be limited to the classroom to have a positive impact. They demonstrate, using data obtained through the Cooperative Institutional Research Program (CIRP), that "informal interactional diversity" promotes higher levels of intellectual engagement as well as students' self-assessed academic skills.

Milem, Chang, and Antonio (2005) point to findings that increased racial and ethnic representation "leads to a broader collection of thoughts, ideas, and opinions held by the student body…" thereby exposing students "to a wider range of perspectives on a particular issue" (p. 7). Further research (Hurtado, Milem, Clayton-Pederson, & Allen, 1999; Gurin, Dey, Hurtado, & Guring, 2002), shows that interracial interactions among students have a positive impact on educational outcomes, including critical thinking, as well as students' attitudes about multiculturalism. This is particularly true for White students. Further, these researchers assert that students' willingness to consider diverse perspectives, and their comfort with challenges to their own perspectives, are important with regard to inter-group contact. But, does diversity impact critical thinking?

According to recent research, experiences with diversity do impact college students' critical thinking. Pascarella, Palmer, Moye, and Pierson (2001), in a study based on first-year students at 23 institutions, found that "a number of diversity experiences had significant positive effects on self-reported thinking complexity at the end of college for White students…Diversity experiences had no significant effects on thinking complexly at the end of college for African American students" (p. 258).

It is necessary to note the distinctions between studies of Black and White students versus those that view diversity and interracial contact in a broader sense, implying the inclusion of all students - Caucasian, Black, African American, Asian American, Latino, Middle Eastern, and other underrepresented ethnic and cultural populations. Kakai (2000), using the California Critical Thinking Dispositions Inventory as a framework, suggests the use of cross-cultural studies and experiences as a way of fostering critical thinking among college students. According to Kakai, cross-cultural

studies and experiences contribute directly to critical thinking development both

cognitively and in terms of fostering students' disposition using these cognitive skills.

These activities better enable students to understand the importance of context, and the

consideration of multiple perspectives, when analyzing a problem, thus nurturing

students' sense of fair-minded higher-order thinking (Kakai, 2000). Kakai further

contends that dispositions toward critical thinking that are developed through cross-

cultural comparison can be applied to other cross-cultural experiences that students

encounter, as well as to other social issues that students face in their everyday lives.

These studies help students to be aware of what is going on around them, living in a

cross-cultural society. Kakai also encourages cross-cultural experiences both inside and

outside the classroom. She argues that extracurricular activities that include a diverse

body of students and/or focus on cultural experiences foster students dispositions toward

critical thinking in many of the same ways that cross-cultural studies do inside the

classroom with an added bonus that they may or may not get in class: "Through actual

interactions with people from culturally different backgrounds, students may deepen their

understanding of the necessity to engage in critical thinking" (Kakai, 2000, p. 126).

First-Year Transitions Courses

Freshmen seminars, while having their roots in American institutions more than

100 years ago, have only in the past 20 to 30 years taken a prominent position in

undergraduate curricula. The freshman seminar, aimed at providing students with the

opportunity to build community with their peers and an instructor, first appeared as part

of the curriculum at Lee College in Kentucky more than 100 years ago. Its popularity

waxed and waned, disappearing almost completely in the 1960s. However, during the 1970s, with large numbers of first-generation college students, an explosion of curricular options, and a seeming inability of the peer culture on campuses to help orient new students to the college environment, came a renewed interest in facilitating the transition that is the first year of college (Gahagan, 2002). Colleges and universities were once again exploring ways to help students make the transition to college in such a way that would encourage them to become not only successful in their own right, but also involved members of the community. In 1972, John Gardner developed a course at the University of South Carolina (USC) entitled "University 101." Gardner's idea was to develop an extended "orientation" course for freshmen wherein "various aspects of adjustment, academic, social, and otherwise, are discussed and skills/strategies provided to assist students in dealing with the difficulties they characteristically encounter during that year" (Tinto, 1993, p. 164). Early proponents believed such courses to be particularly helpful at larger institutions. Gardner is one of the co-authors of the text being used in the control group of this study.

Gardner's idea continued to develop and in 1986, The National Resource Center for The First-Year Experience & Students in Transition (NRC) was chartered at USC. The purpose of the Center is to collect and disseminate information about the first year of college and other student transition. "The Center and University 101 comprise one functionally integrated academic program, each designed to complement the other" (National Resource Center, 2002, brochure).

The University 101 course that currently exists at USC is a three credit-hour course in which "the primary purpose…is to assist students in making a successful

transition to higher education by providing them an essential support group during the first semester as well as the skills and knowledge they need in order to be successful" (National Resource Center, 2002). It goes beyond an "orientation course" that focuses on knowledge and awareness of campus resources, to being more of a "freshman seminar," introducing students to "the nature and value of a liberal education" (Gordon, 1989, pp. 192-193).

The program at USC is only one model of a new student seminar. In a 2003 survey, described in greater detail below, the Center collected data indicating that approximately 74% of colleges and universities across the United States offer a freshman or first-year seminar (Skipper, 2002; National Resource Center, 2003). Some institutions focus on major or career expectations and others focus on particular interest areas. Of the institutions that offer freshman or first-year programs, 70% are focused on helping students acquire the skills necessary for academic and social success (Skipper, 2002; National Resource Center, 2003). While these programs are currently popular among various types of higher education institutions – from community colleges to liberal arts institutions, to large universities – "traditional institutional reward systems often do not favor" their existence due to their non-disciplinary nature (Barefoot & Fidler, 1996, p. 2). Despite these challenges, freshman seminars continue to prosper.

A great deal of literature examining why freshman seminars are beneficial for students. This includes but is in no way limited to establishing a correlation between the seminars and student involvement on campus, and use of campus services. Research shows that retention and academic performance are also positively influenced by such programs (Fidler & Hunter, 1989; Hunter, Skipper, & Linder, 2003). According to a

study at Washington State University, for example, "Freshman Seminar students are nearly five percent more likely to be retained to the sophomore year than other freshmen" (Henscheid, 1999, n. p.). Academic performance, which includes grade point average, communication skills, study habits and attitudes, and relationships with faculty members, is also said to be positively influenced by freshman seminars (Fidler & Hunter, 1989). The Washington State University study also shows that 86 percent of students that participated in seminars said that they were more comfortable participating in their seminar course than in any other course. Results also indicate that freshmen seminar students are more likely than their non-participating peers to read, be actively engaged in their learning, work well with other students, and work well with faculty (Henscheid, 1999).

A myriad amount of both institution-based and student-based outcomes are associated with participation in a first-year seminar program. Institution-based outcomes include: increased satisfaction with the institution, increased campus involvement and participation in extracurricular activities, and increased use of resources and campus services (Dooris, 2001; Hunter, Skipper, & Linder, 2003). Student-based outcomes include: feelings of academic and social integration, self-reported feelings of increased academic competence and decreased levels of stress, increased locus of control, greater emphasis on academics and engagement in learning, and better clarification of short-term and long-term goals (Dooris, 2001; Hunter, Skipper, & Linder, 2003).

A major challenge in research on first-year seminar programs is determining which outcomes to measure and how to measure them. It is nearly impossible to control for all out-of-classroom, or even out-of-college, experiences, as well as differences in

students' ability upon entering college. Pascarella (2001) suggests focusing on practices and processes that are linked to important cognitive and non-cognitive outcomes. Critical thinking, an important cognitive outcome, is the subject of this study.

Adding to the Literature

As discussed in the above groups, the literature on critical thinking and first-year programs, as their own entities in higher education, is abundant. With regard to the former, the literature on critical thinking development, broadly conceived, and the teaching of critical thinking, more specifically, in reference to college students is extensive but, in many respects, not definitive. The literature available on first-year programs continues to grow relative to the programs themselves. Again, there is a great deal of variation in these programs, which are still finding their place on campuses nationwide. The gap in the literature is with regard to whether these two areas, critical thinking and first-year programs can be merged. In other words, there is minimal research on whether first year seminars can be used as a vehicle to accelerate and/or improve critical thinking.

This study addresses this question, thereby adding to the literature in both areas. In this study, a group of 20 students in an experimental class group of UNIV101, *An Introduction to the University*, is taught the content of a first-year transitions seminar with explicit critical thinking instruction techniques. This group of students is compared – based on the results of three critical thinking instruments - to another group of students from a comparable group of the same course, without the critical thinking instruction. In the experimental group, the course content – including topics such as time management,

underage drinking, and date rape – provides the context within which students are

encouraged employ both critical thinking skills and critical thinking dispositions to solve

problems, make decisions, and form opinions.

Chapter III: Methodology

Introduction

According to Pascarella and Terenzini (2003), there is no clear consensus regarding the pedagogical implications of teaching critical thinking within the context of a semester-long course. According to their review of relevant research, pre-test/post-test designs show statistically significant improvements by students exposed to critical thinking coursework. However, four of the studies Pascarella and Terenzini reviewed did not include a control group in their designs, making it nearly impossible to determine whether gains are a result of exposure to critical thinking instruction or confounding factors such as maturation, the test effect, and/or previous exposure to the material covered in the course. Pascarella and Terenzini found that, in studies that included a control group, the findings were mixed: three found statistically significant differences between the experimental and control group, four found no differences. Four others showed statistically significant differences in particular areas of critical thinking, while finding no statistically significant differences in other areas. Based on their review of studies, Pascarella and Terenzini (2003) estimate that critical thinking instruction may lead to an advantage in measured critical thinking skill of .23 of standard deviation, or 9 percentile points. However, they emphasize interpreting this result with caution, as it is only an estimate, and they encourage further research in this area.

This dissertation adds to the literature on the pedagogical implications of teaching critical thinking using a control and an experimental group. While using an experimental and a control group does not make this study unique, given the lack of consensus regarding the implications of explicit critical thinking instruction, this study will add to

the discussion on the impact of such instruction in comparison to a lack thereof. In addition, whereas most studies rely primarily on one standardized instrument this study employs multiple measures in order to examine critical thinking skills, as well as critical thinking dispositions, using various methods of data collection, including multiple choice, Likert-scale, and essay writing. Pascarella and Terenzini (2003) emphasize the increasing interest that scholars are taking to the idea that critical thinking, in addition to encompassing skills and abilities also includes elements of motivation and disposition. This study uniquely brings together critical thinking skills as well as dispositions, using a pre-test/post-test model, employing an experimental and a control group of first-year college students.

This study employs action research such that the instructor/researcher, using comparable syllabi (Appendix B), teaches two groups of the same course at one university during the Fall 2004 semester, and then analyzes the data obtained from the students in these courses. The only known difference between the two groups is the infusion of explicit critical thinking instruction, including the use of a critical thinking textbook, in the experimental group, while the control group receives no explicit critical thinking instruction or critical thinking textbook. This study employs a pre-test/post-test design for two standardized online tests of critical thinking, the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI) (Appendices D and E, respectively). As part of the administration of the post-tests, students will complete a comprehensive questionnaire (Appendix F) regarding their experiences in and around enrollment in the course.

This study uses primarily descriptive statistics, along with various forms of t-tests and two-way ANOVAs, and qualitative thematic analysis to determine whether participation in a first-year transitions course infused with explicit critical thinking instruction influences students' critical thinking abilities and dispositions, as compared to participation in a first-year transitions course wherein there is no explicit critical thinking instruction. Gender differences in the areas of critical thinking skills and critical thinking dispositions are also examined. In addition, this study incorporates students' perspectives on their growth in the areas of critical thinking skills and critical thinking dispositions.

First-Year Program at the University of Maryland

The first-year seminar program at the University of Maryland (UMD), also known as UNIV, *An Introduction to the University*, has essentially the same purpose as the one that exists at the University of South Carolina, described in the previous chapter. However, the course at UMD is more of an extended orientation course than an academic freshmen seminar. The program at the University of Maryland has been evolving for more than ten years, beginning with less than ten groups in 1986, to offering nearly 100 groups in the fall of 2004. According to the Faculty Manual (p. 1-4), the stated goals of UNIV are:

- To assist students in their transition to the University of Maryland community.
- To introduce students to the academic environment at the University of Maryland.
- To help students explore the world of higher education and clarify why they are in college and establish realistic goals for their collegiate experience.

- To assist students in their identification with the University of Maryland while learning about whom they are and how they fit in to the University environment.

- To help students learn the vast number of resources available to them at the University of Maryland.

- To assist students in their intellectual skill development.

- To assist students in their understanding of developmental patterns that will face them in their undergraduate career.

- To develop an appreciation for the cultural diversity at the University of Maryland.

Examining the program at the University of Maryland in relation to other similar programs across the country adds perspective to what is trying to be accomplished both at the institutional and national levels. In 2000, the National Resource Center (NRC) for the First-Year Experience and Students in Transition conducted a national survey of regionally accredited two-year and four-year institutions. One thousand and thirteen institutions took part in the survey, 75% of which were four-year institutions, 25% were two-year institutions. There was approximately a 50/50 split between public and private institutions (Skipper, 2002, p. 12).

The first-year seminar at the University of Maryland, UNIV100, is a one-credit course, running for only the first ten weeks of the semester (approximately 80% of the UNIV groups are 100-level). UNIV101 is a two-credit course, running the length of the semester incorporating all that is covered in UNIV100 as well as additional material left to the discretion of the instructor. According to the NRC, the one-credit seminar is most common, followed by the three-credit option. When the seminars are considered part of

an extended orientation program, 62% carry one-credit. When the seminars are more academically oriented, they are more likely to carry three-credits (Skipper, 2002, p. 38). Performance in UNIV, both 100 and 101, is assessed using letter grades, as is the case in more than 80% of other institutions that offer this type of course (Skipper, 2002, p. 26). While approximately half of the institutions that have first-year seminars require students to take the course (Skipper, 2002, p. 27), the University of Maryland does not require students to take UNIV. However, certain individual colleges (Arts & Humanities, Education, Life Sciences) do require their freshmen to enroll. The Orientation Office, a division of Undergraduate Studies, administratively runs the UNIV program. The Office provides training for new, as well as seasoned instructors. Training is provided by approximately 77% of the institutions that offer freshmen seminars. However, less than 20% of those that offer training dedicate two-days to this experience, as is done at the University of Maryland (Skipper, 2002, p. 54). While the Orientation Office is the administrative center of UNIV, college-specific groups are offered so that the course can be tailored to particular disciplines. Like almost half (47.5%) of the other institutions that offer first-year seminars (Skipper, 2002, p. 24), the University of Maryland limits enrollment to a maximum of 20 students to each group. As at many large research institutions, a class of 20 freshmen students and one instructor is a unique and valued opportunity among students and faculty alike. According to a study on student interaction in freshmen seminar courses by Reynold and Nunn (1998), students that participate in first-year program report having substantially more interaction in this course than in their other courses. Faculty members report using the freshman seminar as a tool for developing innovation in their teaching that they can then transfer to their

discipline-based courses (Hunter, Skipper, & Linder, 2003). Both students and faculty

appear to benefit from the "supportive and non-threatening atmosphere" (Reynold &

Nunn, 1998, p. 15) created by using students' names, as well as incorporating their ideas,

valuing praise, and being open to humor.

Infusion of Critical Thinking in a First-Year Transitions Course

The course design of the experimental group in this study, wherein critical

thinking is infused into a first-year transitions course, is based primarily on the work of

John Chaffee (1999). Compared to other researchers reviewed in the previous chapter,

Chaffee is unique in his attempt to combine critical thinking development with first-year

transitions issues. Chaffee first developed The Critical Thinking program at LaGuardia

Community College in 1979, based on the assumption that "thinking is a process that can

be understood and improved through proper study and practice" (Chaffee, 1999a, n. p.).

The program is now being offered, in some fashion, at over 500 institutions. Chaffee

makes reference to the growing demand for college graduates that are not only skilled in

their major but can also think, reason, communicate, and solve problems. He argues that

college students' critical thinking skills grow little during their years of study because

college teaching, for the most part, treats students as if they are at the lowest cognitive

level by simply dispensing facts, rather than fostering the development of higher-order

intellectual abilities (Chaffee, 1999). Chaffee strongly disagrees with the argument that

students cannot begin to think critically until they have content or discipline knowledge,

and therefore critical thinking is inappropriate for freshmen learning.

By viewing entering students as something less than fully-functioning, intellectually competent human beings, capable of thinking deeply and communicating about important issues, these [freshman] programs have typically been under-designed with simplistic content and unimaginative, unchallenging approaches…If we assume that entering college students are intellectually capable, as they surely are, and then design programs that will challenge their thinking abilities and ignite their motivations, then these students are capable of extraordinary achievements.   (Chaffee, 1999a, n. p.)

Chaffee also disagrees with the debate about whether critical thinking should be taught in a separate course or integrated into the entire curriculum. He insists that this should not be a question of either/or but rather, when possible, why not both? A separate course in critical thinking lays a solid foundation, defining for students what the institution means to be "critical thinking." Such a course can serve as a catalyst for further cognitive development to take place within standard curriculum, discipline-based courses. Through a process of synthesis, students given the opportunity to think critically can learn to better understand themselves, as well as the world around them (Chaffee, 1999).

Students in the experimental group of this study are exposed to ways of thinking that encourage both more breadth and depth of conceptualization. In addition to participating in critical thinking classroom activities that will not be a part of the control group, students in the experimental group are issued Chaffee's text, *The Thinker's Guide to College Success* 1999). The course guides students as they develop their critical thinking skills as well as their dispositions toward critical thinking based on both their individual backgrounds and the new context of college life. Given that this course is not

discipline focused, students are able to devote time specifically to improving their thinking skills as a way to better understand themselves and the world around them. The course merges critical thinking instruction with the realities of everyday decision-making on a college campus, thereby providing students with a set of skills and attitudes applicable to their lives. Therefore, while no disciplinary content is covered in the course, the course is not without content. As students' thinking skills and dispositions are nurtured, they are learning about becoming resourceful, prepared, intellectually and socially adjusted college students at the University of Maryland.

Research Questions

1) Do students who participate in a transitions course infused with critical thinking instruction score higher on tests of critical thinking skills and disposition than students who participate in a transitions course without critical thinking instruction?

2) Does the relationship between participation in a first-year transitions course infused with explicit critical thinking and scores on tests of critical thinking skills and dispositions vary between men and women?

3) Do students attribute self -growth in the areas of critical thinking skills and critical thinking dispositions to taking a first-year transitions course? Is self-reported growth different for students in the group infused with critical thinking instruction than they are for students in the group without critical thinking instruction?

Action Research

Following the example of Reed and Kromrey (2001), this study uses action research to study critical thinking. Reed and Komrey (2001) applied action research in their study of teaching critical thinking, according to Paul's (1990) model, in a community college. Employing multiple measures and statistical analyses to the data that they collected from their own students, Reed and Kromrey determined that explicit critical thinking instruction infused with curricular content is more beneficial to students' critical thinking development than critical thinking instruction that is implicit and immersed in the curricular content.

When one person is simultaneously the teacher of a course (or courses, as is the case in this study) and the researcher of a study, it is necessary to delineate this dual role. A methodology of this sort is referred to as "action research," "practitioner research," "classroom research by teachers," or simply "teacher research" (Angelo & Cross, 1993; Hopkins, 2002; Jacobson, 1998; McLean, 1995; van den Berg, 2001; Walker, 2001; Zeni, 2001). For the purposes of this study, the term action research is applied.

Action research is a variation of evaluation research, which focuses on "a particular practice at a given site" (McMillan & Schumacher, 1997, p. 22). Evaluation research is used in education to determine whether a given practice works and can be applied more broadly at research sites under specific conditions. Action research is a process by which instructors seek to improve the practice of teaching by researching and evaluating the consequences of educational decisions within the context of their own classroom (Jacobson, 1998; McLean, 1995). It "is uniquely appropriate for exploring the outcomes of organizing acts of teaching and contexts for learning in particular ways"

(Jacobson, 1995, p. 125). Because this type of research is highly contextual, the findings of such studies have limited generalizability. A new theory that can be generalized across multiple settings to a large population will not be generated by action research given that this research provides only a small perspective or example of a particular practice. Some researchers find this to be an inherent problem in connecting practice with policy formation (Buysse, Sparkman, & Wesley, 2003). However, new knowledge that can be applied to the practice of specific instruction is produced (Jacobson, 1998; McMillan & Schumacher, 1997). The outcome of action research is new knowledge about what constitutes an effective teaching practice, with the acknowledgement that such practice continues to be subject to negotiation due to variation in the participants as well as the context of research.

Action research first emerged in the 1940s, with the work of Kurt Lewin in the field of social psychology, and was quickly adopted by social scientists as well as practitioners. However, during the 1950s and 1960s, the method was condemned by scientists for its lack of rigor and small-scale nature, leading to a decline in its use. In the 1970s action research began to regain popularity being used, not only in solving problems, but also in developing curriculum grounded in teaching theory. This reemergence was in large part due to the work of Lawrence Stenhouse and John Elliot, who viewed the work of teacher research not as an end, but as means to curriculum change and the development of new teaching strategies (Hopkins, 2002; McLean, 1995; Walker, 2001).

More commonly used in research on elementary and secondary education, action research is gaining legitimacy as a form of inquiry among researchers in higher education

as well (Jacobson, 1998; Hammack, 1997; Walker, 2001). Action research is a methodology that can help to reduce the separation of educational problems from real students and real classrooms that is generally characteristic of university-based research, enabling professors to reconnect "professional development and pedagogy to academic disciplines and research" (Walker, 2001, p. 22). While conventional or "scientific" research is certainly relevant for advancing the field of education as a whole, as well as with regard to particular levels of education, a report published by the National Research Council (2002) concluded that a divide exists between education researchers and practitioners due to differences in goals as well as the world in which the two professions exist (Buysse, Sparkman, & Wesley, 2003). The report further concludes that this divide is one reason for the lack of public support for education; this holds for schools and other institutions of education at all levels. Action research is one way to close gap between research and practice.

Action research brings educators back to the philosophical questions of: For whom is knowledge produced? And, Who produces knowledge? It also offers a way to address some of the impracticality that often arises with conventional scientific research. For example, in conventional research, problems are usually well-defined, and ends are explicit. However, in education research, problems are often ill-defined, and ends are malleable. Action research does not call for an objective product; it is not necessarily a set program or a specific intervention. In a classroom, it can be difficult to predict which means will affect which ends, or whether the ends are appropriate measures for all the students involved.

Action research enables the practitioner to focus more on the iterative process of making educational decisions and understanding the consequences of implementing those decisions in practice (McLean, 1995). Further, conventional research requires that the researcher be objective, with little, if any, impact on what is being studied. In education research, this is often impractical. When a researcher's subjects are also a teacher's students, the subjectivity of teaching takes precedence over the objectivity of research (Hopkins, 2002). Action research enables the researcher to be embedded in the classroom context thereby connecting educational theory to practical relevance. It enables education professionals to become critically engaged with their own practices as well as their aspirations for scholarly research (Angelo & Cross, 1993; Jacobson, 1998; Walker, 2001).

Classrooms are characterized by an instability and complexity that often cannot, and perhaps should not be resolved but rather, should be worked with. This enables the researcher to better understand how results might apply to various populations. In education research, it is often difficult to control for all variables, as is the case in conventional or scientific research, and to know in advance whether a larger population will have the same combination of variables as the smaller sample being used in a study. Controlled variables are not readily transferable to the classroom. When using an "in tact" classroom, the students who are enrolled are not there for the purpose of the research; they are there for the purpose learning. Therefore, an intact classroom used in education research may or may not be representative of other classrooms. For example, students' backgrounds are an important factor in education research, as is the combination of backgrounds that are brought together in a classroom. Controlling for

background differences is not only extremely difficult it is also impractical in a real classroom. If enrollment in a class is restricted for the purposes of research, for example based on students' backgrounds, than it is not truly an in tact classroom. Where a doctor might create an experimental and control group to test a new medication, he/she has control over the age, race, and background of the participants. In comparison, a teacher testing a new instructional method does not have this same level of control over his/her participants. Practically speaking, the doctor can restrict who is eligible for the new medication after it has been tested; the same cannot be said of a new instructional method. This study is an example wherein the curriculum, what is being tested (critical thinking), the definitions being applied, and the approaches being used all influence each other (Facione, 1986). In addition, variables brought into the classroom by the students themselves can also influence the study. Theory is used to guide practice, which in turn helps educators to better understand the interaction between the two (Facione, 1986).

Connecting theory to practice provides the opportunity to link teaching to further research (Angelo & Cross, 1993; Brew & Boud, 1995; Jenkins, Breen, & Lindsay, 2003). In higher education, faculty members are encouraged to draw on research to inform their teaching. The reverse, drawing on teaching to inform research, is not given much attention. However, when teaching and research are brought together under a common concern for learning, each benefits the other. Research does not have to be narrowly conceived as an "objective product," (Jenkins, Breen, & Lindsay, 2003, p. 14) but can be more broadly conceived as a "process of enquiry." Teaching does not have to be narrowly conceived as the "transmission of what is known," it can be more broadly

conceived as an "exploration." Combining theory – both personal and formal – with research, teachers as researchers improve their practice.

Further support for the action research model can be found in students' perceptions of faculty research. According to a qualitative study by Jenkins, Blackman, Lindsay, and Paton-Salstzburg (1998), undergraduate students perceive "that there is a teaching-research nexus" (p. 135) resulting in tangible benefits for both students and faculty in the classroom. While most research in this area focuses on how students perceive discipline-based research, the incorporation of education research into the classroom context is at the crux of action research. Students who know about the research being conducted by an instructor, and can experience first-hand the product of that research, are intellectually stimulated by the instructors' enthusiasm for the subject matter, which is simultaneously being researched and taught (Jenkins, Blackman, Lindsay, & Paton-Salstzberg, 1998; Jenkins, Breen, & Lindsay, 2003). From an alternate perspective, when students know that research is being conducted and that they are the subjects, there is a risk that the Hawthorne effect will occur (McMillan & Schumacher, 1997). In other words, the students may change their behavior simply because they know they are being studied. For the purposes of this study, students were told that they were part of a study on different ways to teach UNIV courses. Emphasis was placed on the instructor's methods rather than on the students' outcomes. In addition, students will be informed that the pre-tests and post-tests they take will not impact their course grade.

Action research is primarily qualitative but often employs quantitative techniques as well therefore it does not fit neatly into either of these categories. Action research does not have the large numbers, random samples, or manipulated variables that are

generally present in quantitative studies, nor the outsider perspective that is often

employed in qualitative studies. Action research is characterized by "'small-n' statistics"

and field study (Zeni, 2001, p. 154). This study will employ both quantitative and

qualitative methods in pursuit of empirical evidence to support the conclusions of the

proposed research questions.

As with all methodologies, there is a particular strategy for the implementation of

action research (McLean, 1995). First, the outcomes being measured are identified. For

purposes of this study, the outcomes are critical thinking development and self-perceived

critical thinking development by students. The next step is to identify a standard for

comparison. In this study, two groups of the same course were used to compare the

impact of different pedagogy. Finally, the comparison is made using a selected method.

For purposes of this study, t-tests and two-way ANOVAs were performed based on

students' scores on two standardized tests of critical thinking. Descriptive statistics were

also used with these instruments. In addition, the teacher/researcher kept field notes, via

a teaching log, throughout the semester of teaching the classes, and students completed a

comprehensive questionnaire regarding their participation in this course. Both the

teaching log and the questionnaire were analyzed for themes, then compared and

contrasted between the two groups. The latter reflects the students' self-perceived critical

thinking development. The teaching log is supplementary data, reflecting the dynamics

and occurrences of the classroom experience as perceived by the teacher/researcher.

Being a teacher/researcher requires reflection regarding what is being sacrificed

and what is being gained as a result of this dual role. For research to generate

knowledge not otherwise known, new variables, behaviors, activities, activities,

and so forth are introduced and examined; new questions lead to new ways of

approaching or defining data. Something other than normal practice happens

when research takes place; otherwise, it would not be called research.

(Hammack, 1997, p. 249).

Dual role conflict emerges as a result of activities, other than those considered normal

practice, that take place between the roles of teacher and researcher (Hammack, 1997).

For example, with regard to this study, the instructor who taught both groups knew which

group was the control group and which group was the experimental group. This

knowledge could potentially bias the results. However, an advantage of having one

instructor teach both groups is that the teaching style was comparable in both groups.

In order to protect against the limitations of action research, such as dual role

conflict and lack of complete "control" over all possible variables, the study must be

systematic with regard to documentation and data gathering. The data need to be

thorough as well as come from a variety of sources; the actions taken in the classroom

must be grounded in research, justified by their relevance within a topic area; and the

methods employed for analysis must be both reliable and rigorous. The study must also

contain some element of self-reflection regarding such issues as the effectiveness of the

practice being studied. The primary job of the action researcher is that of being an

instructor. In this study, the researcher is the instructor for both the control and the

experimental group. Care must be taken to ensure that students and the course content

from both groups are treated with equal importance. The instructor researcher must also

conscientiously guard against making inaccurate assumptions regarding how students in

each group are learning. The teaching log was used to reflect on student learning in

terms of the teacher/researcher's follow-through with lesson plans, student attendance and assignment completion. The log was then used in conjunction with the quantitative analyses in an effort to provide qualitative support for the findings. Finally, as with any type of research, the action researcher must negotiate ethical dilemmas such as anonymity and ownership of data. Given the direct involvement of the teacher/researcher, ethical issues were given especially careful consideration throughout the study (Brew & Boud, 1995; Hopkins, 2002; Jacobson, 1998; Zeni, 2001).

Sample Population

The university at which this study takes place is a large, public, research institution in the mid-Atlantic region of the United States. The University does not require students to enroll in its first-year transitions course; however, the course is highly recommended. In Fall 2003, almost 60% of first-time full-time freshmen enrolled in a UNIV course (University of Maryland, Office of Institutional Research and Planning, 2004). (Students that enter the University in the Honors program are excluded from this number because they are required to take a separate similar course, HONR100).

The student participants in this study, first-time full-time freshmen, were enrolled in two groups of the same first-year transitions course, *UNIV101: Introduction to the University*. Students elect to enroll in the first-year transitions course. This creates some level of bias because the participants are a self-selected group, choosing to enroll in this type of course. However, students did not know that critical thinking development is an objective for one group and not the other, in order to avoid students self-selecting based on their interest, or lack thereof, in critical thinking. Student self-selection also limits any

claims to randomness; however, self-selection allows the closest parallel to most college courses, enabling generalizations about the learning that takes place in transitions courses.

The two groups employed for this study took place at the same time of day (9:00-10:50am), in the same classroom, for periods of one hour and fifty minutes. The experimental group, infused with explicit critical thinking instruction, took place on Tuesdays; the control group, which included no critical thinking instruction, took place on Thursdays. There were 20 students enrolled in the experimental group, and 19 enrolled in the control group for a total of thirty-nine participants in this study. Both groups were taught by the instructor/researcher, using comparable syllabi (same topics, different pedagogy), developed for the purpose of this study. These similarities, shared by the two groups being studied, provide advantages to the validity of the study. Face validity and content validity are evident when the syllabi and course guides for the groups are examined side-by-side. Known differences lie only in the pedagogy of critical thinking instruction. The underlying basis of both groups is the content covered in the University first-year transitions course. The students in both groups were drawn from the same population and exposed to the same course topics. Since the students did not know that there was any difference between the two groups, there is, hypothetically, an equal chance of each student signing up for either group.

Procedure

This study compares two methods of instruction: one intentionally directed toward critical thinking development, the other with no such direction. The latter serves

as a control group, which has not often been used in studies on critical thinking development (Facione, 1997). The researcher developed syllabi and course guides detailing the differences between the two groups in advance of the first day of the semester.

Two instruments, the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI), described later in this chapter, were administered in pre-test/post-test fashion on the second and final course meetings, respectively, in each group. These instruments were administered through an online company, Insight Assessment, based in Millbrae, California. The researcher established an account with Insight Assessment during the summer preceding data collection. This involved setting up a personal profile and creating two sets of passwords so that students from the two groups would log on differently in order to keep the control and experimental results separate. During the summer, the researcher also made arrangements to use the computer lab on campus for the pre-testing and post-testing of both groups so that all of the students would take the tests under the same conditions. JavaScript, the software necessary for the CCTST and CCTDI was not already on the computers so the researcher went through the appropriate channels to gain administrative access in order to download JavaScript and then did so on each individual computer in the lab.

On the first day of class students in both the experimental and control groups were notified that their group of the first-year transitions is the subject of a pedagogical study and were asked to sign consent forms (Appendix A); all agreed to participate. During the second and final sessions of class students in both groups met in a campus computer lab

to take the Critical Thinking Dispositions Inventory (CCTDI) as well as the California Critical Thinking Skills Test (CCTDS) online. Each student created a login name and password at the time of the pre-test to be used again at the time of the post-test. This information was kept on file in the researcher's Insight Assessment account in case students needed to reference them to log on at the time of the post-test. The file displayed only a list of logins and passwords, no test information. The computer assigned each student a "test-taker number." In each group, two students did not come to class on the day of the pre-tests and made arrangements to take the tests at a later date. Once all of the data from the pre-tests and post-tests were collected, the names students provided for their initial login were separated from the test results so that students could be identified only be their test-taker number.

Upon completion of testing, the researcher moved the online results into EXCEL and SPSS files for data analysis. Scores were examined in two ways. First the scores were standardized for more meaningful statistical analyses. In addition, the actual scores were compared with each other – control versus experimental group, and male versus female. The results of these analyses were used to answer the first two research questions.

The questionnaire was administered on the day of the post-tests. Students were told to respond without writing their names and to put the completed questionnaires in a folder that was near the exit on of the computer lab. Two different folders were used to collect the questionnaires: one for the control group and one for the experimental group. The researcher did not examine the questionnaires until both groups completed them. The responses to the questionnaires were used for primarily two purposes. The first was to collect supplementary information about the students: to determine whether the

students in the two groups had similar pre-college academic backgrounds, as well as whether the students in the two groups were enrolled in similar courses for their first-semester. The second purpose was to answer the third research question and to provide corresponding information to the themes presented from the teaching log, discussed in the next chapter, from the students' perspectives.

Treatment

Students in experimental group of this study were taught using activities that emphasized explicit critical thinking skill and disposition development (Chaffee, 1999; Reed & Kromrey, 2001). It is important to note that explicit, rather than implicit, instruction was used, and an infusion, rather than an immersion, approach. Students were made aware that they were learning techniques for the development of critical thinking skills and dispositions (explicit) within the context of the material being covered in their first-year transitions course (infusion). However, students were not prepped on specific aspects of the tests, as this would damage the validity of their measurement (Ennis, 2003). In addition, the students in the experimental group used a textbook that is oriented to critical thinking instruction, *The Thinker's Guide to College Success*, by John Chaffee (1999). The students in the control group used a textbook written solely for the purpose of a general first-year transition course, *Your College Experience: Strategies for Success*, by John Gardner and A. Jerome Jewler (2004). The syllabi and course guides for the experimental and control groups are included as Appendices B and C, respectively. While the syllabi are almost identical, the differences between the groups are clear when the course guides are taken into account. Students in the experimental group took part in

many more activities involving analysis, interpretation, evaluation, and synthesis. A few topics highlight the differences between the experimental and control groups very clearly. The following are examples of the differences in pedagogy between the experimental and control groups. However, differences between the groups are not limited to these examples.

During the fourth class meeting both groups cover "The Impact of Underage Drinking On Campus and In Society." However, the in-class activities used to discuss the topic are quite different. Students in the experimental group took part in an activity, Tom Randall's Halloween Party, created by John Chaffee (2003, pp. 93-109), for the purpose of prompting students to use critical thinking skills. This activity provides a scenario in which a 21-year old college student (Tom Randall) throws a party and serves alcohol to minors. One of the minors leaves the party and, as she is driving home, hits two people, one of whom is killed. The woman driving the car is being charged with driving while intoxicated and vehicular manslaughter. Tom is being charged with involuntary manslaughter. Students in the class become "jurors" for Tom's trial. They read, evaluated, summarized, and formed opinions about witnesses for the defense and the prosecution. They analyzed the major arguments then had to reach a verdict. Students were also asked to brainstorm about possible ways to reduce the amount of drinking that takes place among college students. The control group went in a completely different direction with the same topic. Students in this group took part in an activity, Cheers! (Lothian, n.d.), an activity created to emphasize personal responsibility with regard to alcohol consumption. This is a three-part activity during which students share both positive and negative stories that involved alcohol. It is during the latter that

students are often struck by the severity of the implications of underage drinking. Students were then prompted to discuss ways that they can help each other stay safe when alcohol is involved with their activities. Students were also provided with a series of facts and statistics about alcohol use among college students, and given the opportunity to discuss these as well. Topics such as safety and control, medical emergencies, sex, and violence were addressed with relation to alcohol.

The "Difficult Discussions" topic on the eighth week of the course was also approached quite differently in the two groups. For example, in the first part of this two part series (i.e., two class sessions are devoted to this topic), crime was the focus, with an emphasis on date rape. In the control group, students discussed crime, in general, on campus versus where they grew up. There was a brief review of campus policies and illegal activities on campus. In addition, students were given an article about date rape to read in class, and discuss in small groups. In the experimental group, students took part in an activity called Thinking Aloud Pair Problem Solving (TAPPS) (Lochhead & Whimbey, 1987; Hartman, 1998). They were given problems dealing with campus crime and date rape and had to take the roles of both thinking aloud and listening/questioning. In this activity, finding a "right" answer is not the goal; the goal, according to Lochhead and Whimbey (1987), is to understand the process of thinking.

The third example comes from the class period focused on "Being an Engaged Citizen." In the control group students were asked to brainstorm about various social issues, how individuals were divided over these issues, and whether they think the issues will persist over time. No one topic was focused upon for more than a few minutes but students were given the opportunity to express their beliefs and to respectfully challenge

each other. In the experimental group, students were given a series of short articles about gun control – both pro and con. The class was randomly divided in half so that students may or may not be on the side with which they agree. Students were be given time to work with their peers to build arguments in order to defend their "side." They then took part in a debate. Following the debate, students were given an opportunity to express their real beliefs, if they were different from those that they defended for the activity. Finally, the class as a whole analyzed both the topic as well as the activity itself.

Analysis

Analysis of Covariance (ANCOVA) was used with the CCTST and the CCTDI in the initial validation study (Facione, 1991). Facione (1997) notes the importance of examining not just the mean for each subscale, but also the range, especially when comparing groups of students. However, the subscales require discretion in their interpretation. The authors of the test promote their use for diagnostic, evaluation, and assessment of groups only and urge against their use for "summative evaluations…of individual persons" (Facione, 1990d, p. 9).

Given the small sample size of this study (n= 40), it is not possible to use the more complex analytic techniques relied on by the initial validation studies. Therefore, simpler techniques, such as independent samples t-tests and two-way ANOVAs, were used to examine changes in both subscale scores and total scores for the CCTST and CCTDI. Independent samples t-tests were conducted to compare differences in gains between the pre-tests and post-tests scores for the control group and the experimental group; two-way ANOVAs were conducted to examine the possibility of differential

effects of participating in the treatment group for male and female students . All scores were converted into standardized z-scores in order to more readily understand the magnitude of the effects. Each z-scored subscale and the z-scored total score for both the CCTST and the CCTDI was entered as "testing variables" in the independent samples t-test. Participation in the experimental group was coded as a dummy variable, such that students either did (coded as "1") or did not (coded as "0") participate. The same analyses were done again with gender coded as a dummy variable, such that students were grouped as female (coded as "1") or not female (coded as "0").

In addition, descriptive statistics were calculated for the CCTST and CCTDI, including the mean for each subscale score and total score for each group, the difference between pre- and post-subscale scores and total scores, the percentile rankings for each CCTST subscale and the total score of compared to national norms provided by the publishers of the test, and the category scores (negative, ambiguous, and positive) for each CCTDI subscale and the total score provided by the publishers of the CCTDI.

It is important to emphasize that the small sample size of this study greatly restricts statistical power. Even with relatively large differences in the t-test results, comparisons between the control and experimental groups may not achieve statistical significance; this raises the possibility that the tests will fail to identify treatment effects that actually occurred. Therefore, rather than the conventional p-value of .05, the threshold for statistical significance in this study is 10; the researcher also reports relatively large differences between the control and experimental groups (.50 standard deviation or greater), even when these differences lack statistical significance.

The initial validation studies conducted by the test authors showed that the CCTST is not gender-biased, nor does it favor any ethnicity (Facione, 1990c). However, after completing a course in critical thinking, statically significant gender differences were apparent, leading to the conclusion that men and women do not benefit equally from a critical thinking course. Facione (1990c) noted that 41% of the regression model that was the result of the validation study was explained by SAT-verbal, SAT-math, and college GPA and that perhaps differences in gender would be found in these measures of student achievement. Facione and Facione (2002) hypothesized that this could be due to differences in other factors, such as student expectations for the course, learning styles of men as compared to those of women, or the effectiveness of critical thinking pedagogy for men as compared to women (p. 22). The authors also acknowledge that the differences could be the result of differing student expectations of what can be learned in a critical thinking course, differences in how men and women learn (competition versus collaboration, respectively), or differences in pedagogical effectiveness for men and women regarding critical thinking. Given these findings, gender is included as an independent variable.

Also related to the benefits of a critical thinking course, Facione (1990b) found that no significant gains in critical thinking resulted for non-native English speakers, leading to the conclusion that native English language is a statistically significant factor with the CCTST. However, when native English language ability was controlled for, no statistically significant differences in CCTST score were found. If there are any non-native English-speaking students enrolled in either group of the course, this will be taken into consideration. Otherwise, it is incidental.

Finally, Facione (1990b) found that while academic major was not statistically significant with regard to CCTST pre-tests, post-test scores following a semester of critical thinking instruction did show significant variation. Students in all majors benefited from the instruction (as shown by increased scores). However, students majoring in Mathematics, Engineering, Statistics, and Computer Science showed the greatest gain of 2.04; students majoring in the Natural Sciences, Physical Sciences, and Health Professions showed the smallest gain of .09 (Facione, 1990b). However, since the students enrolled in the course being studied as first-time, full-time freshmen, they will not yet have been influenced by their selection of major. Therefore, it is not included as a variable in this study.

Given that standardized tests of critical thinking do not tap students' self-perceptions of growth, the student questionnaire is used to qualify the quantified results. The questionnaires were collated in order for the answers to the questions to be compared between the control and the experimental groups. In addition, the answers were coded for themes and then compared and contrasted between the experimental and control groups. The purpose of this is to infer whether the students exposed to critical thinking instruction have more recognition of growth, and confidence in building on what they have learned in their first-year transitions course, than the students that did not have critical thinking infused into their transitions course. Since the difference in test scores as a result of one semester may not tell the entire story, the responses on the questionnaire may shed some light on whether students that have received critical thinking instruction may reap future benefits.

Instrumentation for Critical Thinking

A variety of test types are available to assess critical thinking including multiple-choice, essay, and performance assessment. Multiple-choice tests, such as the CCTST used in this study, are a common form used to evaluate a full range of thinking. However, they can be limited in terms of assessing the necessary array of skills (Daly, 1995). Some newer multiple-choice tests that require students to justify their answers, such as the Cornell Critical Thinking Test, Level X, may better test for such skills as being "appropriately cautious in drawing conclusions" (Ennis, 1993, p. 184). Essay tests are also available and come in three levels: high structure, medium structure, and minimal structure. It has been argued that essay tests are superior instruments because they require students to use critical thinking to actively construct a response as oppose to passively recognizing the correct answer on a multiple-choice test. However, the evidence to support this view is inconclusive (Facione, 1986). The greater the structure of an essay test, the more information there is to assess. However, the negative implication of this is less freedom for the students in terms of their responses (Ennis, 1993), creating the possibility of an incomplete, or even inaccurate, picture of the students' abilities. Performance assessment, the most expensive yet also the most valid type of testing, also comes with varying degrees of structure. Here, possible real-life situations are posed for students to analyze. There are two drawbacks to this method. First, a high level of realism can result in a less comprehensive test because most real life situations do not require use of all aspects of critical thinking. Second, real life situations often involve a great deal of subjectivity (Ennis, 1993).

It is important to consider the purpose of the assessment being conducted in selecting an instrument for a specific study. Ennis (1993) outlines the major purposes of critical thinking assessment: diagnosing the students' levels of critical thinking, giving students feedback about their critical thinking abilities, motivating students to become better critical thinkers, informing teachers about their degree of success in teaching critical thinking, doing research about critical thinking instruction and issues, deciding whether an educational program is appropriate for a student, and providing information to schools about the critical thinking capacities of their students.

Facione (1986) puts forward many questions that ought to be considered – in addition to questions of reliability and validity - in selecting an instrument to test critical thinking. Does the instrument differentiate between various critical thinking skills? Does the instrument test the integration of critical thinking skills? Does the instrument test the student's ability to use critical thinking to solve complex problems? Does the instrument have questions that range in difficulty as well as in the skills being tested? Does the instrument differentiate among students' varying levels of abilities? Because it is difficult to answer in the affirmative to all of the above questions with one instrument, Facione suggests the use of multiple instruments to measure student progress in critical thinking.

The Instruments Employed in this Study

This study uses two tests to assess critical thinking: the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI). The CCTST and the CCTDI were selected for use due to their

corresponding relationship with the definitions for "critical thinking skills" and "critical thinking dispositions" employed in this study. The tests as well as the definitions emerged from the work of the Delphi Project (1990), elaborated upon in Chapter II of this study. Both of these tests must be purchased from the California Academic Press and may be administered in the form of paper and pencil or via the computer.

California Critical Thinking Skills Test (CCTST), (Facione and Facione, 2002)

This 34-item multiple-choice critical thinking test evaluates analysis, interpretation, inference, and evaluation through the use of diagrammatic and text-based contexts. Six scores are obtained from the CCTST: an overall score, and five sub-scales scores (analysis, evaluation, inference, deductive reasoning, and inductive reasoning). Students will take this test during the second and final class periods of the semester. The CCTST takes 45 minutes to complete. Scoring is computer generated by CAPSCORE, a service of the California Academic Press. The cost of scoring is included in the cost of the test. CAPSCORE provides total and subscale scores for each test taker, as well as descriptive statistics, such as the range and the mean, for each group of participants (the experimental and control groups) in the study.

The specific form of the CCTST used in this study, Form 2000, is an updated, "more robust" version of the earlier CCTST, Forms A (1990) and B (1992) (Facione and Facione, 2002, p.16). In addition to other item formats, this newer version, for the first time, requires students to use information presented in charts and diagrams to answer questions. 22 of the 34 items on Form 2000 are directly from Form A; 12 items are new. A reliability/validity study, with two groups of college students from two separate

institutions, produced correlations of (0.912) and (0.871) between the scores from Form A and those from Form 2000 (Facione & Facione, 2002, p.16).

According to Facione and Facione (2002), the reliability and validity of Form A are well established. The authors of the CCTST used pre-test, post-test design, to perform cross-group and matched pairs analyses in a validation study comparing two groups of students at California State University: students who had taken a semester-long critical thinking course (experimental group) with students who had not taken the course (control group) (Facione, 1991). In all, 1169 college students from five courses representing three departments took part in the validation study. These studies produced internal consistency estimates between (.68) and (.70), using the Kuder-Richardson 20 procedure (Facione & Facione, 2002, p.16). Further, "internal consistency measures provide evidence that Form 2000 is slightly more reliable than Form A" (Facione & Facione, 2002, p.16).

In terms of content validity, the items that appear on Form A were selected from among 200 possibilities developed over a period of 20 years devoted to this research. The items were purposefully selected by the test authors to cover the domain of the five skills – interpretation, analysis, evaluation, explanation, and inference - defined in the Delphi Report (1990).   The items are discipline neutral, devoid of sex-role and social class stereotypic contexts, and include and equal number of male and female referents (Facione & Facione, 2002, p.15).

According to Facione and Facione (2002), the construct validity rests with the general consensus among authors of measurement texts that well-crafted multiple-choice questions can validly and reliably measure cognitive skills such as critical thinking

(p.19). In addition, given that the test was created to precisely measure the Delphi Study

conceptualization of critical thinking there is further support for its construct validity.

Still, it is difficult to determine whether students who perform well on the CCTST are

truly good critical thinkers (and students who perform poorly, weak critical thinkers),

because to do so would require understanding students' reasoning behind their answers.

One possible way to obtain this data is to administer the test, using only a selected

number of items and having students explain their answers. This would of course require

resetting the time restrictions and performing qualitative analysis on the students'

responses.

Referring once again to the validation studies performed in 1989-1990, the cross-

group analysis (t = 2.44, one-tailed ρ < .008) indicated significant improvement (+0.74)

in mean score (from 16.09 to 16.83) for the experimental group. In the matched pairs

analysis, the experimental group again showed a significant improvement (+1.45) in

mean score (from 15.94 to 17.39 with a standard deviation of 4.59) (t = 6.60, df = 231, ρ

< .001). The analyses indicated no significant improvement for either control group

(Facione & Facione, 2002, p. 19). The validation studies "succeeded in detecting

statistically significant growth in CT skills hypothesized to have resulted from courses

approved specifically for CT instruction" (Facione, 1991, p. 5). In a related study, pre-

test and post-test means for two independent groups were compared, to examine whether

a "test effect" existed (i.e., whether students' scores improved on the second

administration of the test due to previous knowledge about test contest); none was

observed (Facione & Facione, 2002, p.19). These results led the Delphi panel to

conclude that critical thinking at the college level can be "taught, learned, and objectively

assessed" (Facione, 1991, p. 7), when a consensus definition of what it means to think critically is applied.

Finally, criterion validity was studied by the test authors as part of the initial validation study in 1989-90, as well as in a separate 1992 research project examining the critical thinking development of nursing students (Facione, 1997). The CCTST correlates with college grade point average (GPA), as well as SAT-verbal and SAT-math (Facione & Facione, 2002, p.21). Correlations were also found with the GRE – verbal, quantitative, and analytical scales, as well as the Watson-Glaser Critical Thinking Appraisal (WGCTA). The studies also showed that, as measured by the CCTST, neither age nor number of completed semesters in college was a reliable predictor of critical thinking ability (Facione, 1990c). However, regression analyses on CCTST scores of students that had taken a critical thinking course indicated that "71% of the variance in CCTST post-test scores can be predicated by a combination of SAT-verbal, SAT-math, college GPA, and the CCTST pre-test scores (ρ = .001). Removing the CCTST pre-test from the analysis produced a regression model which predicted 41% of the CCTST post-test variance on the basis of a combination of SAT-verbal, SAT-math, college GPA, and high school GPA (ρ = .001)" (Facione & Facione, 2002, p.21). Both, the validation study (Facione, 1990c) as well as the study involving nursing students (Facione, 1997), demonstrate a clear connection between critical thinking and academic ability.

Each of the 34 items that appears on the CCTST is assigned to one of the first three subscale groups listed below. Items 1-9 relate to the critical thinking skills of interpretation and analysis and are scored under the first subscale; items 10-13 and 25-34 relate to the critical thinking skills of evaluation and explanation and are scored under the

second subscale; items 14-24 relate to the critical thinking skill of inference and are scored under the third subscale (Facione, 1990d). Thirty of the 34 items are simultaneously classified as either inductive or deductive in nature, based on the purported strength of the inference (these are the final two subscales).

Analysis – This sub-scale measures the ability to comprehend and express meaning through the skills of categorization, decoding significance, and clarifying meaning. It also measures the ability to identify relationships through the skills of "examining ideas, detecting arguments, and analyzing arguments into their component elements" (Facione & Facione, 2002, p.5).

Evaluation - This sub-scale measures the ability to assess credibility through the skills of "assessing claims and assessing arguments." It also measures the ability to state and justify one's reasoning through the skills of "stating results, justifying procedures, and presenting arguments" (Facione & Facione, 2002, pp.5-6).

Inference – This sub-scale measures the ability to identify the information necessary to form a hypothesis or conclusion, and to recognize consequences, through the skills of "querying evidence, conjecturing alternatives, and drawing conclusions" (Facione & Facione, 2002, p. 6).

Deductive Reasoning – This sub-scale measures the ability to recognize the logical strength of inference wherein "it is not logically possible for the conclusion to be false and all the premises true" (Facione & Facione, 2002, p.6).

Inductive Reasoning - This sub-scale measures the ability to recognize the logical strength of inference wherein "it is unlikely or improbable that the conclusion would

actually be false and all premises true, but it is logically possible that it might" (Facione & Facione, 2002, p.6).

The University of Hawaii West Oahu (UHWO) administered the CCTST to all students taking a particular critical thinking course from Fall 1993 though Fall 1998; a total of 278 cases. The CCTST was administered as a pre-test early in the first week semester and again as a post-test in the second to last week of the semester. The mean for the pre-test scores was 15.2 with a standard deviation of .3. Scores were normally distributed, ranging from 5 to 27. The mean for the post-test scores was 16.2 with a standard deviation of .4. Scores were normally distributed, ranging from 5 to 30. The post-test scores varied from semester to semester more so than the pre-test scores, and also exhibited higher scores overall and a wider variance. However, difference between semesters, both on the pre-tests and post-tests was insignificant. With a strong positive correlation between pre-test and post-test scores, an ANOVA determined that pre-test scores explain 43% of the variation in post-tests scores. It was suggested that, due to the obvious correlation, use of this model might be problematic. It was further hypothesized that the addition of other variables, such as GPA, would likely be helpful. T-tests did indicate a significant difference between pre-test and post-test scores (UHWO Assessment Office, 2001). However, it is unclear from these findings to what the changes in scores can/ought to be attributed.

California Critical Thinking Disposition Inventory (CCTDI), (Facione, Facione, & Giancarlo, 2001)

The CCTDI is not meant to be a measure of critical thinking abilities but rather, their dispositions toward critical thinking. The measure, which takes fifteen minutes to complete, contains no technical or critical thinking vocabulary and no level of college content knowledge is assumed. The 75 items prompt test takers to "express familiar opinions, beliefs, values, expectations, and perceptions" using a six-point forced choice Likert scale ranging from "strongly agree" to "strongly disagree" (Facione, Facione, & Giancarlo, 2001, p.6).

Facione, Facione, and Giancarlo developed the CCTDI in 1991, along side of the Delphi Report definition of the "ideal critical thinker." As the definition of what it meant to be an ideal critical thinker underwent revision, so too did the multiple item pilot prompts used in the development of this instrument. 150 out of 250 pilot prompts, initially developed by working with the consensus definition, were selected by college level critical thinking educators, for use in the preliminary version of the CCTDI. The initial pilot was administered in 1992 by the test authors, at three different comprehensive universities. Following the pilot, authors selected 75 items for the final version of the CCTDI based on "internal consistency and their ability to discriminate between respondents" (Facione, Facione, & Giancarlo, 2001, p.4). As is the case in attitudinal measures, face validity was not desired. This is due to of the potential of test takers responding in a manner that is "socially desirable." To prevent this outcome, the various scale items were interspersed.

The seven subscales: truth-seeking, open-mindedness, analyticity, systematicity, critical thinking self-confidence, inquisitiveness, and maturity, described in detail below, are constructs that resulted from a factor analysis of the pilot test results (n=164), with mean loadings ranging from a low of (.387) for "analyticity" and a high of (.528) for "critical thinking self-confidence." Cronbach's alpha confirmed the internal reliability of each factor. For each of the seven scales there are nine to twelve items "interspersed throughout the instrument" (Facione, Facione, & Giancarlo, 2001, p.5). In other words, the items do not appear in categories according to the disposition they are measuring. Several items on the CCTDI load on more than one factor due to the conceptual framework within which the instrument was created. The factors are non-orthogonal and non-discrete, however, discrete scales are forced in scoring the instrument (Facione, Facione, & Giancarlo, 2001, p. 5).

The alpha reliability for the CCTDI total score on the pilot was .91 (Facione, Facione, & Giancarlo, 2001, p.5). The seven scales ranged from .71 for "Truth-seeking" to .80 for "Inquisitveness." The final version of the CCTDI, tested in 1993 on 1019 college freshmen, provided further empirical evidence of internal reliability with an alpha of .90 for the overall score and scale scores ranging from .60 to .78 (Facione, Facione, & Giancarlo, 2001, p.5).

Each scale is computer scored from 10 to 60 for possible total scores of 70 to 420. "[O]verall scores below 210 indicate a significant opposition to critical thinking" (Facione, Facione, & Giancarlo, 2001, p. 13); scores between 210-280 indicate ambivalence; scores between 280-350 indicate a fairly positive overall disposition. Scores of 350 and above are relatively rare, especially for undergraduate students. The

authors of the instrument recommend paying more attention to the scale scores than the total because "…each scale addresses an individual and essential component of the critical thinker's habits of mind, and no individual disposition can be dismissed as less important to nurture" (Facione, Facione, & Giancarlo, 2001, p.13). However, Facione (1997) found that freshmen students that demonstrated weakness on one scale, tended to demonstrate weakness on the other scales as well; the same is true for students that demonstrate strength. The target score for each scale is 50. A score above 50 indicates strength in that disposition; Scores between 50-40 are considered "positive," scores between 40-30 are "ambivalent," scores below 30 are considered "negative" (Facione, Facione, & Giancarlo, 2001, p.13).

Truth-Seeking – This sub-scale measures the desire to search for "honest and objective" findings, even if these findings do not support one's interests or opinions (p.2). Truth-seeking is the motivation to pursue knowledge in order to find the best information and ideas.

Open-Mindedness – This sub-scale measures the tolerance "of divergent views with sensitivity to the possibility of one's own bias" (p.2). Open-mindedness is the attitude that others are entitled to hold their own opinions.

Analyticity – This sub-scale measures an awareness of potential problems or complications. Analyticity acknowledges the importance of applying reason and using evidence in order to resolve challenging situations.

Systematicity – This sub-scale measures the tendency to be "organized, orderly, focused, and diligent" in inquiry (p.3). Systematicity reflects an organizational approach (no matter linear or non-linear) to specific issues.

Critical Thinking Self-Confidence – This sub-scale measures "trust in one's own reasoning process" (p.3). Critical thinking self-confidence is trust in one's own ability to make judgments as well as holding the belief that others trust in your ability to make such judgments.

Inquisitiveness - This sub-scale measures "intellectual curiosity" (p. 3). Inquisitiveness reflects a desire to be well-informed and to learn, even if there is no apparent need to acquire this new knowledge.

Cognitive Maturity – This sub-scale measures the tendency to make "reflective judgments," thereby addressing both cognitive maturity and epistemic development (p.3). Maturity displays the level of acceptance that some problems are ill-structured, with more than one viable answer, requiring a decision to be made without certainty.

Facione and Facione (1997) examined the CCTDI in relation to academic achievement of college students. While overall scale scores do correlate significantly with the ACT and the SAT-verbal, the relationship between overall CCTDI score and critical thinking skills, as measured by the CCTST, is "fairly weak" (Facione, Facione, & Giancarlo, 2001, p.7). Gender, cultural ideology, and motivation were hypothesized to be of influential in the complex relationship between critical thinking skills and critical thinking dispositions (Facione, Facione, & Giancarlo, 2001, p.7).

The Ennis-Weir Critical Thinking Essay Test

The researcher planned to administer the Ennis-Weir Critical Thinking Essay Test, post-test only, within the first few weeks of the Spring semester (the semester immediately following that in which the students were enrolled in UNIV101). The

reasoning behind the delay in the administration of this instrument was two-fold. First, it was a matter of available time. The Ennis-Weir is a 40-minute test. Administering this during the semester would have resulted in one less day of instruction. The second reason was that the delay would allow the instructor/researcher to examine how much of the critical thinking instruction was retained over a one-month break from school.

The intention was to use this additional test to provide a more well-rounded picture of students' critical thinking progress. The use of multiple instruments would make it easier to differentiate between various critical thinking skills and to examine varying levels of abilities. In addition, the use of an essay test provides a greater opportunity for the integration of these skills (Facione, 1986).

Unfortunately, the delay in administration until the following semester resulted in too much attrition for the data to be useful. The researcher sent an email to all of the students asking them to volunteer for this final assessment (it was mentioned at the end of the fall semester that this request would be made). The email explained that test would be self-scheduled based on a time convenient to each individual student. A follow-up email was also sent. Approximately half of the students replied that they would be happy to help but then failed to schedule a time; some scheduled a time and then failed to show up. In all, ten students took the Ennis-Weir, three from the experimental group, seven from the control group.

Student Questionnaire

Students in both groups completed a brief short-answer questionnaire, designed by the researcher, on the last day of class. The aim of this questionnaire was to give

students an opportunity to reflect on their own growth that may have, or have not, taken place as a consequence of taking UNIV101. Cromwell (1992) reminds researchers of the importance of students' ability to take ownership in what they have mastered, and that this is an important piece in the assessment of critical thinking. The questionnaire will also permit the instructor/researcher to examine whether students' self-perceived increases, or lack thereof, in critical thinking development correspond to test scores in each of the two course groups, as well as whether gender is a factor in students' self-perception of their critical thinking abilities. Li, Long, and Simpson (1999) found that gender was a significant factor in self-perceived gains in critical thinking ability with women self-reporting lower gains in critical thinking ability than their male peers. This provides insight into students' intellectual self-esteem and confidence, which may in turn impact students' willingness and ability to apply what they learned in the transitions course.

The questionnaire took approximately 25 minutes. Confidentiality was maintained by asking students to not include their names. The data collected through the questionnaire were analyzed by comparing students' responses in the control group to those of students in the experimental group in terms of percentages when applicable (i.e., students were asked a few dichotomous questions but also asked to explain their responses) as well as coding for themes. Themes were then compared and contrasted in terms of their emergence in the experimental versus control groups of the course. This data informs the final research question of this study regarding students' self-perceptions of growth. Students' views of their abilities are important to understanding whether a foundation for further learning has developed. As stated previously, the difference in

critical thinking skills and dispositions, based on standardized tests after only one semester of explicit instruction, may not be great. However, one course can set a foundation for, and even accelerate, future learning.

Teaching Log

The instructor-researcher maintained a teaching log throughout the semester of the study for the purposes of reflecting on the planned activities and the way in which the activities are carried out. The log therefore is reflective of the teaching guides for each group including the content covered, activities used, and critical thinking treatment. Entries were made following each class group for both the control and the experimental groups. The teaching log helped to increase the instructors-researcher's awareness of the activities being conducted as well as the ways in which students experienced the activities. This organized record was then be coded for themes once both classes end. The log will further be examined in relation to the students' responses on the questionnaire (described above). These analyses help the researcher to understand where and when throughout the semester students' growth progressed. Such information will be useful for future instruction.

Limitations

This study is subject to multiple limitations. Perhaps the greatest limitation is that consensus has yet to be reached among scholars of critical thinking, higher education faculty and administrators, or even government researchers regarding the teaching and assessment of students' critical thinking skills and dispositions. Evidence of this can be

found in the many definitions that exist for this concept, the debates regarding appropriate pedagogy and the multitude of instruments available for its assessment. As stated throughout this chapter, and elaborated upon in the literature review of this study, the concepts themselves are ambiguous, the instruments available to measure the concepts are numerous, and the variables that might effect students' development in these areas are at times nearly impossible to control for. The use of standardized instruments to measure a concept as broad as critical thinking is a weakness to this research. These instruments limit the generalizability, and potentially decrease the validity, of this study because they are limited to a prescribed definition of critical thinking that may not be shared across institutions, or across studies of institutions.

Particular limitations lie in this study's use of a small non-random sample at one institution, with a single instructor-researcher. This is a highly "local" study, "fundamentally different from knowledge produced through" more traditional research (Buysse, Sparkman, & Wesley, 2003). It is difficult to know whether the same teaching techniques used with the treatment groups would have the same, or a different, impact on students if employed by a different instructor and/or to a different group of students, using different instructional material (i.e., textbook, activity handouts, etc.). Since the treatment group used a critical thinking textbook not used by the control group, it is impossible to determine whether the textbook or the pedagogy had a more differential effect on student learning. For the purposes of analyses, the small sample size translates into results that are not "statistically significant," thereby eliminating generalizability of the findings. In addition, one semester may not be enough time to assess whether changes in critical thinking development have occurred. As stated previously, the

purpose of this study is to determine whether critical thinking development can be accelerated, by infusing critical thinking instruction into a first-year transitions course. More significant differences between the students in the experimental and control groups may evolve over time, as students in the experimental group are able to apply the tools learned in this course to other courses taken throughout their college careers.

While broad generalizations of the results of this study cannot be made, the results can be used to inform more specific curricular decisions regarding the use of critical thinking instruction in basic first-year transitions courses that are offered at colleges and universities across the country. In other words, the results might not be applicable across all institutions of higher education though they may be of use to institutions that have programs similar to the one examined in this study.

Chapter IV: Results

Introduction

Having established the definition and role of critical thinking in higher education and explaining the methods selected for this study, this chapter turns to the results of the analyses and a discussion about the process of conducting this research. This chapter begins with the results of the student questionnaire in order to provide additional insight regarding the students who composed the sample. The first two research questions are addressed using the results of the California Critical Thinking Skills Test and California Critical Thinking Dispositions Inventory. The results of the analyses conducted on the test results are displayed through the use of graphs and tables and discussed in further detail to place the results within the context of this study. The final question is addressed using the results of the student questionnaire. After addressing the research questions, I examine results based on the teaching log and the questionnaire.

Student Questionnaire

Once again, the first purpose of the questionnaire was to collect supplementary information about pre-college academics as well as first-semester courses. The results indicate that all of the students in both the control and the experimental groups were enrolled in Honors courses, Advanced Placement courses, or both during high school. In addition, 79% of the control group and 85% of the experimental group took part in some type of leadership activity (e.g., student government, honor society, volunteering).

As for the classes and activities in which students were enrolled or involved with during their first semester, there are some similarities and some differences. Similarities:

- 44% of the control group and 40% of the experimental group enrolled in a Science course during their first semester at the University.

- 6% of the control group and 15% of the experimental group enrolled in a Philosophy course during their first semester at the University.

- 11% of the control group and 15 % of the experimental group participated in a living/learning community during their first semester at the University.

- 11% of the control group and 10% of the experimental group joined a leadership activity or took on a role in an organization during their first semester at the University.

Differences:

- 28% of the control group and 70% of the experimental group enrolled in an English course during their first semester at the University.

- 50% of the control group and 80% of the experimental group enrolled in a Mathematics course during their first semester at the University.

Demographic information was also obtained from the student questionnaire. This information supports the researcher's decision to perform analyses based on gender difference (the second research question) but to not perform analyses based on racial/ethnic difference, even though both were discussed in the literature review. With regard to the gender breakdown, the control group was composed of 11 males and 8

females; the experimental group was composed of 10 males and 10 females. However, with regard to the racial/ethnic breakdown, the control group was composed of 14 students that categorized themselves as "White/Caucasian" and 5 students that fell into one of three minority groups: Asian, Hispanic, and Other; the experimental group was composed of 16 students that categorized themselves as "White/Caucasian" and 4 students that fell into one of two minority groups: Asian and Black/African American. Therefore, while there is literature to support studying differences between racial/ethnic populations of students with regard to critical thinking development, this study did not have an adequate amount of diversity within its sample to support such analyses.

Research Question 1: Do students who participate in a transitions course infused with critical thinking instruction score higher on tests of critical thinking skills and dispositions than students that participate in a transitions course without critical thinking instruction?

The results of the California Critical Thinking Skills Tests and the California Critical Thinking Dispositions Inventory are used to answer this question.

The California Critical Thinking Skills Test (CCTST)

The results for the CCTST pre-test and post-test are displayed in Figures 4.1 through 4.4. In each figure there are columns for each CCTST subscale score and the total score - one for the control group, one for the experimental group, and one for the experimental group minus a single outlier. The outlier in the experimental group scored substantially lower than the other students in that group (total score was more than two

standard deviations lower than the mean); thus, mean scores are examined within and without the outlier for all subscales and total scores.

Figures 4.1 and 4.2 display the CCTST pre-test and post-test raw scores. While these provide some perspective on both the movement that took place within each group, as well as how the groups compared, it is difficult to get a sense of the impact of, for example, a one-point change in the mean score.

Figure 4.1: CCTST Pre-Test Raw Mean Scores by Group
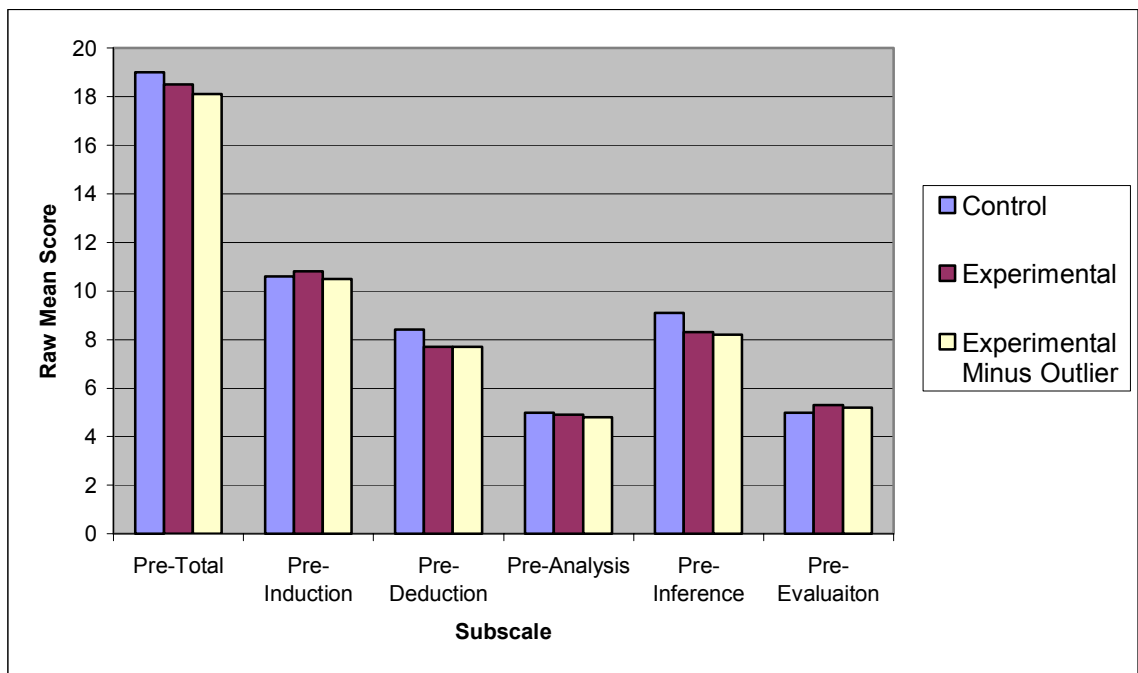
Source: Analysis of CCTST Raw Pre-Test Scores

Figure 4.2: CCTST Post-Test Raw Mean Scores by Group
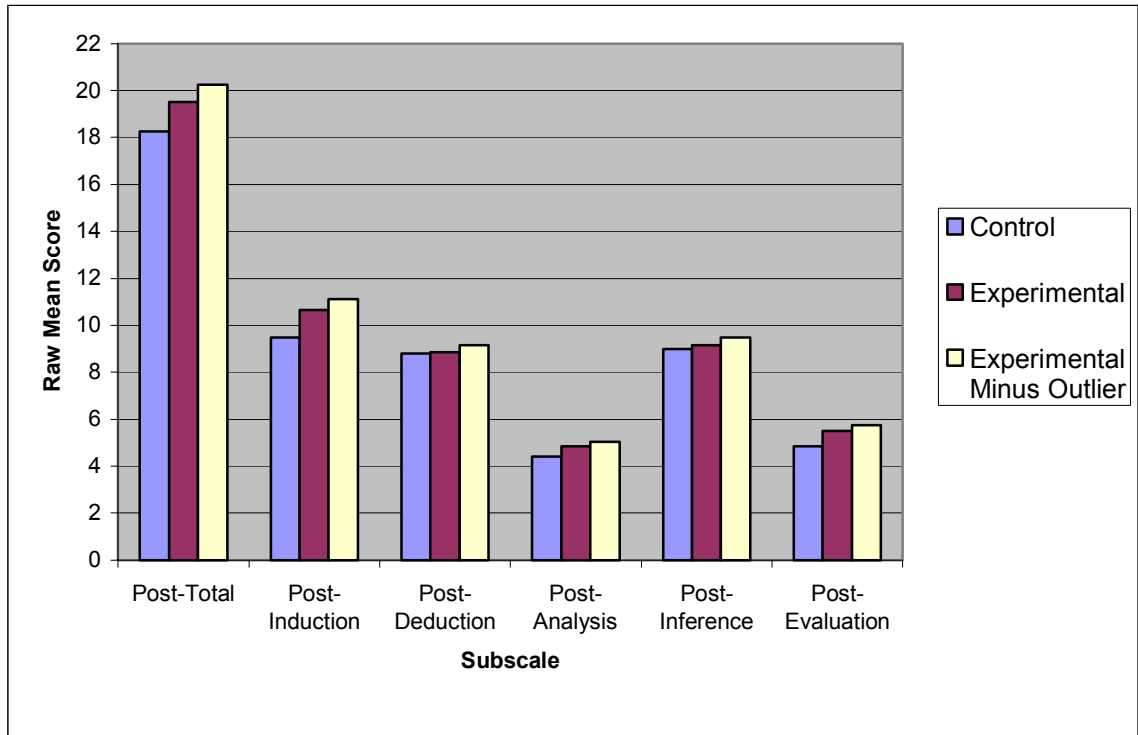
Source: Analysis of CCTST Raw Post-Test Scores

Figures 4.3 and 4.4 can also be used to examine both between group differences as well as within group differences however, these figures display the results using standardized scores. Independent samples t-tests were conducted on the standardized scores to examine the differences between the control group and the experimental group for both the pre-test and the post-test. Although the results were not statistically significant, the comparisons do provide some insight about differences and similarities between the control and treatment groups. Focusing first on the CCTST pre-test scores (Figure 4.3), overall, the experimental group, with or without the outlier, scored lower than the control group. In Figure 4.4, the CCTST post-test scores, the differences have shifted such that, overall, the experimental group scored higher than the control group.

Figure 4.3: CCTST Pre-Test Standardized Mean Scores by Group
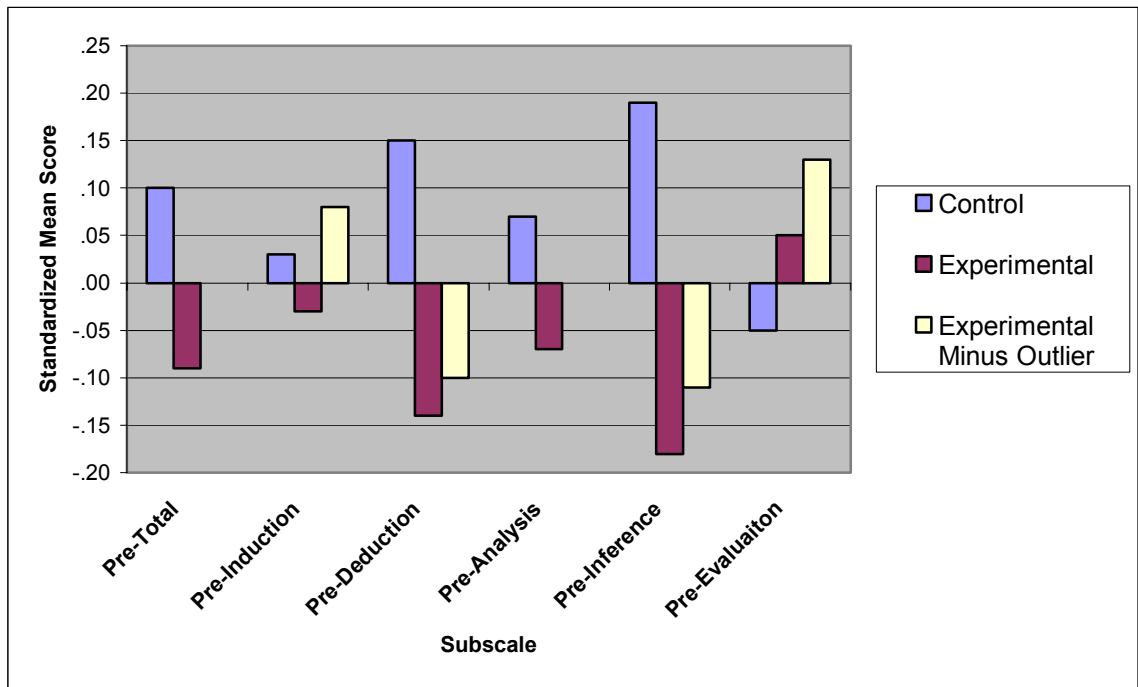
Source: Analysis of CCTST pre-test standardized means

Figure 4.4: CCTST Post-Test Standardized Mean Scores by Group
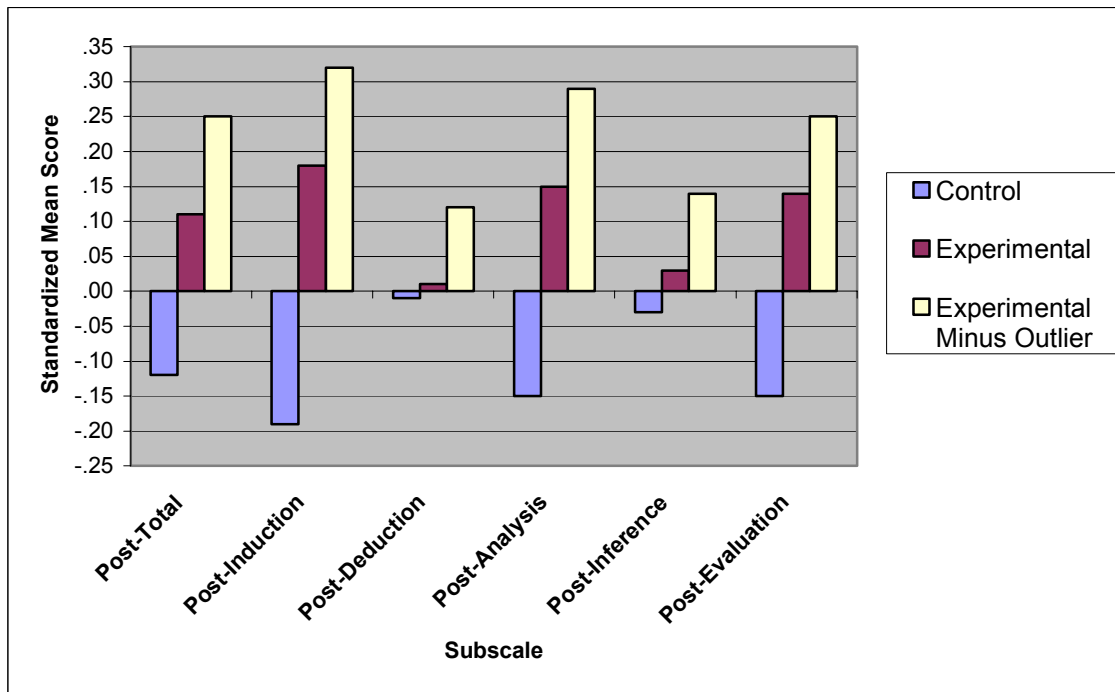
Source: Analysis of standardized means

While the previous figures examines pre- and post-test scores separately, a more meaningful examination of potential treatment effects requires examining the change in pre- and post test scores for the experimental and control groups. Figure 4.5 displays these changes or gain scores. Each subscale as well as the total score was paired pre- and post- for each, the control and the experimental group. The change in score favored the experimental group on all subscales as well as the total score, with difference in gains ranging from a quarter to almost two-thirds of a standard deviation. Independent samples t-tests were conducted to examine whether differences from pre- to post-test were statistically significant. Due in part to the small sample size, the limited statistical power biases the t-tests toward non-significance. However, with a $\rho < .10$ threshold, the experimental group scored significantly higher, more than a half of a standard deviation, than the control group, on the subscale for Induction as well as on the total score. (Table 4.1, displayed at the end of this section, provides the examined mean gain scores for this analysis). While outside factors are not taken into account, these changes could be due to the experimental groups' exposure to critical thinking instruction. This is perhaps the most useful figure for answering the first research question regarding the CCTST, because it can be used to visualize the difference between the pre- to post-test change for the control group, the pre- to post-test change for the experimental group, and the difference between the two.

Figure 4.5: CCTST Standardized Mean Difference Scores by Group
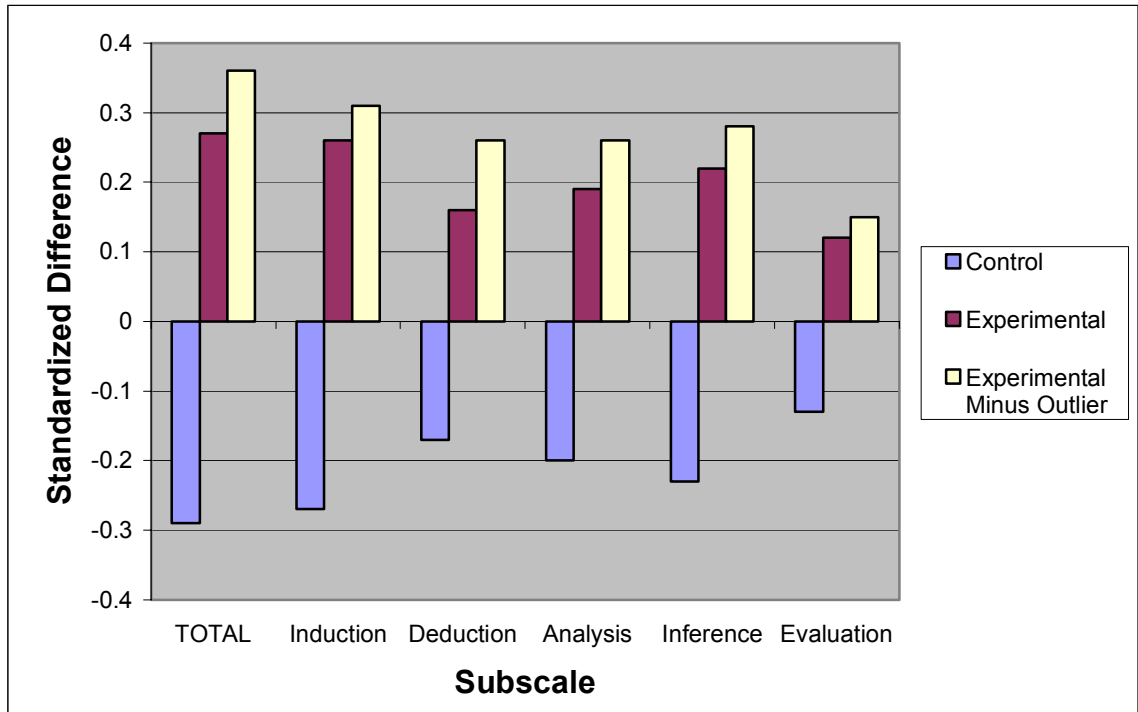
Source: Analysis of standardized difference between pre- and post-test scores.

Insight Assessment, the company that administers the online versions of the CCTST and CCTDI, publishes norms for the CCTST based on a national survey and replication study conducted in 1993/1994 by the National Center for Higher Education Teaching, Learning, and Assessment at The Pennsylvania State University (Jones et al., 1995). For all possible scores on each subscale as well as for the total there is a corresponding percentile rank. Using this information, the researcher determined the percentile ranking of each student for all subscales and the total score and then calculated the mean for each scale and the total, for the control group, the experimental group, and the experimental group minus the outlier. The results are displayed in Figure 4.6, the percentile rank for each group using pre-test scores, and Figure 4.7, the percentile rank for each group using post-test scores.

Figure 4.6 shows that the control group and the experimental group score similarly with respect to percentile norms on the CCTST pre-test. The greatest difference is found in the inference subscale wherein the control group scored close to the 64th percentile and the experimental group scored close to the 53rd percentile.

Figure 4.7 shows that the percentile rankings of the control group fall in the induction, analysis, inference, and evaluation subscales. The largest drop was in the induction subscale, from the 59th percentile to the 46th percentile. Meanwhile, the experimental group rises in its percentile rankings in all subscales as well as in total score. The largest increase was in the deduction subscale, from the 54th percentile to the 67th percentile. This change is even greater looking at the experimental group minus the outlier wherein the deduction rank went from the 55th percentile to the 70th percentile. Another large increase was in the inference subscale, from the 55th percentile to the 67th percentile. The percentile gain for the total score is the same as the average percentile gain reported by Pascarella and Terenzini (2003) for critical thinking instruction and might indicate a positive response to participation in the experimental group.

It is also worth noting that in the control group, five out of nineteen students (26%) scored above the 80th percentile on the pre-test and six out of nineteen students (32%) scored above the 80th percentile on the post-test. In the experimental group, six out of twenty students (30%) scored above the 80th percentile on the pre-test and ten out of twenty (50%) scored above the 80th percentile on the post-test.

Figure 4.6: CCTST Pre-Test Scores by Group with Respect to Norms
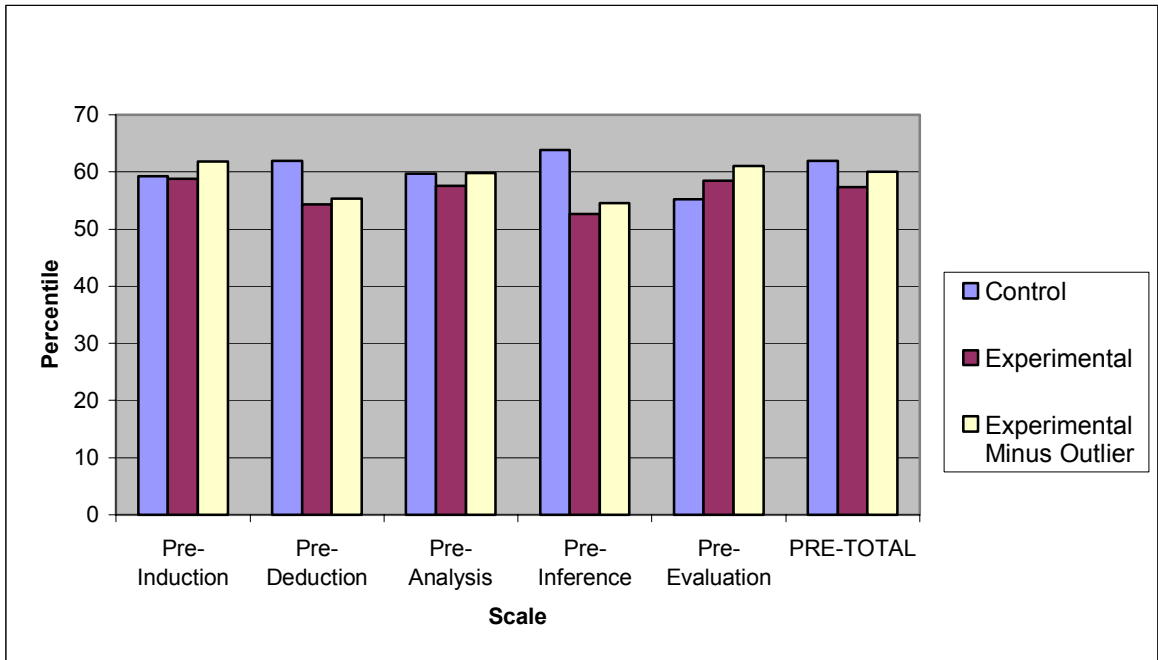
Source: Analysis of normed percentile rankings.

Figure 4.7: CCTST Post-Test Scores by Group with Respect to Norms
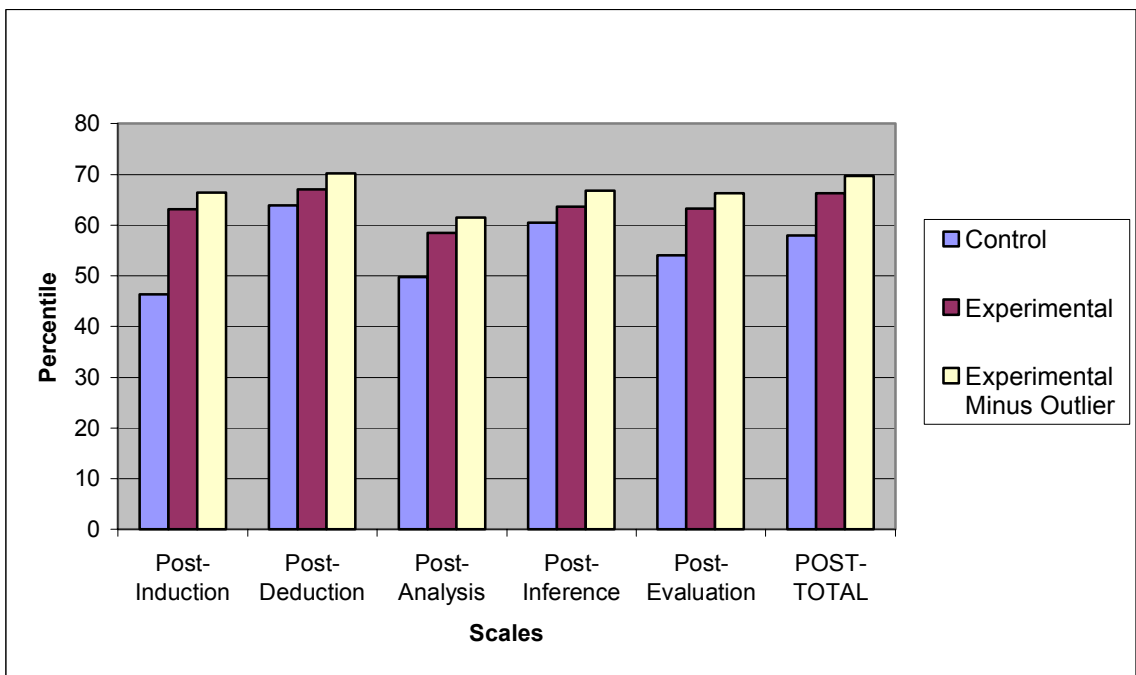
Source: Analysis of normed percentile rankings.

Another important piece of information pertaining to the percentage rankings concerns the weighting of scores. Scores are weighted such that as scores increase, the change in the percentile rank gets smaller. Therefore, for every one-point increase in raw score, the corresponding increase in percentile rank decreases. As a student's score increases, it becomes more difficult to increase in percentile ranking. It is for this reason that each student's percentile rank for each subscale score as well as the total score was used to calculate the mean percentile rank (rather than determining the percentile rank based on the group mean of the raw score). In addition, this explains why a half-point difference in scores between the pre-test and the post-test is sometimes associated with a four-point change in percentile rank and it is sometimes associated with a ten-point change in percentile rank. The scores associated with the former increase would be higher than the scores associated with the latter increase.

Table 4.1 displays all of the information discussed in this section, the raw mean scores, standardized mean scores, and mean percentile rankings. The "difference" column indicates the change – increase or decrease in score – from the pre-test to the post-test, for the control group, the experimental group, and the experimental group minus the outlier. It is important to note that the standardized difference score is based on the difference between pre- and post-test raw scores and may not equal the difference between the standardized pre- and post-test scores. (The differences will be the same only if the standard deviations for the pre-, post- and gain scores are equal.)

Table 4.1: CCTST Differences Between Groups in Raw Mean Score, Standardized Mean Score, and Percentile Ranking

RAW SCORE	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference	Pre	Post	Difference	Pre	Post	Difference
TOTAL	19.0	18.3	-0.7	18.1	19.5	+1.4	18.5	20.3	+1.8
Induction	10.6	9.5	-0.9	10.5	10.7	+0.2	10.8	11.1	+0.3
Deduction	8.4	8.8	+0.4	7.7	8.9	+1.2	7.7	9.2	+1.5
Analysis	5.0	4.4	-0.6	4.8	4.9	+0.1	4.9	5.1	+0.2
Inference	9.1	9.0	-0.1	8.2	9.2	+1.0	8.3	9.5	+1.2
Evaluation	5.0	4.8	-0.2	5.2	5.5	+0.3	5.3	5.7	+0.4

STANDARDIZED SCORE	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference*	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	0.10	-0.12	-0.29	-0.09	0.11	+0.27	0.00	0.25	+0.36
Induction	0.03	-0.19	-0.27	-0.03	0.18	+0.26	0.08	0.32	+0.31
Deduction	0.15	-0.01	-0.17	-0.14	0.01	+0.16	-0.10	0.12	+0.26
Analysis	0.07	-0.15	-0.20	-0.07	0.15	+0.19	0.00	0.29	+0.26
Inference	0.19	-0.03	-0.23	-0.18	0.03	+0.22	-0.11	0.14	+0.28
Evaluation	-0.05	-0.15	-0.13	0.05	0.14	+0.12	0.13	0.25	+0.15

PERCENTILE RANKING**	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference	Pre	Post	Difference	Pre	Post	Difference
TOTAL	62nd	58th	-4	57th	66th	+9	60th	70th	+10
Induction	59th	46th	-13	59th	63rd	+4	62nd	66th	+4
Deduction	62nd	64th	+2	54th	67th	+13	55th	70th	+15
Analysis	60th	50th	-10	58th	59th	+1	60th	62nd	+2
Inference	64th	61st	-3	53rd	64th	+11	55th	67th	+12
Evaluation	55th	54th	-1	59th	63rd	+4	61st	66th	+5

* The standardized difference score is based on the difference between the pre- and post-test raw scores and may not equal the difference between the standardized pre- and post-test scores.

** Percentile ranking based on norms provided by Insight Assessment

California Critical Thinking Dispositions Inventory

The mean raw score results for the CCTDI pre-test and post-test are displayed in Figures 4.8 and Figure 4.9 respectively; total scores appear in Figure 4.10. Figures 4.11 and 4.12 display the standardized mean scores. In each figure there are three sets of bar charts, representing each subscale score and the total score, for the control group, the experimental group, and the experimental group minus a single outlier. On this test, the outlier from the CCTST did not exist; however, the comparison is still made for the sake of consistency.

Figures 4.8 and 4.9 provide insight into how similarly the control and experimental groups scores on both the pre-test and the post-test. In addition, these scores indicate that all of the students – in both the control and the experimental groups – started out on the pre-test with strong scores. The authors of the CCTDI have determined the scores, for the subscales and for the total, that indicate whether students' dispositions are positive, negative, or ambiguous. Table 4.2(a) shows these breakdowns as well as the categories in which the groups' scored (mean scores were used). The categories were the same from the pre-test to the post-test for all groups – control, experimental, and experimental minus the outlier. In five out of the seven subscale scores, as well as for the total score, the means for all groups were in the "positive" range for both the pre-test and the post-test. On the other two subscales mean scores were "ambiguous."

Figure 4.8: CCTDI Pre-Test Raw Mean Subscale Scores by Group
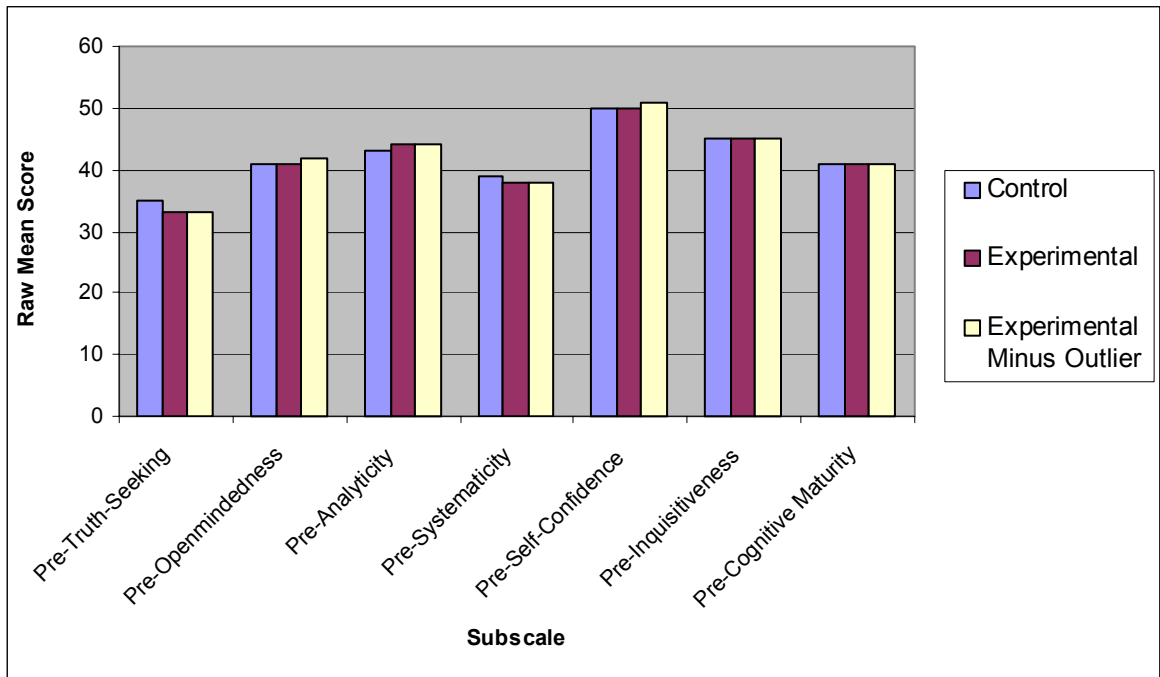
Source: Analysis of CCTDI pre-test raw mean scores.

Figure 4.9: CCTDI Post-Test Raw Mean Subscale Scores by Group
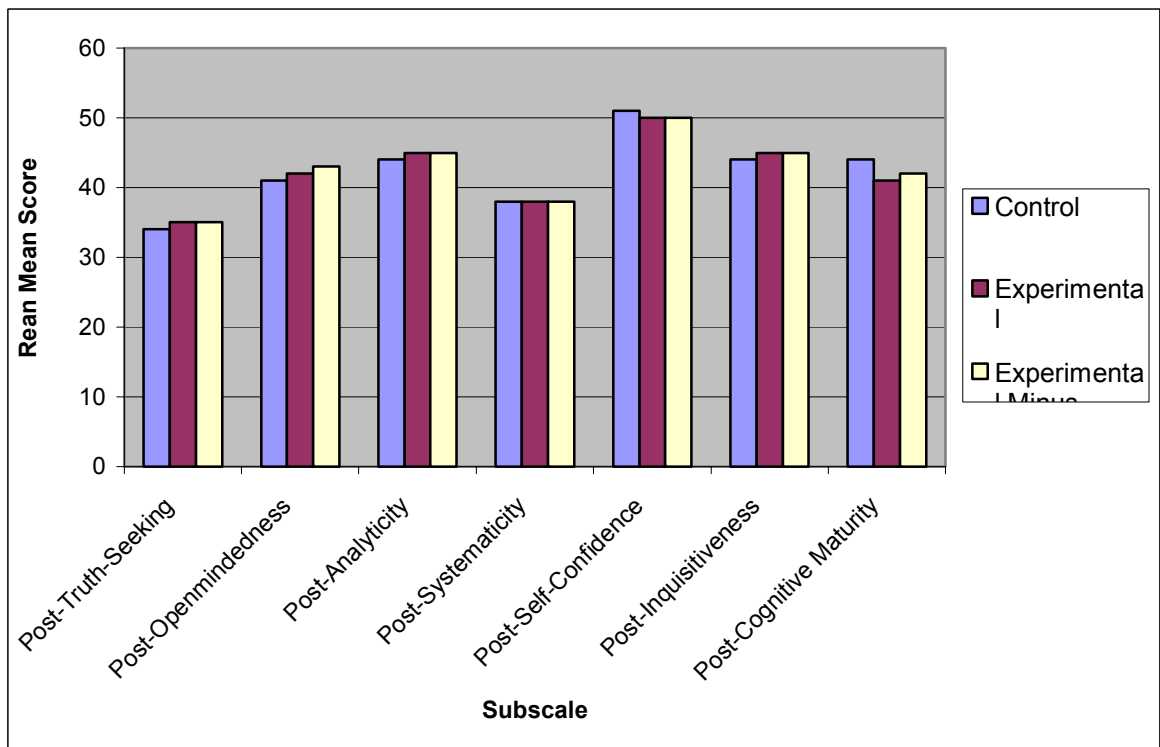
Source: Analysis of CCTDI post-test raw mean scores.

Figure 4.10: CCTDI Pre-Test and Post-Test Raw Mean Total Scores
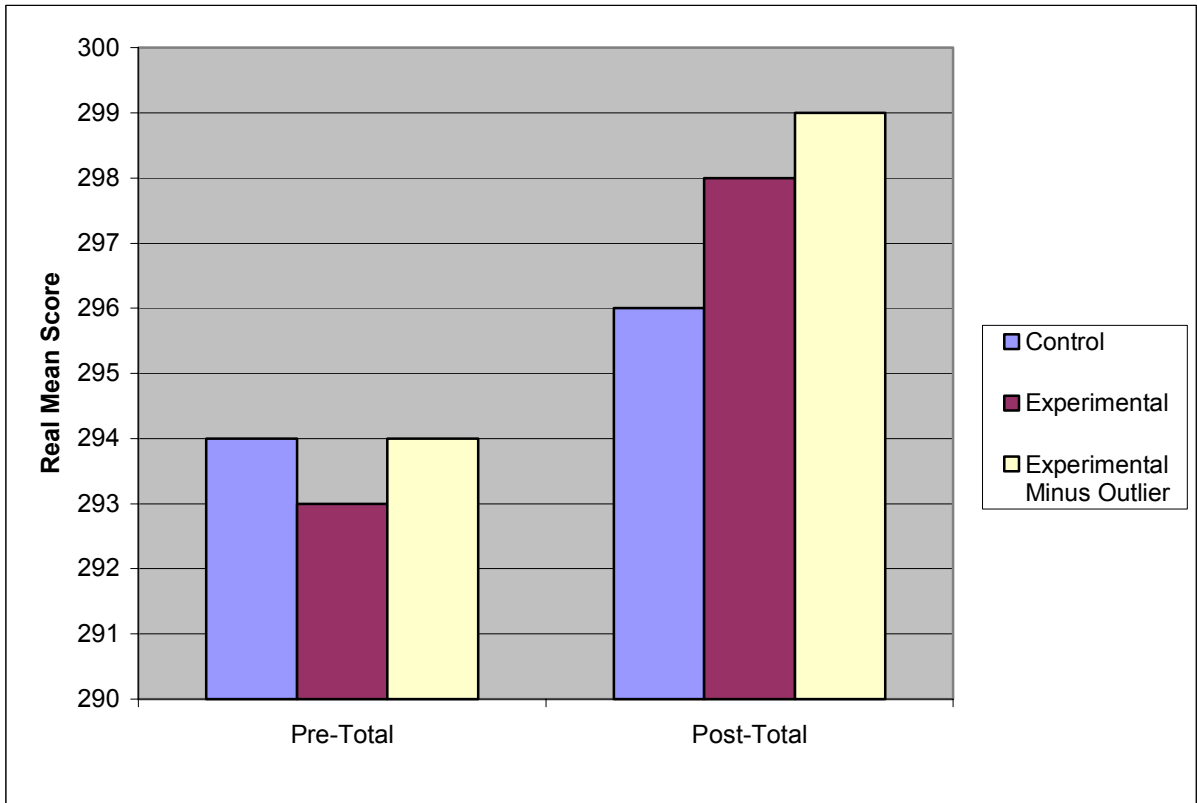
Source: Analysis of CCTDI pre-test and post-test raw mean total scores.

Table 4.2(a): CCTDI Differences Between Groups in Raw Mean Score and Score Category

RAW SCORE CATEGORY	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference	Pre	Post	Difference	Pre	Post	Difference
TOTAL	294.0 Positive	296.4 Positive	+2.4 None	292.7 Positive	298.0 Positive	+5.3 None	294.0 Positive	298.5 Positive	+4.5 None
Truthseeking	34.7 Ambiguous	34.4 Ambiguous	-0.3 None	32.7 Ambiguous	35.4 Ambiguous	+2.7 None	32.9 Ambiguous	35.4 Ambiguous	+2.5 None
Openmindedness	41.1 Positive	40.9 Positive	-0.2 None	41.5 Positive	42.5 Positive	+1.0 None	41.2 Positive	42.6 Positive	+1.4 None
Analyticity	43.3 Positive	44.5 Positive	+1.2 None	44.3 Positive	45.0 Positive	+0.7 None	44.4 Positive	45.1 Positive	+0.7 None
Systematicity	38.9 Ambiguous	38.1 Ambiguous	-0.8 None	37.5 Ambiguous	38.5 Ambiguous	+1.0 None	37.6 Ambiguous	38.4 Ambiguous	+0.8 None
CT Self-Confidence	49.6 Positive	50.7 Positive	+1.1 None	50.4 Positive	50.2 Positive	-0.2 None	50.8 Positive	50.2 Positive	-0.4 None
Inquisitiveness	45.1 Positive	43.7 Positive	-1.4 None	45.1 Positive	45.2 Positive	+0.1 None	45.3 Positive	45.3 Positive	0.0 None
Cognitive Maturity	41.4 Positive	44.1 Positive	+2.7 None	41.2 Positive	41.3 Positive	+0.1 None	41.3 Positive	41.6 Positive	+0.3 None

Figure 4.11 and 4.12 display the CCTDI standardized mean pre- and post-test

scores, respectively. With regard to the pre-test (Figure 4.11), it is clear that for three of

the subscales – openmindedness, inquisitiveness, and cognitive maturity – as well as for

the total score the differences between the groups on the CCTDI pre-test are minimal

(less than a tenth of a standard deviation). The post-test scores (Figure 4.12) also show

minimal difference (approximately a tenth of a standard deviation) on three subscales –

but different subscales than on the pre-test – analyticity, systematicity, and critical

thinking self-confidence. Again, the differences in total scores are minimal as well.

Independent samples t-tests were conducted on the standardized scores to examine the

differences between the control group and the experimental group for both the pre-test

and the post-test, and these tests identified no statistically significant differences between

the groups.

Again, a more meaningful examination of potential treatment effects requires an

examination of the actual change in pre- and post-test scores of students who participated

in the experimental and control groups. Figures 4.11, 4.12, and 4.13 together with Table

4.2(b) permit the examination of these potential effects. Changes favored the

experimental group on four subscales (Truthseeking, Openmindedness, Systematicity,

and Inquisitiveness), and on the total score; change favored the control group on three

subscales (Analyticity, Critical Thinking Self Confidence, and Cognitive Maturity).

Independent samples t-tests were conducted to determine whether these difference were

statistically significant. On only two subscales were the score changes statistically

significant ($\rho < .10$): Truthseeking, favoring the experimental group by almost two-thirds

of a standard deviation; Cognitive Maturity, favoring the control group by just over a half

of a standard deviation. Overall, these findings are inconclusive regarding whether

critical thinking instruction impacts the development of students' critical thinking

dispositions.

Figure 4.11: CCTDI Pre-Test Standardized Mean Scores by Section
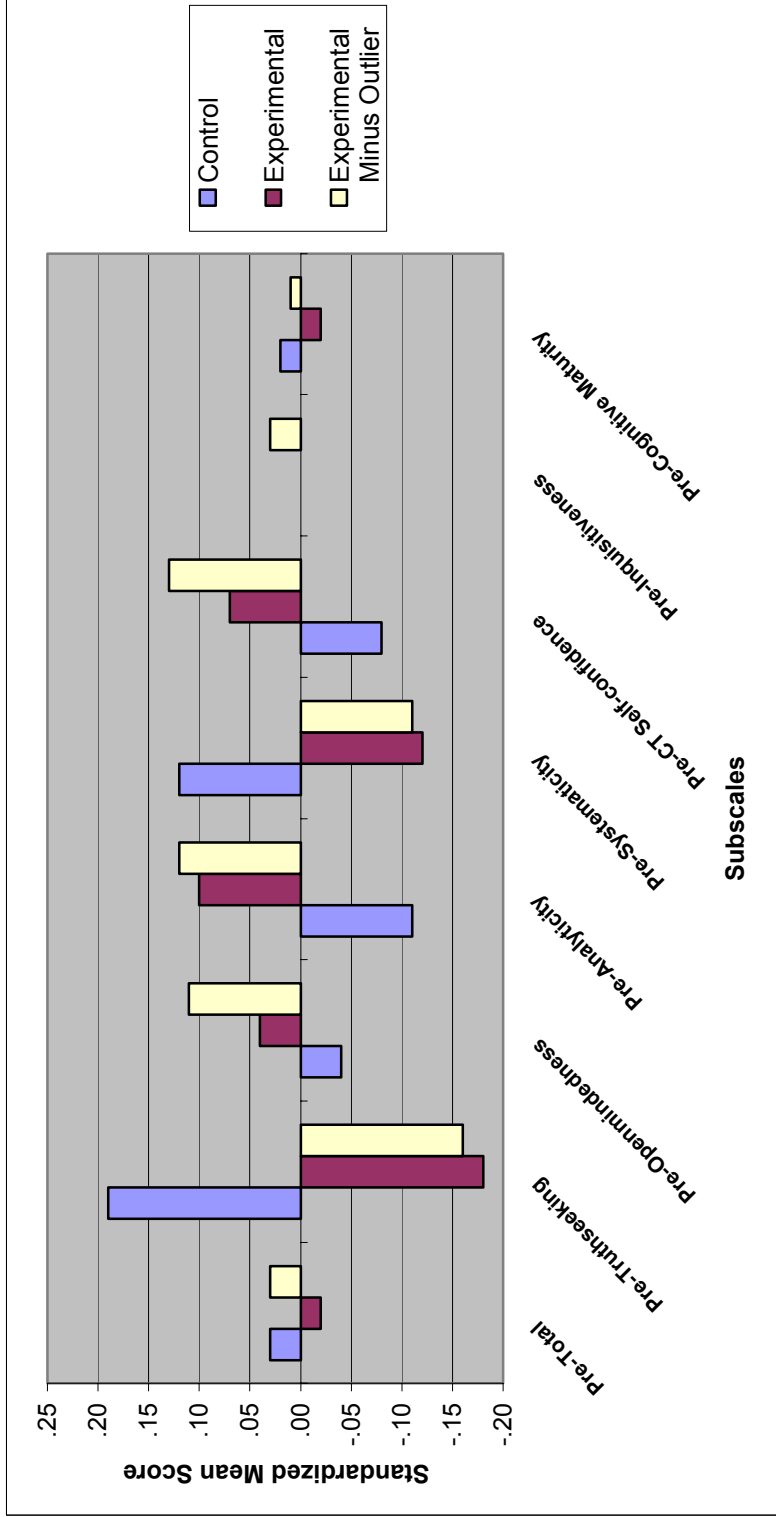
Source: Analysis of CCTDI pre-test standardized scores.

Figure 4.12: CCTDI Post-Test Standardized Mean Scores by Section
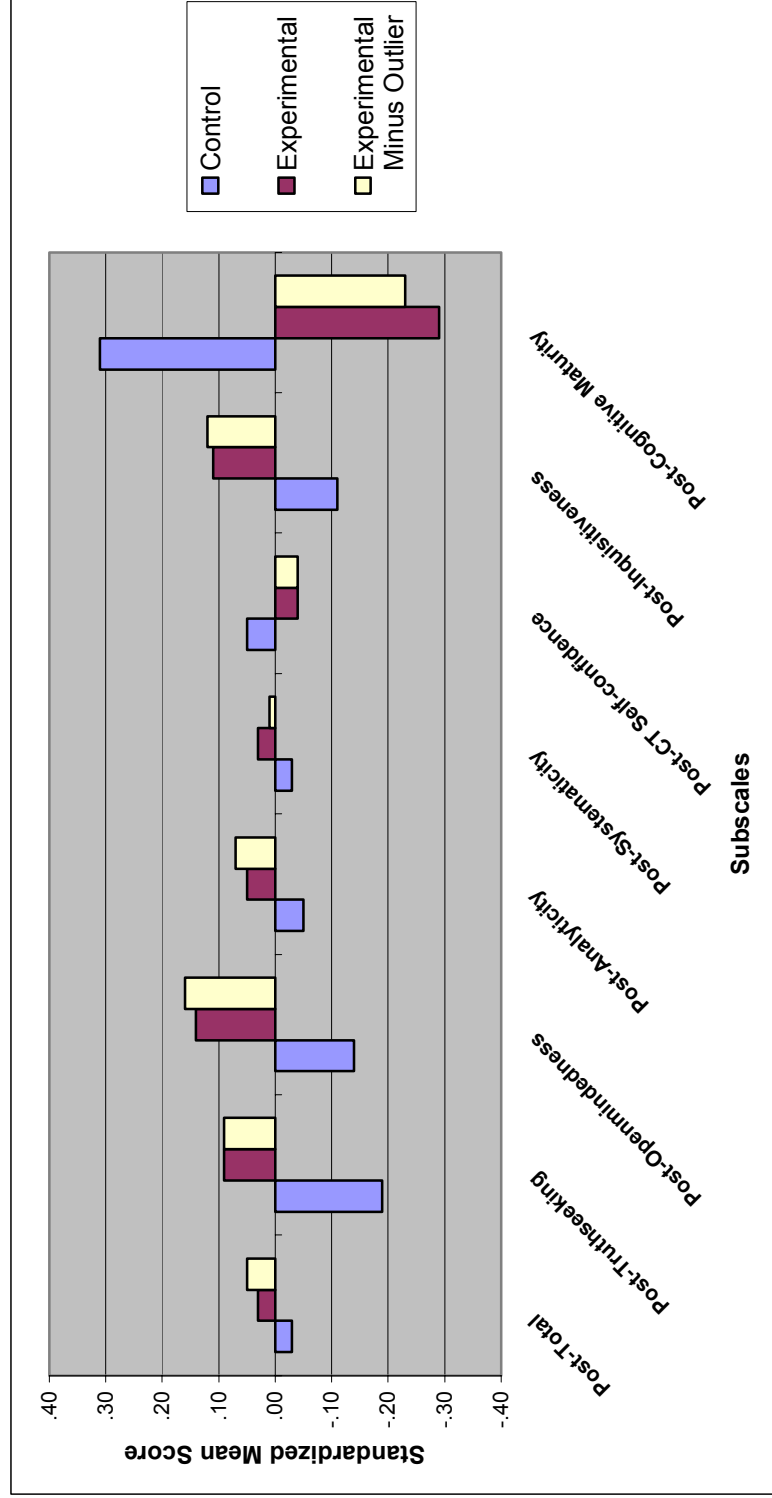
Source: Analysis of CCTDI post-test standardized mean scores.

Figure 4.13: CCTDI Standardized Mean Difference Scores by Group
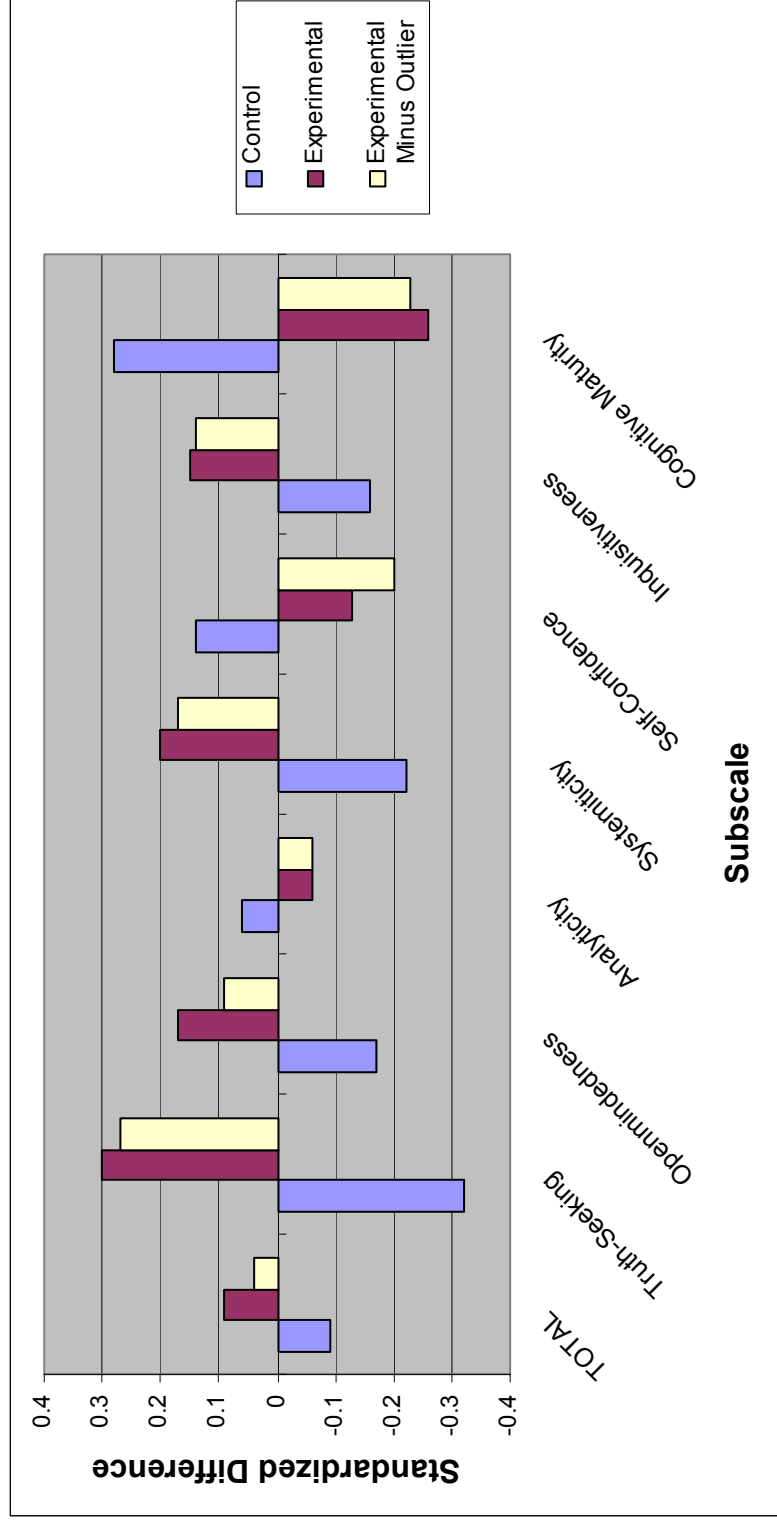
Source: Analysis of CCTDI standardized pre-test to post-test differences.

Table 4.2(b): CCTDI Differences Between Groups in Standardized Mean Score

STANDARDIZED SCORE	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference*	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	0.03	0.03	-0.09	-0.03	0.03	+0.09	0.03	0.05	+0.04
Truthseeking	0.19	-0.09	-0.32	-0.18	0.09	+0.30	-0.16	0.09	+0.27
Openmindedness	-0.04	-0.14	-0.17	0.04	0.14	+0.17	0.11	0.16	+0.09
Analyticity	-0.11	-0.05	+0.06	0.10	0.05	-0.06	0.12	0.07	-0.06
Systematicity	0.12	-0.03	-0.22	-0.12	0.03	+0.20	-0.11	0.01	+0.17
CT Self-Confidence	-0.08	+0.05	+0.14	0.07	-0.04	-0.13	0.13	-0.04	-0.20
Inquisitiveness	-0.00	-0.11	-0.16	0.00	0.11	+0.15	0.03	0.12	+0.14
Cognitive Maturity	0.02	0.31	+0.28	-0.02	-0.29	-0.26	0.01	-0.23	-0.23

* The standardized difference score is based on the difference between the pre- and post-test raw scores and may not equal the difference between the standardized pre- and post-test scores.

Research Question 2: Does the relationship between participation in a first-year transitions course infused with explicit critical thinking and scores on tests of critical thinking skills and dispositions vary between men and women?

Once again, the results of the California Critical Thinking Skills Tests and the California Critical Thinking Dispositions Inventory are used to answer this question. This question can be interpreted in at least two ways. It asks, how do the females and males in the control group compare to the females and males in the experimental group from pre-test to post-test with each instrument? It also asks, how do the females compare to the males in the control and experimental groups on the pre-tests and then on the post-tests? The primary question, however, is whether there are differences in the benefits of participating in a first-year transition course for male and female students – that is, are there differences in the change or gain scores for male and female students who participated in the treatment group compared to their counterparts in the control group. In order to answer these questions the control and experimental groups were further broken down by gender, thereby making the sample sizes even smaller: Control/Male, 9; Control/Female, 10; Experimental/Male, 11; Experimental/Female, 8. Given that there was not much difference in the results of the analyses of the first research question whether or not the experimental group outlier was included, the student is included in the analyses of the second research question.

The California Critical Thinking Skills Test

Table 4.3(a) displays the raw score, standardized score, and percentile ranking of females in the control and experimental groups. The "difference" column indicates the change – increase or decrease in score – from the pre-test to the post-test. The change favored the females in the experimental section on the subscales of Induction, Deduction, and Inference, as well as on the total score; the change favored the females in the control group on the subscales on Analysis and Evaluation. However, these numbers create a complicated picture. Looking specifically at the raw score totals, while the score for the females in the control group decreased by just under one point from pre-test to post-test, the score for females in the experimental group increased by just over one point. The drop in scores for the females in the control group led to a 6 point drop in their percentile ranking while the increase for the females in the experimental group led to a 9 point gain in percentile ranking.

A more meaningful examination of potential treatment effects requires examining the change in pre- and post-test scores for the females in the control and experimental group. Using the standardized scores in "difference" column, independent samples t-tests were conducted to examine whether any changes were statistically significant. Only on the subscale of Inference was the score change (more than one standard deviation) statistically significant $\rho < .10$, favoring the females in the experimental group. However, the magnitude of differences displayed in Table 4.3(a) for other subscales suggests a high likelihood that other score changes would be statistically significant with a larger sample, as many of the differences are equal to one-half of a standard deviation or more.

Table 4.3(a): CCTST Differences Between Females in Raw Mean Score, Standardized Mean Score, and Percentile Rank

FEMALES

RAW SCORE	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference	Pre	Post	Difference
TOTAL	18.1	17.3	-0.8	16.5	17.6	+1.1
Induction	10.1	9.0	-0.9	10.1	10.1	0.0
Deduction	8.0	8.3	+0.3	6.4	7.5	+1.1
Analysis	4.6	4.6	0.0	4.9	4.7	-0.2
Inference	8.6	7.5	-1.1	6.8	8.2	+1.4
Evaluation	4.9	5.1	+0.2	4.8	4.7	-0.1

STANDARDIZED SCORE	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	-0.09	-0.05	-0.33	-0.42	-0.24	+0.20
Induction	-0.14	-0.22	-0.26	-0.15	0.01	+0.18
Deduction	0.00	0.15	-0.25	-0.63	-0.47	+0.12
Analysis	-0.18	-0.10	+0.16	0.00	0.04	+0.03
Inference	0.01	0.06	-0.68	-0.72	-0.31	+0.38
Evaluation	-0.08	-0.14	+0.07	-0.12	-0.21	-0.12

PERCENTILE RANKING**	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference	Pre	Post	Difference
TOTAL	59th	53rd	-6	48th	57th	+9
Induction	55th	38th	-17	53rd	57th	+4
Deduction	59th	61st	+2	42nd	55th	+13
Analysis	52nd	55th	+3	60th	53rd	-7
Inference	61st	46th	-15	38th	54th	+16
Evaluation	57th	58th	+1	52nd	54th	+2

* The standardized difference score is based on the difference between the pre- and post-test raw scores and may not be equal to the difference between the standardized pre- and post-test scores.

** Percentile rank according to normed scores provided by Insight Assessment

Table 4.3(b) displays the CCTST differences between males in the control and experimental groups in raw mean score, standardized mean score, and percentile ranking. The Analysis subscale is interesting to examine in detail. The control group decreased by one point, from pre-test to post-test, while the mean raw score for the experimental group increased by a third of a point. The result was the largest percentage point decrease, with males in the control group dropping 19 points from pre-test to post-test, while males in the experimental group rose 9 percentage points.

Once again, more meaning can be attained from the "difference"– increase or decrease in score – from the pre-test to the post-test. The change in score favored the males in the experimental group on all of the subscales, except Inference, as well as on the total score. Independent samples t-tests were conducted to determine whether these differences were statistically significant. Only the subscale of Analysis was the score change (more than three-quarters of a standard deviation) statistically significant $\rho < .10$, favoring males in the experimental group. Again, splitting the analysis by gender severely restricts the statistical power of these analyses and some differences, given their magnitude, might be statistically significant with a larger sample size.

Table 4.3(b): CCTST Differences Between Males in Raw Mean Score, Standardized Mean Score, and Percentile Rank

MALES						
	CONTROL			EXPERIMENTAL		
RAW SCORE	Pre	Post	Difference	Pre	Post	Difference
TOTAL	19.6	19.0	-0.6	19.7	21.4	+1.7
Induction	11.0	9.8	-1.2	10.8	11.2	+0.4
Deduction	8.6	9.2	+0.6	8.9	10.2	+1.3
Analysis	5.3	4.3	-1.0	4.7	5.0	+0.3
Inference	9.4	10.1	+0.7	9.5	10.1	+0.6
Evaluation	5.0	4.6	-0.4	5.5	6.3	+0.8
	CONTROL			EXPERIMENTAL		
STANDARDIZED SCORE	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	0.23	-0.16	-0.26	0.24	0.46	+0.35
Induction	0.16	-0.17	-0.28	0.09	0.35	+0.34
Deduction	0.25	-0.13	-0.12	0.36	0.49	+0.21
Analysis	0.25	-0.19	-0.46	-0.13	0.25	+0.34
Inference	0.31	-0.09	+0.10	0.36	0.36	+0.05
Evaluation	-0.02	-0.16	-0.27	0.22	0.50	+0.35
	CONTROL			EXPERIMENTAL		
PERCENTILE RANKING**	Pre	Post	Difference	Pre	Post	Difference
TOTAL	64th	61st	-3	66th	76th	+10
Induction	63rd	53rd	-10	65th	69th	+4
Deduction	64th	66th	+2	66th	79th	+13
Analysis	65th	46th	-19	55th	64th	+9
Inference	66th	71st	+5	67th	73rd	+6
Evaluation	54th	51st	-3	65th	72nd	+7

* The standardized difference score is based on the difference between the pre- and post-test raw
  scores and may not be equal to the difference between the standardized pre- and post-test scores.
** Percentile rank according to normed scores provided by Insight Assessment

Based on the above findings, both the females and the males in the experimental group responded similarly to the "treatment"; both demonstrated a total score change favoring their group over their corresponding peers in the control group. But is their any evidence that participation in the "treatment" might have resulted in greater gains for female students than to male students? To answer this question, a two-way ANOVA was conducted for each subscale as well as the total score. The only statistically significant interaction found was on the Inference subscale for females $\rho < .10$, indicating that female students made greater gains than male students in terms of inferential thinking; on all of the other scales, including the total score, the change scores for males and females were similar. Again, the small sample size limits the likelihood that findings will be statistically significant, so caution should be exercised in interpreting these results.

California Critical Thinking Dispositions Inventory

As described in the discussion of the first research question, the creators of the CCTDI created three score categories: positive, ambiguous, and negative. Both females and males started out with strong scores on the pre-test, which were upheld for the post-test. Tables 4.4(a) and (b) display the breakdown of CCTDI mean raw scores and their corresponding categories (a) and mean standardized scores (b) for females. Tables 4.4(c) and (d) display the breakdown of CCTDI mean raw scores and their corresponding categories (c) and mean standardized scores (d) for males.

Overall, the females in the experimental group showed greater improvement than the females in the control group on the CCTDI. This was the case on all but two subscales, Inquisitiveness and Critical Thinking Self-Confidence (the latter differences

are comparable), as well as for the total score wherein the mean raw score for females in the experimental group increased by almost eight points, while the mean raw score for the females in the control group decreased by two points. However, due to the high scores that all the students achieved on the pre-test, already placing them in the highest category, "Positive," the change in scores did not have much impact category movement (Table 4.2(a)). Only on one scale, Systematicity, did a change in score result in a change in category. Females in the control group dropped from the "Positive" category to the "Ambiguous" category due to a drop in raw score of just over two and a half points

Table 4.2(b) compares the CCTDI mean standardized scores for females in the control group and females in the experimental group. The "difference" column indicates the change – increase or decrease in score – from pre-test to post-test. Analysis of these differences provides a more meaningful explanation of the changes that occurred. Independent samples t-tests were conducted to determine whether any of these differences were statistically significant. Only on the scale of Systematicity was the score change (just under one standard deviation) statistically significant $\rho < .10$, favoring females in the experimental group.

Table 4.4(a): CCTDI Differences Between Females in Raw Mean Score and Score Category

RAW SCORE CATEGORY	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference	Pre	Post	Difference
TOTAL	309.1 Positive	307.1 Positive	-2.0 None	292.5 Positive	300.4 Positive	+7.9 None
Truthseeking	36.7 Ambiguous	36.0 Ambiguous	-0.7 None	32.3 Ambiguous	36.3 Ambiguous	+4.0 None
Openmindedness	42.4 Positive	42.3 Positive	-0.1 None	42.8 Positive	43.5 Positive	+0.7 None
Analyticity	46.1 Positive	46.4 Positive	+0.3 None	43.2 Positive	44.7 Positive	+1.5 None
Systematicity	41.5 Positive	38.8 Ambiguous	-2.7 Decrease	38.1 Ambiguous	38.9 Ambiguous	+0.8 None
CT Self-Confidence	51.4 Positive	52.4 Positive	+1.0 None	50.1 Positive	49.0 Positive	-1.1 None
Inquisitiveness	46.8 Positive	46.1 Positive	-0.7 None	45.0 Positive	46.2 Positive	+1.2 None
Cognitive Maturity	44.3 Positive	45.1 Positive	+1.2 None	41.1 Positive	41.8 Positive	+0.7 None

Table 4.4(b): CCTDI Differences Between Females in Standardized Mean Score

STANDARDIZED SCORE	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	0.67	0.40	-0.36	-0.04	0.13	+0.25
Truthseeking	0.57	0.21	-0.38	-0.27	0.25	+0.58
Openmindedness	0.21	0.11	-0.17	0.30	0.33	+0.09
Analyticity	0.51	0.31	-0.21	-0.14	-0.01	+0.16
Systematicity	0.58	0.07	-0.71	-0.02	0.10	+0.18
CT Self-Confidence	0.25	0.35	+0.12	0.01	-0.27	-0.33
Inquisitiveness	0.29	0.25	-0.00	-0.01	0.26	+0.41
Cognitive Maturity	0.58	0.53	-0.10	-0.04	-0.19	-0.14

* The standardized difference score is based on the difference between the pre- and post-test raw scores and may not be equal to the difference between the standardized pre- and post-test scores.

As for the males, the pre-test to post-test change in CCTDI score favored the males in the experimental group on four subscales (Truthseeking, Openmindedness, Systematicity, and Inquisitiveness); the change in score favored the males control group on three subscales (Analyticity, Critical Thinking Self-Confidence, and Cognitive Maturity), as well as on the total score. As with the females, these changes from pre-test to post-test did not result in much category movement (Table 4.4(c)). Only on the subscale of Cognitive Maturity where the control group increased its mean raw score by more than four points, was there a shift from the "Ambiguous" category to the "Positive" category.

Once again, analysis of the standardized "difference" – increase or decrease in score – from pre-test to post-test (Table 4.4(d)), provides a more meaningful explanation of score changes. Independent sample t-tests were conducted to determine whether any changes in score were statistically significant. Only on the subscale of Cognitive Maturity was the score change (more than three-quarters of a standard deviation) statistically significant $\rho < .10$, but this change favored the males in the control group over the males in the experimental group.

Table 4.4(c): CCTDI Differences Between Males in Raw Mean Score and Score Category

RAW SCORE CATEGORY	CONTROL			EXPERIMENTAL		
	Pre	Post	Difference	Pre	Post	Difference
TOTAL	283.1 Positive	288.7 Positive	+5.6 None	293.0 Positive	295.6 Positive	+2.6 None
Truthseeking	33.3 Ambiguous	33.2 Ambiguous	-0.1 None	33.2 Ambiguous	34.5 Ambiguous	+1.3 None
Openmindedness	40.1 Positive	39.9 Ambiguous	-0.2 Decrease	40.2 Positive	41.4 Positive	+1.2 None
Analyticity	41.2 Positive	43.1 Positive	+0.9 None	45.4 Positive	45.4 Positive	0.0 None
Systematicity	37.0 Ambiguous	37.7 Ambiguous	+0.7 None	37.0 Ambiguous	38.0 Ambiguous	-1.0 None
CT Self-Confidence	48.4 Positive	49.5 Positive	+1.1 None	50.8 Positive	51.4 Positive	+0.8 None
Inquisitiveness	43.8 Positive	41.9 Positive	-1.9 None	45.2 Positive	44.1 Positive	-1.1 None
Cognitive Maturity	39.3 Ambiguous	43.4 Positive	+4.1 Increase	41.3 Positive	40.8 Positive	-0.5 None

Table 4.2(b): CCTDI Differences Between Groups in Standardized Mean Score

STANDARDIZED SCORE	CONTROL			EXPERIMENTAL			EXPERIMENTAL MINUS OUTLIER		
	Pre	Post	Difference*	Pre	Post	Difference*	Pre	Post	Difference*
TOTAL	0.03	0.03	-0.09	-0.03	0.03	+0.09	0.03	0.05	+0.04
Truthseeking	0.19	-0.09	-0.32	-0.18	0.09	+0.30	-0.16	0.09	+0.27
Openmindedness	-0.04	-0.14	-0.17	0.04	0.14	+0.17	0.11	0.16	+0.09
Analyticity	-0.11	-0.05	+0.06	0.10	0.05	-0.06	0.12	0.07	-0.06
Systematicity	0.12	-0.03	-0.22	-0.12	0.03	+0.20	-0.11	0.01	+0.17
CT Self-Confidence	-0.08	+0.05	+0.14	0.07	-0.04	-0.13	0.13	-0.04	-0.20
Inquisitiveness	-0.00	-0.11	-0.16	0.00	0.11	+0.15	0.03	0.12	+0.14
Cognitive Maturity	0.02	0.31	+0.28	-0.02	-0.29	-0.26	0.01	-0.23	-0.23

* The standardized difference score is based on the difference between the pre- and post-test raw scores and may not equal the difference between the standardized pre- and post-test scores.

Given the above results, a two-way ANOVA was conducted to determine whether females in the experimental group had greater gains than males in the experimental group compared to their counterparts in the control group on each of the subscales and on the total score of the CCTDI. The analysis provided no evidence that females or males benefited more from participating in the experimental group $\rho < .10$. Once again, however, the small sample size biased these and other statistical analyses toward a "no difference" finding.

Research Question 3: Do students attribute self-growth in the areas of critical thinking skills and critical thinking dispositions to taking a first-year transitions course? Are these changes different for students in the group infused with critical thinking instruction than they are for students in the group without critical thinking instruction?

To address this question, the researcher administered a questionnaire to students in both the control and experimental groups on the last day of class, after the students completed the post-tests. Table 4.5 displays the results of the questionnaire discussed in this group. The questionnaire specifically asked students whether or not participation in the class increased their critical thinking skills and dispositions. As indicated by the table, an overwhelming majority of the students in the experimental group felt like they had benefited from the class. The results of the questionnaire indicate that 75% of the students in the experimental group, and 6% of the students in the control group, believed that their critical thinking skills and dispositions improved as a consequence of taking UNIV101. In elaborating, students in the experimental group commented that they were taught some critical thinking skills in high school, and even before, but that this course helped to enforce what they learned. They noted our discussions on thinking things through from different perspectives, inductive and deductive reasoning, problem-solving and decision-making. The students that did not think that the course helped largely believed that they were already critical thinkers before they arrived at college. As for the control group, many of these students also commented about being critical thinkers prior to taking this course, though not so many as to explain the difference in the proportion of students in the experimental and control sections that attributed gains to the course.

Using the Teaching Log and the Questionnaire to Learn More

In addition, I maintained a teaching log throughout the semester of teaching the two groups of UNIV101 being used in this research. This log is used in conjunction with the results of the questionnaire to learn more about my perceptions of the study relative to the perceptions of the students. (Note: first-person narrative is used in this section given the personal nature of the data collected.)

The majority of students in both groups (95% in the experimental group and 89% in the control group) enjoyed taking UNIV101 but more students in the experimental group (90%) than in the control group (78%) anticipated being able to use what was learned in UNIV101 beyond the classroom. While these results indicate that students in both groups enjoyed the course, I had some doubts during the semester. For example, in weeks four and eight the log reflects my perceptions that there is more congruency in the control class, more focus on peer connection, due to an emphasis on discussion in comparison to the more activity-based experimental group. I was not certain how this would impact students' enjoyment of the course, which might in turn impact effort level and learning. Specifically, if my students in the experimental group were not enjoying the course, would they still be able to get out of it the most possible learning?

The questionnaire also substantiated my own dissatisfaction with the textbooks that I used. In both groups, less than half (45% in the experimental group and 33% in the control group) believed that the textbook used for class contributed to their learning. Addressing the control group first, most groups of this course at the University do not use a textbook at all. By many accounts it is not necessary. It was used in this study primarily for the purpose of the two groups having parallel levels of work and reference.

As for the experimental group, in week nine, I commented that perhaps the textbook should have been used more in order to better infuse critical thinking into the experimental group. I commented that I knew some students were not reading the chapters, as was quite clear during some classroom discussions, but rather going straight to the pages on which their assignments were laid out. Most students did not feel that the textbook contributed a great deal to their learning. Would they have felt differently if the textbook had been used more or differently? Should I have brought it into my classroom instruction more or would this have led to less overall enjoyment of the course? Negotiating use of the textbook was also difficult because, if I was over-dependant than any changes in students' scores may be more likely due to what they learned in the book than what they learned in class; if I did not use the book enough, there would be no reinforcement of what we did in class, once the students' walked out the door.

Table 4.5: Responses to Student Questionnaire

	CONTROL	EXPERIMENTAL
Enjoyed taking UNIV101	89%	95%
Anticipate being able to use what was learned in UNIV beyond the classroom	78%	90%
Felt that critical thinking abilities improved as a result of UNIV	**6%**	**65%**
Believed textbook in UNIV contributed to learning	33%	45%
Participation in Courses/Co-curricular Activities during First Semester:		
An English course	28%	70%
A Math course	50%	80%
A Science course	44%	40%
A Philosophy course	6%	15%
A diversity course	50%	30%
A living/learning community	11%	15%
A leadership program or role in an organization	11%	10%

In addition to using the teaching log with the questionnaire, it was also coded for themes to be used in conjunction with the findings of both the two instruments and the questionnaire. The instructor/researcher first read through the log, organized by class number (1-13), to generate themes. Then, the log was re-read with the themes in mind and coded to indicate where the themes existed. The data in the log were then re-organized by theme. Not surprisingly, the most prominent themes were: similarities, differences, satisfaction, and disappointment. All of these can be connected to students' perceptions of their critical thinking development.

In some instances one activity could encompass all four themes. For example, in week six, students in both groups were taken on a walk around campus to many of the campus libraries. I commented in my teaching log, "Both classes clearly got a lot out of our walk" (Teaching Log, Week 6). This example is made more interesting by the fact that originally this activity was intended to be a bit different for the experimental group than for the control group. While on this walk, I planned to hold a more "focused" discussion with the experimental group about a passage that they were instructed to read for homework prior to class. My goal was to use the time of our walk to have an intellectual conversation in a more informal setting than the classroom. I thought this might help with the confidence of some of the students who were more reluctant to speak up in class, where all eyes were on them. My teaching log reflects frustration that this activity did not go as planned but also satisfaction that the students were involved in the activity of learning about the libraries and various campus resources we passed along the way. This one activity, planned to be different for each group but carried out quite similarly, provoked both frustration and satisfaction.

The theme of "similarity" focuses heavily on the content of what was being covered. Because this study used two intact UNIV classes, infusing one with critical thinking instruction (as opposed to using a course whose primary purpose is critical thinking development) some similar experiences were expected. The class topics were always the same, and in some instances, delivery of the material was similar as well. Examples of this can be found in the first couple of weeks when students were still getting acclimated – for example, the first day of class was nearly identical for both groups, going over the syllabus, participating in ice-breaker activities, discussing expectations of the course as well as their first semester in college; the second class session for both groups consisted of the pre-tests; in second to last week students in both groups presented their final projects which were the same assignment, perform a skit in a small group demonstrating something learned in this course. My intention was to keep similarity limited to course content as much as possible. It was in the delivery that I aimed to impact students' development as well as their self-perceptions of growth.

In contrast, the theme "difference" focused heavily on pedagogy and the activities used to cover the weekly topic. One example of this is in week seven when the topic for class was time-management. "In the experimental group…we reviewed the steps of problem-solving that were introduced earlier in the semester and talked about the steps in the context of time-management" (Teaching Log, Week 7). In the control group we also discussed time management but in a more general context of daily scheduling. Another variation of the "difference" theme emerged in the context of class discussion. In week eight, the topic of date rape was covered in both groups. While different activities were conducted, the same handout was distributed to all of the students. "The control class

had more to say about the handout…I teach this class a bit more informally and I think this helps students get more 'into' the discussions as compared to the experimental group wherein I try to do more activities" (Teaching Log, Week 8). There was a clear difference in the way the two groups were conducted and a corresponding difference to the classroom environment. At the time, I was uncertain as to how the students perceived their environments and how this would in-turn impact both their actual growth and their perceived growth. For example, was the lack of discussion in the experimental group holding students back? The questionnaires did provide some insight about this. In elaborating about whether they enjoyed taking UNIV101, several students in both groups made comments about the "friendly" or "relaxed" environment.

"Satisfaction," encompassed reflections of the instructor/researcher indicating the belief that an activity or a class session had gone well. The instructor/researcher's perspective can be compared to those of the students' using the responses from the student questionnaire. Students were given a list of topics covered during UNIV101 and asked to circle the one or two that they thought were "covered in the most effective or interesting ways" (Student Questionnaire, #3). Time management and learning styles were two of the top three topics selected by both groups. The teaching log reflects that the instructor/researcher shared the students' perspective with regard to time management. As noted in the above paragraph, this was a class session that exemplified the differences between the two groups. After writing about these differences, the instructor/researcher concluded, "I thought both of these classes went well" (Teaching Log, Week 7). With regard to "learning styles," the instructor/researcher believed this class "went better in the experimental group" because "we talked more specifically about

how your MBTI and other learning preferences can be understood in order to help you learn more efficiently and effectively" (Teaching Log, Week 5). The third most enjoyed activity for the experimental group, according to the questionnaire, was the class on alcohol and responsible decision-making. The instructor/researcher also believed this class had been successful, noting, "The experimental students enjoyed the…exercise. If anything there was not enough time to run this activity as well as I would have liked" (Teaching Log, Week 4).

The third most enjoyed activity for the control group, according to the questionnaire, leads into the final theme "disappointment," that emerged from the teaching log. The control group ranked the diversity lesson among their top three classes. The instructor/researcher, reflecting on this class, wrote, "I feel like this class could have gone better…I struggled a bit. I neglected to do one of my favorite activities which, in retrospect, might have lead to a more productive discussion" (Teaching Log, Week 9). Conversely, the instructor/researcher believed, "This week went much better with the experimental group" (Teaching Log, Week 9). The experimental students rated this class among those "covered in the least effective or least interesting ways" (Student Questionnaire, #4).

The theme of "disappointment" encompasses many situations wherein the instructor/researcher indicates uncertainty regarding whether the critical thinking work in the experimental group is explicit enough; in other words, how often should the instructor say, "This activity will help with your critical thinking development"? Week 6 is the first mention of this. The following statement is made in the teaching log: "Beginning next week I want to try to make the differences between the groups more pronounced. I am

not sure that I have been doing this. I want to be more explicit about the critical thinking activities with my experimental group" (Teaching Log, Week 6). Yet, at the end of the semester, the instructor/researcher still believes that not enough was done. "In retrospect, I do not think that I did enough 'explicit' critical thinking work with the group. We did plenty of exercises but I do not think that I emphasized the fact that we were doing the exercises to develop critical thinking, as often as I could have" (Teaching Log, Week 13). There is a difficult balance to be achieved in how much emphasis is placed on the intentionality of instruction: if an instructor repeatedly tells students "this exercise highlights [particular skill], an important part of critical thinking," there is a risk that students will internalize that they are becoming critical thinkers simply because *they are being told* that they are acquiring these skills, not necessarily because they are genuinely acquiring the skills; this is known as the Hawthorne Effect. However, if, as was the case in this study, the instructor wants students to learn to associate particular skills with their own growth as critical thinkers, not telling the students about the connection between an activity, a particular skill, and critical thinking, seems to contradict the purpose of the pedagogy. This balancing act was a struggle or the instructor/researcher of this dissertation.

In addition, the theme of disappointment reflects instances wherein the instructor/researcher felt the frustration of conducting a study wherein not all variables can be controlled. Simply because a critical thinking activity is planned, does not mean that it will go well, or that students will get out of it the lesson that is intended. For example, in week 8 the instructor/researcher planned an activity called "Pairs Problem-Solving." This is well documented in the literature as a critical thinking activity.

However, according to the teaching log, the students did not respond to this activity the way the instructor/researcher hoped noting, "I am feeling like I have less control over the students' learning than I would have liked" (Teaching Log, Week 8). The students' willingness to truly engage in an effort to solve a real problem with a partner was lacking. They struggled to "think outside the box" and to ask each other questions that would illicit genuine interaction; it was a classic display of dualism beyond the immediate control of the instructor. Week 11 brought about a reminder that, once students leave class, the instructor has little control; just because there is a homework assignment that is intended to elicit critical thinking, does not mean that the assignment will receive the attention it deserves or that it will even be completed (even if that means point deduction in the grading system).

Conclusion

The results of the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI), which had been administered in a pre-test post-test design, were used to answer the first two research questions. T-tests were conducted to examine between group and within group differences.

The first question asked: Do students who participate in a transitions course infused with critical thinking instruction score higher on tests of critical thinking skills and dispositions than students that participate in a transitions course without critical thinking instruction? According to the results from the CCTST, the answer to this question would be yes, students enrolled in the transitions course infused with critical

thinking instruction do score higher than students enrolled in the same course without the critical thinking instruction. Results from the CCTDI, however, indicated no overall change in disposition and inconsistent changes in two sub-scales (one favoring the experimental group, another favoring the control group).

The second question asked: Does the relationship between participation in a first-year transitions course infused with explicit critical thinking and scores on tests of critical thinking skills and dispositions vary between men and women? The results of the CCTST reveal that the males and the females in the experimental group outperformed their counterparts in the control group with regard to improvement from pre-test to post-test. On the CCTDI, the females in both groups and the males in both groups scored comparably, with all groups scoring predominantly in the "positive" range. Statistical analyses indicate that female students had greater gains in inferential thinking than male students, but female students performed comparably to male students on all of the other subscales and the total CCTST scale. There was no indication of any differential effects regarding dispositions on the CCTDI.

The final research question asked: Do students attribute self -growth in the areas of critical thinking skills and critical thinking dispositions to taking a first-year transitions course? Are these changes different for students in the group infused with critical thinking instruction than they are for students in the group without critical thinking instruction? This question was answered using the data collected from a student questionnaire. Students in the experimental group did self-identify more growth in critical thinking as a result of taking the transitions course.

In addition to the research questions, the instructor/researcher conducted additional analysis of a teaching log kept throughout the semester of the study. Four themes were identified: similarities, differences, satisfaction, and disappointment. All of these themes were relevant to the students' critical thinking development and whether differences would emerge between the control and experimental groups. In some cases, the information in the log was used in conjunction with information obtained from the student questionnaire to add a qualitative dimension to this otherwise quantitative study.

Chapter V: Conclusion

This final chapter will provide a review of the study – including the research questions, the literature, the methodology, and results of the data analysis. Following this review, conclusions and ideas for further research will be explored. The final chapter is one of synthesis and reflection; to remind the reader that research is as much about process as it is about outcomes, especially when it is examining pedagogy, and taking place in a classroom.

Research Questions

This study posed three questions:

1) Do students who participate in a transitions course infused with critical thinking instruction score higher on tests of critical thinking skills and dispositions than students that participate in a transitions course without critical thinking instruction?

2) Does the relationship between participation in a first-year transitions course infused with explicit critical thinking and scores on tests of critical thinking skills and dispositions vary between men and women?

3) Do students attribute self -growth in the areas of critical thinking skills and critical thinking dispositions to taking a first-year transitions course? Are these changes different for students in the group infused with critical thinking instruction than they are for students in the group without critical thinking instruction?

Critical thinking is a broad concept, defined by many education researchers and practitioners. While the definitions are similar is some general respects, such as the link between theory and practice, they differ with regard to level of specificity and particular skills captured by the concept. Following a review of several definitions that of the American Philosophical Association (APA), developed in 1990, was selected for use in this study. The definition was created through a unique study that brought together experts throughout the field of education in order to reach a consensus about the expectations and outcomes of college students.

> We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon. Facione, 1990, p. 3.

The APA study also created a separate definition for the disposition to think critically:

> The ideal critical thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in selection of criteria, focused on inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit.

Thus, educating good critical thinkers means working toward this ideal.

American Philosophical Association, 1990, p. 3.

These definitions were selected for their congruence with the study as well as the fact that the author of the APA study was also the author of the instruments used in this study. However, all of the authors discussed in the literature review with regard to defining critical thinking agreed that it is always a combination of skills and dispositions. A student can have a clear understanding of the skills that constitute critical thinking but if he/she does not have the motivation to use those skills, than he/she is not a critical thinker. In the same vain, a student motivated to embrace new ways of thinking but who does not fully understand how is not a critical thinker. The results of this study exemplify the latter. All of the students in each group began and ended the semester with positive dispositions toward critical thinking. However, their critical thinking skills were not as developed.

Becoming a critical thinker during college, learning the skills and acquiring the dispositions, is influenced by many variables both inside and outside the classroom. These variables were discussed in depth in the literature review, focusing primarily on the former. Interaction between students as well as between the students and the instructor, creating an environment that promotes questioning, and explicitly practicing critical thinking skills were among the pedagogical practices found to foster critical thinking development in the classroom. This discussion then moved into whether critical thinking is best taught as an independent course or within the context of a discipline-based course. Following an explanation of each side of this debate - including issues of transferability, context setting, and discipline-specific skills - this study embraced the philosophy that an

either/or approach is not necessary but rather, both are important for the development of critical thinking skills and dispositions.

Critical thinking is one element of cognitive development, within student development theory. The last portion of the literature review dedicated to critical thinking focused on where critical thinking fits in to various developmental schemes, whether differences are believed to exist among different student populations, and the impact of exposure to diversity. While both are subjects of debate, the literature on differences between male and female students, as well as between African American and Caucasian students, in the area of critical thinking, is inconclusive. While the majority of students benefit from exposure to diversity, more research is needed to better understand how this exposure impacts critical thinking development.

Prior to concluding the literature review with an explanation of how this study adds to the literature that currently exists on critical thinking, a group was dedicated to research on first-year student programs. The history and evolution of these programs, aimed at easing the high school to college transition, helps set the foundation for the idea that this study is unique in bringing together critical thinking instruction and first-year transitions courses. It is also unique in its use of action, or classroom, research, one of the topics of the methodology chapter.

Methodology

This study employed a pre-test/post-test design using two instruments: the California Critical Thinking Skills Test (CCTST) and the California Critical Thinking Dispositions Inventory (CCTDI). The methodology chapter discussed how and why

these instruments were selected, and provided in depth explanations of the subscales measured by each instrument. In retrospect, these instruments may not have been the best choice. While they matched up with the definitions of critical thinking skills and critical thinking dispositions employed in this study, they were not well-matched with the nature of the UNIV101 courses being studied or the textbook selected for the experimental group. For example, the format of the CCTST placed relatively more focus on logic and analysis while the course and textbook took a more rounded approach, focusing on generating alternatives, decision-making, and day-to-day problem-solving. Selecting and instrument to "test" critical thinking is difficult – in part because of the plethora of instruments available and in part because of the complexity of the construct. Ideally, a researcher/instructor would develop his/her own instrument because only that person can clearly match what they want to learn about the students with the questions being posed. The reality is, if every researcher did this there would be no measure of reliability or validity.

Due to the small sample size ($n = 39$), the research was limited in the types of statistical analysis that could be conducted. For each of the instruments, paired samples t-tests were used to compare the within group differences, for the control and experimental groups, from the pre-test to the post-test; independent samples t-tests were used to compare between group differences, between the control and experimental group, on the pre-test and then the post-test. ANOVA was used to test for interaction between participation in the experimental group and gender.

Beyond the statistical analyses, this study was an exercise in action/classroom research. The focus of the study was the pedagogy of critical thinking instruction. One

instructor, who was also the researcher, taught two groups of UNIV101, *An Introduction to the University*. One group, the control group, was taught in the manner considered typical for this course – informal, discussion-based; the other group, the experimental group, was taught infused with explicit critical thinking instruction. What took place in the classroom, the comparisons between the control group and the experimental group, captured through a teaching log, was equally as important to the researcher as the student outcomes on the instruments. Some of the differences between the two groups are highlighted in the methodology chapter; a complete comparison of the two groups is provided in Appendices B and C, the syllabi and course guides, respectively. The CCTST and the CCTDI were used to establish a baseline (pre-test) and then to examine differences in critical thinking growth as a result of taking UNIV101 (post-test). Both instruments were computer based and administered to each group on the second and final course meetings. A student questionnaire, designed by the researcher, was also administered during the final course meeting. The administration of a third test, the Ennis-Weir Critical Thinking Essay Test, was intended to take place during the semester following the students' enrollment in UNIV101. However, a lack of voluntary student participation resulted in the elimination of this instrument in analysis.

Results

The student questionnaire revealed that there was a great deal of similarity between the control and experimental groups as far as enrolling in Science and Philosophy courses during their first-semester of college, as well as with regard to taking part in living-learning and leadership opportunities. There were however differences

when it came to enrollment in English and Mathematics courses; in both cases more students in the experimental group than in the control group took courses in these disciplines.

The comparisons between the control group and the experimental group, based on analysis of the CCTST and the CCTDI, resulted in the experimental group demonstrating overall greater improvement on the former than the control group. The CCTST pre-test scores of the control group were higher than those of the experimental group but, at the end of the semester, the post-test scores of the control group decreased while those of the experimental group increased. The most meaningful examination of the data was in the difference – increase or decrease in score – from pre-test to post-test, for each, the control group and the experimental group. Due to limited statistical power, the majority of the scores were not statistically significant. However, on the subscale of Induction as well as on the total score, the experimental group scored significantly higher than the control group. These changes could be due to exposure to critical thinking instruction. The total score is of particular interest. As cited in the literature review, Pascarella and Terenzini (2003) estimated that critical thinking instruction may lead to an advantage in measured critical thinking skill of just under a half of a standard deviation or 9 percentage points. The experimental group in this study improved their total score, from pre-test to post-test by more than a half of a standard deviation, 9 percentage points. An alternative explanation lies in the fact that more students in the experimental group than in the control group participated in a math course during the same semester of the study. This may have given students in the experimental group an advantage (though on the subscales this would more likely influence Deduction), given the format of the

instrument. Future research in this area might consider controlling for other courses taken simultaneous to critical thinking instruction.

Both groups scored well on the CCTDI on the pre-test, leaving little room for improvement on the post-test; both groups were able to maintain their "positive" scores, based on the score categories established by the instrument publisher. This, in itself led the researcher to question the value of using the CCTDI with college students. It is difficult to capture growth when all of the participating students in a study can score so strongly on the pre-test of an instrument. The difference – increase or decrease - in score from pre-test to post-tests was examined for more meaning. On the Truthseeking subscale the difference for the experimental group was significantly more positive than the difference for the control group. However, on the Cognitive Maturity subscale the difference for the control group was significantly more positive than the difference for the experimental group. Overall, these findings are inconclusive. In addition to students' high scores on the pre-test, the researcher questioned the likelihood of being able to impact students' dispositions within the timeframe of one-semester. Perhaps, even more than critical thinking skills, critical thinking dispositions are acquired over time. An instructor can pass on knowledge about skills through activities, readings, and discussions; the manner in which dispositions evolve is less direct, less tangible.

The results of the comparisons between the females and the males, based on analysis of the CCTST and the CCTDI, showed that males and females in the experimental group outperformed their counterparts in the control group on the CCTST. As was the case with the comparisons between the two groups, most results where not statistically significant – especially since the sample size is reduced even further when

focusing on one gender. The difference in score from pre-test to post-test was used to compare females in the control group to females in the experimental group and males in the control group to males in the experimental group. The only statistically significant difference for females was on the Inference subscale, favoring the females in the experimental group. For the males, the only statistically significant difference was on the Analysis subscale, favoring the males in the experimental group. The results of ANOVA determined the there existed a significant interaction between gender and participation in the experimental group for females on the Inference subscale. This indicates that females may benefit more from instruction in this area than males.

The gender comparisons using the CCTDI were similar to those between the groups. Due to overall high scores on the pre-test, there was little change from pre-test to post-test. Focusing on the differences in score from pre-test to post-test, for the females, only the Systematicity subscale was statistically significant, favoring the females in the experimental group; for the males, only the Cognitive Maturity subscale was statistically significant, favoring the males in the control group. The results from ANOVA indicated that there was no difference between females and males in terms of benefits from participation in the experimental group.

As discussed in the literature review, the research regarding whether males are better critical thinkers than females is inconclusive. In addition, the research is based primarily on one-shot assessments. The focus of this study is different because rather than asking which gender is better at critical thinking, it asks which gender responds more positively to critical thinking instruction. More research is needed in this area to

determine whether males and females respond differently to instruction that integrates various types of thinking skills.

The final research question dealt with students' self-evaluation of their growth in critical thinking as a consequence of enrolling in UNIV101. Students in the experimental group did believe that they grew in the area of critical thinking more so than the students in the control group. The teaching log was used to add information that was not necessarily captured by the formal research questions regarding the themes of similarities, differences, satisfaction, and disappointment throughout the semester.

Other than providing a review of the study, this chapter serves primarily three purposes: to explain and draw conclusions based on the analyses presented in the preceding chapter, to evaluate the study itself, and to raise questions and promote ideas for further research of college students' critical thinking development. This study aimed to determine whether the infusion of critical thinking instruction into a first-year seminar course could accelerate the development of freshmen students' critical thinking skills and dispositions. While acknowledging that this course alone was not enough exposure to radically change students' abilities, the researcher aimed to provide students with a foundation upon which skills and dispositions would be built, throughout their college education. Once the study was underway, it became clear that this was a more complex goal than anticipated. Pedagogy and student learning are not the only things that take place in a classroom. No matter how well planned, it is difficult to anticipate every classroom contingency.

Explanation of the Findings

The findings of this study were not intended for generalization to a larger population. The sample size was far too small to extend the meaning of the findings to other similar courses, even at the same institution, never mind other institutions. Still, studies like this one are important, though quite rare, at the college level. It is important to note that this study was a form of action research focusing specifically on two classrooms; the pedagogy was the subject of the study, not the students. The students provided the "input" and "output," but the pedagogy was the "throughput." One instructor used two different styles of instruction in an effort to link theory to practice; this is the essence of classroom research.

The small sample size of 39 students is one likely reason that findings were not statistically significant. While these findings may not be generalizable, they inform the researcher about the link between theory and practice as they capture the internal life of what was occurring with the two classes. For example, the mean standardized scores on the CCTST for the experimental group demonstrated overall improvement from pre-test to post-test. The mean standardized scores for the control group, in many instances actually decreased from pre-test to post-test.

The link between statistical significance and generalizability does not exist with regard to classroom research in the same way it might for other types of research. Even if statistically significant results are achieved, there are so many variables that interact within each individual classroom – not the least of which is the combination of students, their interactions with each other, and their interactions with the instructor – that results from any classroom-based study are not entirely generalizable (Zeni, 2001). However,

the results are helpful at the local level; they inform present practitioners and future researchers.

Given that this study did not control for other variables, such as other courses or co-curricular activities that might enhance critical thinking, a questionnaire was administered to all of the participating students. The results, outlined in the previous chapter, indicate that more students in the experimental group were enrolled in English and/or Mathematics and/or diversity courses during the same semester that they were enrolled in their first-year seminar course. Participation in such courses can aid in critical thinking development. It is impossible to determine, in the case of this study, whether enrollment in these courses, participation in the experimental group of this study, or a combination of these factors lead to the experimental group demonstrating greater improvement than the control group.

The greatest differences between groups were generally from a quarter of a standard deviation to a little more than half of a standard deviation. While these differences are not large, in addition to considering the small sample size, the length and credit value associated with the course might also be considered. This course was one-semester in length, minus one-week for each the pre-test and the post-test. In addition, while critical thinking instruction was integrated into the experimental group, it was not the primary purpose of the course. Students enrolled in the two-credit UNIV course first and foremost to ease their transition into the college environment. Had this study compared a group of students enrolled in a two-credit course devoted to critical thinking and a group of students enrolled in a two-credit transitions course, the differences between groups would likely be greater. However, that would also be a different study.

This study adds to the literature on both the effectiveness of first-year transitions courses and critical thinking instruction. There are few institutions that attempt to combine such initiatives.

Another issue in the analyses presented in the previous chapter is relative importance of standardized mean scores versus raw mean scores. As has been established, the standardized scores are somewhat less meaningful due to the small sample size. In addition, given that the results will not be used to generalize to larger populations but rather, to better understand the pedagogy of infusing critical thinking instruction into a UNIV course at this particular institution, the raw scores actually provide better insight. This is especially true regarding the CCTDI because of the score categories. In order to get the whole picture of students' dispositions in both, the control and experimental groups, the mean raw scores were necessary. They showed that the students had strong scores from the beginning therefore improvement over the course of a semester would be more difficult. In addition, given that the average mean scores started out in the positive range, an increase in score will not change the score category. With regard to the CCTST, it was the raw score that was related to the percentile ranking, indicating that as the scores rose, it became increasingly more difficult to increase in percentile ranking. The standardized mean score versus raw mean score became even more prominent when the groups were broken down by gender because this reduced the sample size even more.

Even with using both the standardized mean scores and the raw mean scores it is difficult to get the entire picture of what is occurring inside the classroom. This is a problem with using quantitative analyses with action research. The research questions

themselves could be, and were, answered using quantitative data. However, student development is not limited to the results of pre-test, post-tests, and questionnaires. There is much to be learned from qualitative evaluation. In this study a teaching log was kept and themes were discussed in the results chapter. While there is no evidence that what is presented in the teaching log themes is directly related to the results, the themes reflect what was going on inside the classroom, the perspective of the instructor, and reflections regarding whether the study was going as planned. These are important elements to consider in connecting theory to practice in pedagogy at any level.

For this study, individual students' scores were not the subject but rather the scores of the class as a whole were considered (the mean of each group for each of the instruments subscales and totals), as this is a more appropriate reflection of pedagogy. However, this does not detract from the instructor/researcher learning about her students as individuals and coming to understand why some students score better than others. One example of this pertains to the significance of the outlier as presented in the previous chapter.

In the experimental group, there was one student whose scores on the California Critical Thinking Skills Test (CCTST) were significantly lower than those of his peers on both the pre-test and the post-test. Looking at the actual scores, as well as the standardized scores, this was clear; a scatter plot served as confirmation. Given the already small sample size, the researcher was uncertain as the whether the outlier should be included or removed. Therefore, statistics and graphs were run both ways. On the California Critical Thinking Dispositions Inventory (CCTDI), there was no outlier. However, since this one student (identified by test identification number) was removed

for the CCTST analyses, he was also removed, and analyses were run both with and without the outlier, for the CCTDI analyses to provide better consistency.

Evaluation of the Study

For the purposes of this study, the instructor/researcher integrated content and pedagogy. At times, a class group would get off-track and devote less time than planned to an exercise geared toward critical thinking development and more time to the content of the class session. Two lessons can be learned from this. First, classroom research involves many uncontrollable variables – and these may change from one class session to the next. Rarely will a course smoothly move through a syllabus and course guide, no matter how clearly it is outlined at the beginning of the semester. An instructor has no control over world or campus events that have a profound impact on the classroom environment; nor does an instructor have control over the life experiences that students bring with them into the classroom. An instructor might lose a class session to a highly publicized campus rape, or lose the focus of a student whose home four states away, was severely damaged by a hurricane. Both of these scenarios occurred during the semester in which this study took place.

Second, it is difficult to combine an emphasis on content and an emphasis on pedagogy without one or the other getting somewhat sacrificed. In the case of this study, the content was relatively simple; it did not rely upon a great deal of reading or work outside the classroom, and emphasized common sense rather than intellectual strength. Students were given weekly topics related to their transition to college and asked to think about them critically; each student had an equal opportunity to do this given that the

topics did not require the background knowledge of a discipline-based course. This leads

to a questioning of the implications of integrating critical thinking instruction with

discipline-based courses. While discipline-based courses certainly build critical thinking

skills, as discussed extensively in the literature review of this paper, there is some debate

as to whether they are the best environment for setting the foundation of critical thinking

development. While faculty member can certainly ask students to think critically about

the topic at hand, there is a disadvantage in the fact that students in a discipline-based

course are not always on equal footing. For example, in a History course, some students

may be taking the course as part of their major, some may be taking the course as part of

the University requirements. There may be Freshmen and Seniors in the course, students

that have taken several courses with the professor and students experiencing the

professor's style for the first time. These complications, combined with the lack of

faculty understanding as to what constitutes critical thinking, as was discussed in the

literature review, adds to the argument for setting this foundation for critical thinking

development early in the college career so that it can be built upon later. First-year

transitions courses can be an excellent venue for this but more research is needed to make

it as effective as possible.

An additional consideration is the fact that the two groups of the UNIV course

used in this study, like all groups of UNIV at the University, were worth two-credits.

Class met once a week for two hours at a time. A second day of class each week would

likely help in students' retention of material. In addition, many students do not enjoy the

two-hour class session. This is a tremendous change for some of the students coming

from high school class periods of forty-five minutes in length. The credit value was also

taken into consideration by the instructor/researcher when determining the appropriate amount of homework to assign. The control group and experimental group were given an equal amount of work to keep them comparable. However, at times, the instructor/researcher felt like the control group was doing "busy work," while the experimental group needed to be doing more in order to make use of the material being covered in class. A standard group of UNIV, such as the control group of this study, does not warrant three-credits in terms of the time required to cover the content associated with this course. However, with the integration of critical thinking instruction, the additional credit hour might provide a means to better achieve the goals of this course.

A change that might be made, if this study was repeated or if this instructor/researcher taught a similar course, would be to eliminate use of a textbook, replacing it with a course manual, or weekly hand-outs, composed of hand-selected readings and assignments. In doing this, there would be more control over areas of emphasis and a better chance of "fit" between the goals of the coarse and the knowledge students acquired over the semester. A course manual could also be constructed, or handouts selected, to reflect the credit hours and appropriate corresponding work load both in- and outside of class.

As discussed above, this study was not about individual students, but rather, about the pedagogy of critical thinking. In retrospect, the separation of the two may have taken away from this study. It was difficult, as an instructor, to not focus on individual student outcomes and critical thinking development. Perhaps an additional qualitative element, such as focus groups or individual student interviews would have been useful in better understanding students' perspectives on the course, and obtaining a better sense of what

they learned throughout the semester, beyond the scope online multiple-choice questions. Another qualitative way to add to this study would be through follow-up with students in both groups. Would students from the two groups remember the course differently? Would students from the experimental group remember the emphasis on critical thinking – in particular problem-solving and decision-making while students from the control group remember an emphasis on content areas such as responsible decision-making and time management? Would students from the experimental group remember content as well? Based on students' questionnaire responses from each of the groups, there may be some differences, but likely, there would not be many. This is important given the idea that this course was not meant to impact critical thinking in and of itself, but rather, the course was meant to set a foundation for critical thinking development throughout college. Had the groups gone differently, had the critical thinking instruction been better integrated, the outcomes may be different. Part of this also lies with whether the critical thinking instruction was explicit enough. In retrospect, there could have been more statements such as "this activity focuses on [analysis], as important critical thinking skill." Another interesting question lies with the particular groups of students in the control and experimental groups, different group of students, or even reversing the two groups, might also produce different outcomes. Such is the nature of classroom research. The question is how to move beyond this to make this research more meaningful and applicable?

One limitation of this study, not mentioned previously, was that the instructor/research had previously taught UNIV, but had never before used critical thinking pedagogy. While she felt secure in her own knowledge, this study was a test run

of her ability to convey this knowledge, as much as it was a test of students' abilities to take it in. This would be a limitation for many faculty members if they adopted the idea of integrating critical thinking instruction into a discipline-based course. As evidenced through the review of literature, critical thinking has, especially over the past twenty-years, become a discipline unto itself. The instructor/researcher spent months researching various activities, textbooks, and materials, as well as determining which critical thinking skills and dispositions in particular could reasonably be focused upon during the timeframe and using the content of the UNIV course. Would faculty be willing to do similar work, or attend training, in order to be prepared? Or would they teach based on their own belief that they themselves are critical thinkers and can thereby teach it? There are two issues here. First, the scope of critical thinking: general skills versus skills those that are particular to a discipline. It seems more appropriate for faculty members to focus on the latter. Second, like anything else, it is one thing to be a critical thinker and another thing to teach a college student how to be a critical thinker. And this would, of course, be in addition to teaching students the nuances of a particular subject area.

This study adds to current literature in higher education by the nature of its unique focus on the classroom. Much of the research in higher education is based on large samples, multiple groups of students, multiple institutions. Classroom research is much more typical of elementary and secondary education. But why is that? Is higher education not interested in improving classroom pedagogy? Are faculty members not interested in linking theory to practice? Unfortunately, the answer to these questions is often that pedagogy and linking theory to practice are not top priorities in higher

education, at least not at research institutions like the one used in this study. Faculty members are specialists in their disciplines; they are not trained teachers. If how they are teaching and what they are teaching is not working for a student, it is the student's responsibility to address this. Certainly this is not always the case, but for introductory level courses, with hundreds of students enrolled, there are not many options as to how the information is communicated. While pedagogy is not the top priority of most research universities, especially in first-year courses, graduating students with strong critical thinking skills is a common element of a university's mission. This study attempted to find a way to fit critical thinking instruction into an already full curriculum by integrating it into a first-year seminar course. In this way, students would have the opportunity to acquire some of those more general critical thinking skills and learn what it means to be a critical thinker, so when faculty members ask students to use these skills, they recognize them and can build on them.

Future Research

Classroom/action research

More classroom research at colleges and universities is needed to better understand the link between theory and practice at this level. If institutions truly want to give students the best learning experiences it is important to study not only large, nationwide samples of students, but to also study small, local samples of their own student body. The large studies are where theories are developed, but the smaller studies test those theories to determine if they are practical in the classroom. Classroom research could be useful in situations such as to study a particular course wherein many students

are not doing well or to study a course that has been on the books for many years is getting revised. An instructor at the beginning of his/her career may find this useful as a form of self-evaluation; a seasoned instructor may find this useful as a check on his/her continued effectiveness. Of course, classroom research can also be useful in studying particular pedagogies, such as critical thinking instruction.

As discussed in Chapter 3, classroom research is based on what is actually occurring inside the classroom therefore it cannot be purely objective or based on solely quantitative analyses. Findings cannot be generalized to large populations but they can be used in developing a curriculum at a particular institution. As discussed throughout this study, there will always be variables within a classroom that cannot be controlled. However, from semester to semester, certain qualities – about the instructor, about the curriculum, even about the students - will remain constant. Ask a Chemistry professor about which groups of the course students struggle through the most; they are likely the same groups students struggled through five years ago. Ask a UNIV instructor about which transition issues students struggle with the most; they are likely the same issues students struggles with five years ago. The point is, what is learned through studying one particular classroom, is useful after those students, or that professor, move on. This is because the student outcomes are not the subject of the study; the pedagogy is subject.

New theories on pedagogy and activities for teaching various subjects are constantly being developed. The only way to determine whether these theories are useful in practice, they must be tested in a real environment. Faculty members that are concerned with whether such research would take away from their responsibilities to their own disciplinary research should be assured that this research too, is important to their

discipline. If the discipline is to continue to grow and attract bright and interested students, professors must find the best ways to train and retain those students.

Research on critical thinking

Critical thinking, like many other skills and dispositions, develops over a long period of time – some may argue, over a lifetime; this makes it difficult to measure. Pre-test/post-test quantitative designs do provide the hard data that many institutions want and need for policy and curriculum formation, however, they are not the best way to understand student development in this area. One weakness of this study was likely the short period of time in between the pre-test and the post-test. Future research might include a study wherein students are tested upon entry to the University and then prior to graduation. Of course, in this case, the number of variables that could potentially impact critical thinking development would be vast. However, the study could be limited to a particular college or program at the University. This limitation would provide that the group of students being studied had similar exposure to courses and professors. Provided the sample was large enough, other variables could then be controlled for during data analysis.

As was the initial plan for this study, testing critical thinking using multiple formats is likely to result in a more comprehensive picture of students' abilities; for example, using both a multiple-choice instrument and an essay instrument, or a multiple-choice instrument and student interviews. The addition of a qualitative element of analysis would likely improve the reliability of the study by providing a different form of insight to the complex construct of student development. In order to do this type of

study, a captive audience or incentive, is necessary as it requires a great deal of the students' time; such was a dilemma for this study. As it was, two days of pedagogy were sacrificed for students to take the pre-test and then the post-test. Administering the CCTST and CCTDI instruments during classroom time was the best way to ensure the greatest amount of student participation. When students were asked to return on their own time to take the Ennis-Weir Essay Test, the response rate dropped to a number that deemed the results useless.

Teaching critical thinking

Over the past forty years, critical thinking began developing into a discipline of its own. Today, as evidenced through various mission statements, it is recognized a necessary college outcome from community colleges to the Ivy League. Do students need a separate course in critical thinking, or can they develop skills and dispositions as a consequence of completing a college curriculum? Of course, it depends. It depends on a number of student variables, such as academic background, course selection, and participation in co-curricular activities; but it also depends on a number of faculty/instructor variables, such as comfort within their own discipline, comfort with their own knowledge of what it means to be a critical thinker, and teaching style. More research is needed in the realms of student intellectual development, forms of college classroom pedagogy, and the interaction between these phenomena, as they contribute to critical thinking development during college.

Critical thinking cannot be learned as a consequence of taking one course for one-semester. However, it seems logical to this researcher, if a first-year college student is

exposed to the concept of critical thinking, the skills and dispositions that the concept encompasses, and a variety of situations – both inside and outside the classroom wherein critical thinking is useful, this can only help the student when he/she is asked to think critically about a discipline-based question. An analogy can be made to a young mechanic receiving a full toolbox on the first-day of a new job. A seasoned mechanic would likely take each tool from the box, explain its use, other tools with which it can be used in conjunction, and perhaps a situation wherein the tool would be required. A course in critical thinking provides students with different tools for thinking about, and processing, information. If taken during the first-semester, students can then use these tools throughout their college careers. More longitudinal research on the outcomes of students that take a course in critical thinking, as compared to students that take no such course, is needed to pinpoint specific areas of difference, if any, in critical thinking ability. Ability should be recognized as both skill and disposition. Such a study, of students at the end of their first semester and then in the middle of their Senior year, might include both quantitative and qualitative methods in order to capture students' sense of their own ability. As was attempted in this study, it would also be useful to determine whether students believe – three years after the end of their first semester – that receiving critical thinking instruction (if they did) was helpful or whether (if they did not) they now think it might have helped them.

Based on the argument developed in Chapter 2, that learning - including the acquisition of critical thinking skills - is often most fluid if there is a context, this study placed critical thinking in the context of a first-year transitions course. According to the literature reviewed, this has not often been done. This type of course provides students

with topics to think about; however, the topics were more matters of common sense and awareness than matters concerning specialty knowledge. All students were on equal footing in that none had ever before experienced the transition to college – no matter what type of high school, what area of the country, or how large a family they came from, none had ever themselves been in this situation. This permitted students to engage in thinking activities without getting too hung up on what it was they were thinking about. Even with this being the case, the actual amount of critical thinking instruction used with the experimental group was not as extensive as was intended. Sometimes the context lead the class astray; sometimes classroom variables – such as attendance - lead to discussion being more or less productive; sometimes time did not permit the completion of activities to the extent of the lesson plans. The point here is that it is difficult to both permit the free-flow of thought on a subject and simultaneously conduct a focused activity. That is not to say it cannot be done, only that the more subject matter, the more context, there is to be covered, the more difficult this may be. At no time during this course were "lectures" more than fifteen minutes, leaving plenty of time for questions and answers, and then inter-activity among the students and with the instructor and still some days the time just got away. Having now integrated a first-year transitions course and critical thinking instruction the instructor/researcher has a better idea of what to expect and the changes to be made to made such a combination more productive (such as more structured homework assignments, two class sessions per week rather than one, and more explicit explanations of what critical thinking is and why it is important). More research on integrating first-year transitions content with critical thinking instruction

would benefit many the many institutions across the country that require students to enroll in first-year seminar type courses.

Yes, there are particular skills associated with critical thinking that can be explicitly covered through readings and activities. Can faculty use such readings and activities in the context of their own discipline-based courses? Of course, but it is not as easy as some may think, especially if this is the students' only exposure to critical thinking. In order for students to benefit, a significant amount of time would have to be dedicated to explanation and follow-through; the last thing and instructor wants is for students to get so caught up in how to think about a reading or an assignment that they overlook the intended topic of instruction. The degree to which this is necessary may vary within the class given that students with different levels of background knowledge and experience are likely to be enrolled in the course. For example, a Freshman and a Junior, both taking a course to fulfill a university requirement, are likely to have different levels of critical thinking ability. This could potentially impact a critical thinking activity. Taking the time for in depth discussions about critical thinking is, in many instances, impractical in the limited time frame of a course attempting to cover Medieval History, Organic Chemistry, or United States Foreign Policy. In addition, this would require the faculty member to develop extensive knowledge on the various components of critical thinking.

However, if students enter discipline-based courses armed with critical thinking tools, faculty can provide students with opportunities to use these tools, thereby developing skills and dispositions over time. While such a schema makes intuitive sense, this is an area in need of future research. As stated above, longitudinal studies of students

that receive formal instruction in critical thinking early in their college careers are needed to determine whether what is intuitive can be better substantiated. In the context of this study, the critical thinking instruction likely needed to be more explicit and better reinforced, though assignments and follow-though, to have the impact that the researcher desired – an impact that would last, and grow, throughout college.

Conclusion

This study aimed to determine whether integrating critical thinking instruction into a first-year seminar course would enable students in the course to develop stronger critical thinking skills and dispositions than students enrolled in a first-year seminar course without critical thinking instruction. The findings, while not statistically significant, indicate that critical thinking instruction does have a positive impact on critical thinking skill development and that this is true for both males and females. Using action research, together with a pre-test/post-test design the instructor/researcher was able to learn more about critical thinking pedagogy, as well as the critical thinking skills and dispositions of first-semester students; this study contributes to the literature in both of these areas.

Linking theory to practice in higher education is necessary to better understand both, how students learn and develop and how faculty and administrators can best contribute to student growth. Colleges, academic programs, and disciplines are often judged on the students that enter and the outcomes that those students achieve. Critical thinking is quickly becoming one of those outcomes. Studying critical thinking in the context of the first-year seminar classroom moves the academic community one step

closer to understanding the complex goal of developing students into critical thinkers,

from their first semester forward.

Appendix A: Informed Consent Forms

INFORMED CONSENT FORM
(18 and older)

Identification of Project/Title	Comparative Pedagogies in UNIV, *Introduction to the University* Courses
Statement of Age of Subject (Please note: Parental consent always needed for minors)	I state that I am over 18 years of age and wish to participate in a program of doctoral research being conducted by Lauren Ruff under the supervision of Dr. Steven Selden in the Department of Education Policy and Research at the University of Maryland, College Park.
Purpose	The purpose of this study is to determine the effectiveness of different pedagogical practices in UNIV, *Introduction to the University* courses.
Procedures	The procedures involve taking two tests: one to assess my skills and one to assess my attitudes. I will take each test at the beginning, and then again at the end, of the semester for a total testing period of 65 minutes. I will be asked to return next semester to complete an additional essay test as well as an open-ended questionnaire, for a total testing time of 65 minutes. This information will be used solely for the purpose of the study and will not influence students' grades.
Confidentiality	All information collected in this study is confidential to the extent permitted by law. I understand the data I provide will be grouped with data others provide for reporting and presentation and that my name will not be used. All identifying information will be destroyed at the completion of the study.
Risks	There are no risks involved in participating in this study.
Benefits, Freedom to Withdraw, and Ability to Ask Questions	The experiment is not designed to help me personally but to help the investigator learn more about pedagogical practices in UNIV, *Introduction to the University* courses. I am free to ask questions or withdraw from participation at ant time without penalty.
Contact Information of Investigators	Dr. Steven Selden Lauren Ruff 3112E Benjamin Building lgr@umd.edu 301-405-3566

Contact Information of Institutional Review Board	If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: Institutional Review Board Office, University of Maryland, College park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-4212
	Name of Subject:
	Signature of Subject:
	Date:

INFORMED CONSENT FORM
(Under 18 years old)

Identification of Project/Title	Comparative Pedagogies in UNIV, *Introduction to the University* Courses
Statement of Age of Subject (Please note: Parental consent always needed for minors)	I state that I am under 18 years of age and wish to participate, with the permission of my parent/guardian, in a program of doctoral research being conducted by Lauren Ruff under the supervision of Dr. Steven Selden in the Department of Education Policy and Research at the University of Maryland, College Park.
Purpose	The purpose of this study is to determine compare the effectiveness of different pedagogical practices in UNIV, *Introduction to the University* courses.
Procedures	The procedures involve taking two tests: one to assess my skills and one to assess my attitudes. I will take each test at the beginning, and then again at the end, of the semester for a total testing period of 65 minutes. I will be asked to return next semester to complete an additional essay test as well as an open-ended questionnaire, for a total testing time of 65 minutes. This information will be used solely for the purpose of the study and will not influence students' grades.
Confidentiality	All information collected in this study is confidential to the extent permitted by law. I understand the data I provide will be grouped with data others provide for reporting and presentation and that my name will not be used. All identifying information will be destroyed at the completion of the study.
Risks	There are no risks involved in participating in this study
Benefits, Freedom to Withdraw, and Ability to Ask Questions	The experiment is not designed to help me personally but to help the investigator learn more about pedagogical practices in UNIV, *Introduction to the University* courses. I am free to ask questions or withdraw from participation at ant time without penalty.
Contact Information of Investigators	Dr. Steven Selden Lauren Ruff 3112E Benjamin Building lgr@umd.edu 301-405-3566

Contact Information of Institutional Review Board	If you have questions about your rights as a research subject or wish to report a research-related injury, please contact: Institutional Review Board Office, University of Maryland, College park, Maryland, 20742; (e-mail) irb@deans.umd.edu; (telephone) 301-405-4212
	Name of Subject:
	Signature of Subject:
	Name of Parent/Guardian:
	Signature of Parent/Guardian:
	Date:

Appendix B: Course Syllabi

	EXPERIMENTAL GROUP	CONTROL GROUP
Class 1 **Assignment 1**	**Welcome and Introductions** Review syllabus, expectations Autobiography (including what brought you to UMD)	**Welcome and Introductions** Review syllabus, expectations Autobiography (including what brought you to UMD)
Class 2 **Assignment 2**	**At Home in the Campus Computer Lab** Online Pre-tests, Exploring UMD internet resources Read Chapter 1, respond to "Thinking Toward the Future: A Goal I Want to Achieve" (p. 11)	**At Home in the Campus Computer Lab** Online Pre-tests, Exploring UMD internet resources Read Chapter 3, respond to "Your Personal Journal," #'s 1, 6 (p. 58)
Class 3 **Assignment 3**	**Goal Setting** Connecting short-term and long-term goals with decision-making Read Chapter 2, respond to "A Community of Thinkers: Analyzing a Belief" (p. 51)	**Goal Setting** Connecting short-term and long-term goals with decision-making Read Chapter 10, respond to "Your Personal Journal," #7 (p. 197)
Class 4 **Assignment 4**	**Responsible Decision-Making** The impact of underage drinking on campus and in society Read Chapter 4, take MBTI online	**Responsible Decision-Making** The impact of underage drinking on campus and in society Read Chapter 2, take MBTI online
Class 5 **Assignment 5**	**Learning Styles and Your Personality** Integrating MBTI results with learning how to learn Read Chapter 7, respond to "A Community of Thinkers: Writing a Film Review" (p. 233)	**Learning Styles and Your Personality** Integrating MBTI results with learning how to learn Read Chapter 8, respond to "Your Personal Journal," #3 (p.147)

	EXPERIMENTAL GROUP	CONTROL GROUP
Class 6 **Assignment 6**	**Library Safari** Locating resources in the library and using the library website Read Chapter 3, respond to "A Community of Thinkers: Analyzing an Unsolved Problem" (p. 78)	**Library Safari** Locating resources in the library and using the library website Read Chapter 1, respond to Exercise 1.1 (p. 21)
Class 7 **Assignment 7**	**Time Management and Other Complex Problems in College** Creating and using schedules, identifying priorities and areas of flexibility, generating alternatives for unsolved, real-life problems Read Chapter 8, respond to "A Community of Thinkers: Composing a Dialogue" (p. 248)	**Time Management** Creating and using schedules, identifying priorities and areas of flexibility Read Chapter 4, respond: How are your listening skills inside the classroom connected to the listening techniques you use with friends and family? How can you use one to improve the other?
Class 8 **Assignment 8**	**Difficult Discussions, Part I** Crime on campus and in society, with focus on date rape Read Chapter 9, respond to "A Community of Thinkers: Thinking Critically About Stereotypes" (p. 287)	**Difficult Discussions, Part I** Crime on campus and in society, with focus on date rape Read Chapter 9 and the Epilogue, respond to "Your Personal Journal," #2 (p. 167)
Class 9 **Assignment 9**	**Difficult Discussions, Part II** Diversity on campus and in society Read Chapters 5 and 6	**Difficult Discussions, Part II** Diversity on campus and in society Read Chapters 5 and 6

	EXPERIMENTAL GROUP	CONTROL GROUP
Class 10 **Assignment 10**	**Study Skills** Getting the most out of reading assignments and preparing for various types of exams Go online and determine possible courses for next semester. Bring a list of at least 7 to class next week	**Study Ski***lls* Getting the most out of reading assignments and preparing for various types of exams Go online and determine possible courses for next semester. Bring a list of at least 7 to class next week
Class 11 **Assignment 11**	**Getting the Most Out of CORE** Distribution requirements, Limited Enrollment Programs, short-term planning for the long-term Group Presentations (NOVEMBER30): Begin thinking about and preparing to demonstrate something you have learned as a consequence of having taken this class (may be direct or indirect)	**Getting the Most Out of CORE** Distribution requirements, Limited Enrollment Programs, short-term planning for the long-term Group Presentations (DECEMBER 2): Begin thinking about and preparing to demonstrate something you have learned as a consequence of having taken this class (may be direct or indirect)
Class 12 **Assignment 12**	**Being an Engaged Citizen** A current social issue will be used for a class activity Interview Paper (DUE: DECEMBER 7): Read Chapter 10, start thinking about who you would like to interview for your response to "Thinking About the Future: Changing Beliefs" (p. 331)	**Being an engaged Citizen** Discussion of a current social issue Interview Paper (DUE DECEMBER 9): Read Chapter 7, start thinking about who you would like to interview for your response to Exercise 7.1A, "Friends and Values" (p. 126)
Class 13	**Group Presentations**	**Group Presentations**
Class 14	**Post-tests**	**Post-tests**

Appendix C: Course Guides

	EXPERIMENTAL CLASS	CONTROL CLASS
Class 1	**Welcome** • Name cards • Ice breakers: name with action, candy and questions • Review syllabus	**Welcome** • Name cards • Ice breakers: name with action, candy and questions • Review syllabus
Class 2	**Feeling at Home in the Campus Computer Lab** • Pre-tests • UMD internet resources: health center, writing center, career center, campus recreation center, math success, faculty directory, undergraduate studies, academic disciplines	**Feeling at Home in the Campus Computer Lab** • Pre-tests • UMD internet resources: health center, writing center, career center, campus recreation center, math success, faculty directory, undergraduate studies, academic disciplines
	* From this point forward the first twenty minutes of class will be spent doing a weekly check-in during which students must reflect on a "high" and a "low" from the preceding week.	*** From this point forward the first twenty minutes of class will be spent doing a weekly check-in during which students must reflect on a "high" and a "low" from the preceding week.**
Class 3	**Goal Setting and Decision-Making** • Setting goals in the context of one semester, then in the context of four years of college • Connect goals to major/career exploration • Students write letters to themselves regarding where they hope to be (goals/accomplishments) by the end of the semester [Letters will be returned to students in November] • Analyze a complex decision - using questioning techniques – with regard to facts, interpretation, analysis, synthesis, evaluation, and application	**Goal Setting and Decision-Making** • Setting goals in the context of one semester, then in the context of four years of college • Connect goals to major/career exploration • Students write letters to themselves regarding where they hope to be (goals/accomplishments) by the end of the semester [Letters will be returned to students in November] • In small groups, students discuss a past decision prompted by a short-term or long-term goal; then consider how this can be useful in the context of college

	EXPERIMENTAL CLASS	**CONTROL CLASS**
Class 4	**The Impact of Underage Drinking on Campus and in Society** • Use role play to enact Tom Randall's trial • Break up into small groups to answer the questions associated with Tom Randall's Halloween Party • As a class, discuss alcohol/drug consumption on campus	**The Impact of Underage Drinking on Campus and in Society** • Presentation of facts and figures regarding alcohol consumption of 18-22 year olds, on campus and off-campus • Ask students which facts/figures they are and are not surprised about, which scare them • Cheers! activity
Class 5	**Learning Styles and Your Personality** • Using personality type to determine which study techniques, environments, and modalities work best • Create learning worksheets: goals/motivation (exams vs. papers), environments, schedule (time/day, allotted time), approaches (resources, framework of knowledge, modality)	**Learning Styles and Your Personality** • Basic MBTI interpretation and associated activities • Discuss ways different "types" learn best: studying for exams, writing papers, organization, etc.
Class 6	**Library Safari** *Meet at McKeldin Library • In classroom: library website (catalogue, databases, reserving), card activation, printing, photocopying, NetEthics • In small groups: activity involving retrieval of articles from microfiche, periodicals (shelves and stacks), government documents	**Library Safari** *Meet at McKeldin Library • In classroom: library website (catalogue, databases, reserving), card activation, printing, photocopying, NetEthics • In small groups: activity involving retrieval of articles from microfiche, periodicals (shelves and stacks), government documents

	EXPERIMENTAL CLASS	CONTROL CLASS
Class 7	**Time management and Other Complex Problems in College** • Create schedules for a "typical" week, including everything from sleeping to studying, socializing to exercising • Anticipate problems with schedules, consider alternatives • In small groups brainstorm about unsolved problems from homework assignment	**Time management and Other Complex Problems in College** • Discuss how students' days are different now from when they were in high school – Spare time? Structure? • Activities for prioritizing, recognizing where students spend their hours • Connection between time management and stress management – need for balance of academic, social, physical arenas of life • Create schedules for a "typical" week, including everything from sleeping to studying, socializing to exercising
Class 8	**Difficult Discussions, Part I** • Communicating effectively one-on-one conversations versus in groups • Crime and date rape on campus and in society • Pairs problem solving activity	**Difficult Discussions, Part I** • Discussion about crime on campus – email alerts – Do students feel safe? • College Park versus where students grew up; On a campus versus in general society • Review campus policies, illegal activities, repercussions • Distribute, read, and discuss date rape article
Class 9	**Difficult Discussions, Part II** • Understanding the various elements of an argument and the distinction between an argument and a generalization • Diversity web activity • Provide students with a brief newspaper article for a critical incident exercise that touches on a diversity issue with multiple perspectives	**Difficult Discussions, Part II** • Diversity web activity • Diversity in the media activity • Circle of Diversity activity • Discussion – diversity in high school versus at UMD, in general society

	EXPERIMENTAL CLASS	CONTROL CLASS
Class 10	**Study Skills** • Go over specific study strategies for different types of exams: multiple-choice, true/false, matching, short answer, and essay; Use real examples • Analyze the problem of test anxiety with five-step method outlined in the text • Discuss getting the most out of a reading assignment; Various approaches	**Study Skills** • Note-taking techniques for in-class and for use on reading assignments • Preparing for an exam a week in advance, two days in advance, the night before/day of • Where, when, and with whom to study – pro's and con's of locations, environments, study groups
Class 11	**Getting the Most Out of CORE** • Review CORE requirements • Have students share information on one CORE class they are currently taking • In small groups, have students discuss making a course plan through *at least* sophomore year	**Getting the Most Out of CORE** • Review CORE requirements • Have students share information on one CORE class they are currently taking • In small groups according to anticipated discipline, have students discuss whether they have researched the direction they hope to pursue, courses they want to take next semester
Class 12	**Being an Engaged Citizen** • Engage in a critical debate regarding some specific social issue (provide students with three articles representing different perspectives). • Students are given time to prepare with their "teammates," the debate is held, a class discussion follows regarding how students felt about this activity, as well as the sources provided.	**Being an Engaged Citizen** • Prompt students to engage in an intellectual discussion regarding three articles that represent different perspectives on a social issue. • Following topic discussion, or as part of it, discuss what it feels like to be having this discussion, and the sources of information provided to them. • Ask specific but open-ended questions

	EXPERIMENTAL CLASS	CONTROL CLASS
Class 13	**Group Presentations** • Each group performs a skit representing something they learned as a consequence of taking this course	**Group Presentations** • Each group performs a skit representing something they learned as a consequence of taking this course
Class 14	**Last Class** • Post-tests	**Last Class** • Post-test

Appendix D: Student Questionnaire

Thank you for participating in this research study. Please answer the following questions as completely as possible. The instructor will not be able to link you to your responses; you will only be linked to you UNIV class group.

1)   Gender: MALE   FEMALE

2)   Did you enjoy taking UNIV101? Why or why not?

3)   Which topic(s) do you think were covered in the most effective or most interesting ways? (Circle one or two)

        College Drinking   Date Rape

        Goal Setting   Learning Styles and Your Personality
                                      (MBTI)

        Study Skills   CORE Requirements

        Diversity   Time Management

4)   Which topic(s) do you think were covered in the least effective or least interesting ways? (Circle one or two)

        College Drinking   Date Rape

        Goal Setting   Learning Styles and Your Personality
                                      (MBTI)

        Study Skills   CORE Requirements

        Diversity   Time Management

5)   Do you think you will be able to apply what you learned in UNIV101 to other courses during college? Please explain.

6) Do you think you will be able to apply what you learned in UNIV101 to aspects of your life outside the classroom throughout college? Beyond college? Please explain.

7) Do you feel that your critical thinking abilities improved as a result of taking UNIV101? Why or why not?

8) Do you think the textbook used in this course contributed to your learning? Why or why not?

9) Did you participate in any of the following during this semester: (Circle all that apply)

An English course   A science course

A math course   A philosophy course

A diversity course   A living/learning community

A leadership program or role in an organization

10)   Did you participate in any of the following during high school: (Circle all that apply)

AP courses

Honors courses

Leadership activities (e.g., student government, honor society, volunteering)

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