2005

A comparison of the critical thinking dispositions of arts and non-arts undergraduates

Nancy Ann Lampert
College of William & Mary - School of Education

A COMPARISON OF THE CRITICAL THINKING DISPOSITIONS OF ARTS AND NON-ARTS UNDERGRADUATES

A DISSERTATION PRESENTED TO
THE FACULTY OF THE SCHOOL OF EDUCATION
THE COLLEGE OF WILLIAM AND MARY
WILLIAMSBURG, VA

In Partial Fulfillment of the Requirements for the Degree
Doctor of Education

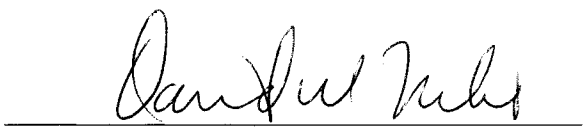
by
Nancy Ann Lampert
2005

A Comparison of the Critical Thinking Dispositions
of Arts and Non-Arts Undergraduates

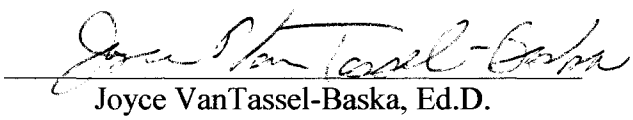
by

Nancy Lampert

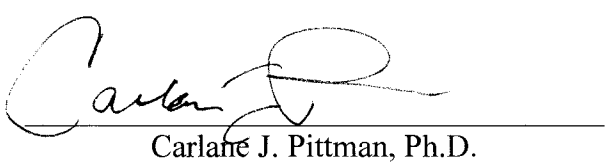
Approved October 2005 by



David W. Leslie, Ed.D.
Chair of Doctoral Committee



Joyce VanTassel-Baska, Ed.D.



Carlane J. Pittman, Ph.D.

ABSTRACT

A Comparison of the Critical Thinking Dispositions of Arts and Non-Arts Undergraduates

by

Nancy Lampert

This study investigates the variance in critical thinking dispositions between arts and non-arts undergraduates using quantitative data from the California Critical Thinking Disposition Inventory (CCTDI), a survey instrument. Data were collected from a sample of 141 undergraduates at a large, urban, public university on the east coast. The population consisted of four groups: freshmen non-arts students, freshmen arts students, junior and senior non-arts students, and junior and senior arts students.

Of the four groups which were compared, the junior and senior arts subjects showed the greatest mean total score on the CCTDI. This mean was significantly higher than that of freshmen non-arts students. Junior and senior arts students were also found to have significantly higher mean scores on several of the CCTDI subscales.

A consensus of findings in research literature on higher education and critical thinking indicate that an inquiry-based curriculum positively influences gains in critical thinking in undergraduates. Research shows, as well, that learning in the arts is largely inquiry-based. The synthesis of those findings and the results of this study indicate that exposure to learning in the arts positively influences students' disposition to think critically.

ACKNOWLEDGEMENTS

In grateful acknowledgement of my doctoral dissertation committee: Dr. David Leslie, advisor and chair of the committee; Dr. Joyce Van Tassel-Baska, and Dr. Carlane Pittman, who each provided me with appropriately rigorous challenge and support throughout my doctoral program and dissertation research.

Thanks as well to my family: my husband, Charles Lampert, my sons, Joshua and Jesse Lampert, my parents, Irene and Sy Rutkowski, and my mother and father-in-law, Joyce and Ernest Lampert, for their constant encouragement.

Also, in gratitude to my colleagues at Virginia Commonwealth University who encouraged and generously enabled my research—Dr. Don Forsyth, Dr. David Burton, Dr. Pamela Taylor, Professor Thomas White, and Professor Samuel Banks.

Contents

List of Tables

List of Figures

CHAPTER 1: INTRODUCTION

Conceptual Framework

Critical thinking ability is generally considered to be a desirable outcome of an undergraduate liberal arts education. In his book, *Assessment for Excellence*, Alexander Astin (1993a) stated that "of all the skills that are considered basic to the purposes of a liberal education, critical thinking is probably at the top of the list" (p. 47). Erwin and Wise (2002) noted that "generic critical thinking and problem-solving skills across the curriculum are mentioned in nearly every discussion of general education" (p. 69). Yet, few empirical studies have tested the effectiveness of various instructional techniques in producing the outcome of improved critical thinking in undergraduates (Halpern, 1993; Tsui, 1998, 2002). And in particular, there is little published research available on the effects of fine arts instruction on the critical thinking abilities of college students (Simon & Ward, 1974; Astin, 1993b), despite the fact that in our culture individuals working in the arts are often considered to be open-minded, creative problem solvers—dispositions I propose are akin to those involved in critical thinking.

Scholarly studies of critical thinking and of creativity, as separate fields of inquiry, have been underway for more than half a century (Bleedorn, 1993; Perry, 1999). The examination of the ways in which the two types of cognitive function might overlap and influence one another is a relatively young research focus, having only developed in roughly the last decade (Bleedorn, 1993). The manner in which the overlap of these two constructs is manifested in and relevant to postsecondary instructional practices narrows the focus and shortens the historical span of inquiry

even more—making the scholarly study of how this overlap is manifested in higher education a relatively unexplored line of inquiry.

As one of the central aspects of critical thinking is open-mindedness and the ability to recognize that multiple valid viewpoints or perspectives exist on any given issue, it was my belief, derived through observation from my practice as an arts instructor, that it was worthwhile to study whether or not the classroom techniques of arts instruction might reinforce open-mindedness, and the understanding of multiple perspectives.

For example, when a drawing class renders a still life in a studio course, each student views the still life from a different perspective in the classroom. Students then observe in class critiques that each classmate's drawing is unique. Repeated exposure to this fact of natural observation may instill in art students an inherent understanding of how relative one individual viewpoint is. Also, when art students render from nature, they become acutely aware of how variables such as light, atmosphere, and shadow, etc. affect the form, clarity, and interpretation of an object or scene, again reinforcing how relative one perspective is in any given moment in time.

In a longitudinal higher education study, Giancarlo & Facione (2001) used the California Critical Thinking Disposition Inventory (CCTDI) to test the critical thinking dispositions of freshmen in 1992, and then again to test seniors four years later. In this study the investigators found that, over the four years spent at the institution where the data was collected, students "came to endorse more strongly the ideal of putting aside personal biases in the pursuit of good evidence and reason" (p.

14). Overall, the researchers discovered more increases than decreases in scores on the various scales of disposition toward critical thinking.

An additional finding of this study indicated that there was a statistically significant difference in attitudes in four of the scales when comparing students by discipline. The Humanities, Letters, and Languages students scored highest on Truthseeking and Openmindedness of all the discipline clusters represented—the other discipline clusters being Natural and Physical sciences; Mathematics, Computer Science, and Engineering; Business Administration and Communication; Social and Behavioral Science and Liberal Studies; and Undeclared. Business and Communications students scored lowest of all the discipline clusters on Inquisitiveness and Maturity of Judgment. The Fine and Performing Arts students were dropped out of this study due to insufficient sample size.

Giancarlo & Facione noted in their report that "because this study used discipline clusters as opposed to individual discipline areas the findings must be interpreted with caution. It remains to be seen whether these findings can be replicated in other data sets. Certainly the implications of these findings merit further investigation" (Giancarlo & Facione, 2001, p. 21).

Given that Giancarlo & Facione did find discipline cluster differences in critical thinking ability in a study in which the Fine and Performing Arts students were dropped out because of insufficient sample size, I believed that further study of differences in critical thinking dispositions among disciplines was warranted. I designed a study similar to that of Giancarlo & Facione, but with Fine Arts students included. Rather than doing a longitudinal study, I collected data at one point in time.

Using the same instrument as Giancarlo & Facione, I compared the California Critical Thinking Disposition Inventory scores of two discipline groups: arts and non-arts undergraduates; and two class rank groups: freshmen and juniors/seniors.

In doing this study I believed that research into the outcomes of postsecondary instructional practices in the fine arts might further enlighten practitioners on specific instructional techniques that may facilitate the development of open-mindedness and an understanding of multiple perspectives—hence the disposition toward critical thinking. Enhanced development in this area in non-art students may promote cognitively flexibility, enabling them to better explore issues and topics from multiple perspectives across the college curriculum and into adulthood.

Statement of the Problem

Because little research has been done on the relationship between university level fine arts instruction and critical thinking, further study was suggested on whether or not a relationship exists between the disposition toward critical thinking and the undergraduate study of fine arts.

Definitions of Terms

The definitions of critical thinking, creativity and dispositions which were utilized in this study are as follows:

Critical thinking is the ability to recognize the soundness of various viewpoints, and the ability to make a reflective commitment to one (Perry, 1999).

Creativity is a cognitive activity involving decision making, critical thinking and metacognition which results in novel products, solutions, understanding, or behaviors (Feldhusen & Eng Goh, 1995).

Dispositions are the inclination to use existing skills (Facione, Giancarlo, Facione, & Gainen, 1995)

Research Questions

Does the disposition toward critical thinking vary between arts and non-arts undergraduates?

Does the disposition toward critical thinking vary between freshmen and juniors/seniors?

Is GPA related to the disposition toward critical thinking?

Overview of Methodology

This study utilized inferential statistics to estimate population values from known sample statistics (Keiss, 2002). The California Critical Thinking Disposition Inventory (P. Facione & Facione, 1992) was administered to freshmen and junior/senior arts, and non-arts undergraduates. Scores on the Inventory were compared and contrasted between groups of arts and non-arts students, and between freshmen and juniors/seniors. Comparisons were done of four groups: freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students, to determine if there were differences between arts and non-arts students in general, and/or between groups by class level.

As well, correlations between CCTDI scores and GPA were conducted to examine whether or not GPA had any bearing on the CCTDI outcomes.

Table 1— Research Question Table

Question	Instrument	Data Analysis
Does the disposition toward critical thinking vary between arts and non-arts undergraduates? Does the disposition toward critical thinking vary between freshmen and juniors/seniors?	California Critical Thinking Disposition Inventory (CCTDI)	Between-subjects ANOVAs run on total CCTDI scores of arts undergraduates and non-arts undergraduates; freshmen and juniors/seniors; arts freshmen and arts juniors/seniors; and non-arts freshmen and non-arts juniors/seniors Between-subjects ANOVAs run on scores for each of the seven CCTDI subscales of arts undergraduates and non-arts undergraduates; freshmen and juniors/seniors; arts freshmen and arts juniors/seniors; and non-arts freshmen and non-arts juniors/seniors
Is GPA related to the disposition toward critical thinking?	California Critical Thinking Disposition Inventory (CCTDI)	Correlations run between student GPAs and total CCTDI scores Correlations run between student GPAs and scores for each of the seven CCTDI subscales

Limitations of Study

Population Sample Limitations

Undergraduate student subjects for the study were obtained from a large, public, urban university on the east coast during the spring semester 2005. Comparisons were done of four groups: freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students. For strength of statistical analysis, 30 students were sought for each group to be compared.

Because the researcher had limited access to undergraduate research subjects at this university a random sample was not possible. Instead, a convenience sample of primarily non-arts students was drawn from Psychology 101 classes in which students were required to either participate in research studies or complete readings of research reports to gain understanding of psychological research methods.

Additionally, because of time constraints and limited access to undergraduate classes, the nature of the college instruction the subjects in the study experienced was not analyzed. Also, due to cost and time limitations, this study utilizes outcome data from only one instrument.

A large enough group of non-arts seniors was not available in the lower level Psychology 101 classes, so to contrast CCDTI scores by class level, freshmen non-arts students were compared with a combined group of junior and senior non-arts students from Psychology 101.

Because a large enough group of arts student subjects was not available in Psychology 101 classes, a convenience sample of art students who volunteered to participate at the request of the researcher was sought from School of the Arts classes

where the researcher is a faculty member.

Also, because access to research subjects is limited at the university where the study was conducted, all student subjects in non-arts disciplines were combined into one non-arts group rather than separated into separate discipline groups. This was done so that the total number of students from Psychology 101 who participated in the study stayed within the percentage of the subject pool to which the researcher was limited.

An additional limitation of the study reported here is that it may not be generalizable beyond the setting in which it occurred because art students in the sample were from a highly regarded art school and were compared with non-arts students from a very large public university not known to have a high humanities orientation.

Data Collection Timeframe Limitations

To compare the critical thinking dispositions of freshmen with those of upperclassmen, a longitudinal study of the same convenience sample of subjects, tracked through several years of undergraduate study, was not feasible for this researcher. For that reason, a cross-sectional comparison of freshmen and upperclassmen was done at the same point in time, with different subjects in each group.

Conclusion

This study compared the critical thinking dispositions of freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts

students to examine whether or not study of the arts impacts the critical thinking dispositions of undergraduates. This chapter presented the conceptual framework, the research questions and an overview of the methodology.

Chapter Two presents a review of the literature; Chapter Three details the methodology; Chapter Four reports the findings of the study; and Chapter Five presents a summary and discussion of the findings.

CHAPTER 2: REVIEW OF THE LITERATURE

Review of Literature on the Pedagogy of Critical and Creative Thinking

Background and Introduction

When Harvard, the first college in America, opened its doors in 1636, until well after the Revolutionary War, higher education curriculum in this nation was based on the classical curriculum of Britain, the nation by which America had been ruled. The pedagogy of the classical curriculum was such that college students were required to spend day after day in class reciting Latin, Greek and Hebrew passages from the Bible and classical literature (Morison, 1936; Winterer, 1998).

After the Revolutionary War and the break with Britain, leaders such as Jefferson began to explore alternatives to the classical British curriculum. The Enlightenment, which had grown out of the Scientific Revolution in Europe, had profoundly influenced Jefferson and several college leaders. Enlightenment thinking stressed that authority not be preferred over observation. Beginning with the Enlightenment, as science expanded, the perception of knowledge expanded (Hooker, 1996; Thomson, 1970).

Revisions to the classical curriculum in American colleges sputtered and stalled for nearly a century after the Revolution, but eventually colleges began to perceive knowledge as a territory to be mined, discovered and interpreted. The belief that knowledge was handed down from the Bible and the ancient classics was supplanted by explorations into the nature of understanding and knowledge through scientific

research consisting of observation, experiment and interpretation (Pilcher, 1994; Snow, 1907; Veysey, 1965).

The first college research seminar is said to have taken place in the U.S. at the University of Michigan in the academic year 1871-1872. This seminar course is described in the University of Michigan's *President's Report* of 1874, in which it is noted that a professor by the name of Charles K. Adams "sent his students off to write papers, armed with lists of assigned topics and of the best authorities in the University library, and each week class discussion centered on one of these student essays" (Turner & Bernard, 2000, p. 232).

The first seminar represented a significant departure from the traditional curriculum in which students recited Latin and Greek for hours each day. Ironically, although the classical curriculum had included recitations of the Greek classics, the inquiry based teaching methods of Socrates were not employed in this curriculum. Socrates was known to have encouraged those he mentored to seek the truth by questioning the authoritative claims of others. It wasn't until the late 1800s that American colleges underwent a liberation into a more active, and interactive method of pursuing knowledge—a method which can be likened to the Socratic Method.

The inquiry-based seminar method in American colleges was based on a model derived from the German university system, which "assumed as their mission the advancement of knowledge and training in original research" (Turner & Bernard, 2000, p. 222). Numerous individuals, educated in Europe and working in American higher education at the turn of the 19th century, had been profoundly influenced by

the German model and began to experiment with it in American colleges in the late 1800s (Turner & Bernard, 2000).

These early experiments resulted in a permanent infusion of the research based curriculum into American higher education. However, the infusion took over a half century to make its way through all segments of higher education. Fifty years after the first seminar class at the University of Michigan, there were only 15 American institutions in which research was solidly in place as an institutional goal—where professors and graduate students were conducting original research and experiments. Five were state universities from the Middle and Far West—Illinois, Michigan, Minnesota, Wisconsin and California. Five were among the nation's oldest institutions—Columbia, Harvard, University of Pennsylvania, Princeton and Yale. And five were private institutions begun in the late 1800s—MIT, Cornell, Johns Hopkins, Stanford and the University of Chicago (Geiger, 1986).

At the same time that the research-based curriculum was taking hold in American higher education, another important innovation in college curriculum was taking place—the establishment of the elective system. Forays into an elective curriculum at American colleges had been attempted in the early 1800s, but to no avail (Rudolph, 1990). But under the leadership of Charles Eliot, in the late 1800s, an elective system was firmly established at Harvard. Eliot created:

> The movement that substituted a broadly elective course of study for the old prescribed classical curriculum. Step by step under Eliot's leadership Harvard abandoned prescription and expanded the domain of election. In 1872 all subject requirements for seniors were abolished. In 1879 all subject requirements for juniors were abolished. In 1884 the sophomores were liberated, and in 1885 subject requirements were materially reduced for

> freshmen. By 1894 a Harvard freshmen's only required courses were rhetoric and a modern language. By 1897 the prescribed course of study at Harvard had been reduced to a year of freshmen rhetoric (Rudolph, 1990, pp. 291-294).

Soon after its establishment, Eliot's elective system for Harvard became a model which was implemented at colleges across the U.S. "Hardly an institution was spared the necessity of considering its own course of study in relation to the reforms that Eliot was carrying out at Harvard" (Rudolph, 1990, p. 300). By 1901, a "survey of 97 representative colleges found that 34 institutions offered courses of study that were between 50 percent and 70 percent elective" (Rudolph, 1990, p. 302).

It was a curriculum based on the elective system first established at Harvard at the turn of the 19th century that William G. Perry, working at Harvard in the 1950s, theorized was responsible for significant development in the critical thinking ability of college students. Perry (1999) explained that

> The young person's discovery of diversity in other people's points of view is of course part of the folklore of adolescence and of 'growing up' in the college years....We had been impressed with the variety of ways in which the students responded to the relativism which permeates the intellectual and social atmosphere of a pluralistic university....For the college student, the confrontation with pluralism of values becomes inescapable, not only in his courses but in his daily life with his peers. Cultural diversity in the student body has become a deliberate policy of selection in nonsectarian colleges of liberal arts (pp. 3-5).

Perry (1999) described his research as documenting "a revolution in the very definition of knowledge confronted by freshmen in a college of liberal arts in this century" (p. 5). In explaining his model of intellectual development, he referred

to the historical movement in the perception of knowledge which was described by Henry Adams. Perry noted: "In Henry Adams's words: 'the movement from unity to multiplicity, between 1200 and 1900, was unbroken in sequence and rapid in acceleration. Prolonged one generation longer, it would require a new social mind'" (p. 5). Perry's response to Adams' comments was "the rate of acceleration has been greater than perhaps even Adams foresaw" (p.5).

Since the time of Perry's study of the intellectual development of college students, higher education curriculum has not undergone the kind of radical change it did in the decades leading up to his research. Most nonsectarian American universities continue to be pluralistic, as Perry described Harvard had to be in the 1950s. However, women and minorities now represent a significant aspect of the diversity and pluralism of American colleges—and this wasn't the case when Perry began his work.

What follows is a review of literature on contemporary higher education pedagogy and how it may influence the intellectual development of college students—a topic first researched and documented by Perry in the 1950s.

Critical Thinking Defined

The roots of the construct of critical thinking can be traced back 2500 years, to the teaching practice of Socrates, who developed a probing method of questioning the claims made by others (Paul et al., 1997). This type of questioning is now commonly referred to as the 'Socratic Method.' In the report, *California Teacher Preparation for Instruction in Critical Thinking: Research Findings and Policy Recommendations*, Paul et al. (1997) noted that Socrates believed that

> Confused meanings, inadequate evidence, or self-contradictory beliefs often lurked beneath smooth but largely empty rhetoric. Socrates established the fact that one cannot depend upon those in 'authority' to have sound knowledge and insight. He demonstrated that persons may have power and high position and yet be deeply confused and irrational. He established the importance of asking deep questions that probe profoundly into thinking before we accept ideas as worthy of belief. He established the importance of seeking evidence, closely examining reasoning and assumptions, analyzing basic concepts, and tracing out implications not only of what is said but of what is done as well (p. 8).

In more recent history, scholars have developed many definitions and models of the construct of critical thinking (Jones 1995; Paul et al., 1997; Perry, 1999; Ennis, 2002). Examination of a sample of existing contemporary models shows some similarities in the way the construct is described by various contemporary researchers.

William G. Perry, while he was a professor of education at Harvard in the 1950s, developed an interview instrument to "[document] a revolution in the very definition of knowledge confronted by freshmen in a college of liberal arts" (Perry, 1999, p. 5).

From his findings, Perry determined that college students (exposed to a liberal arts/general education curriculum) often move through stages of intellectual development in which they begin with initially assuming there are absolute right and wrong positions on various issues, to a stage where they recognize multiple viewpoints exist on issues, to a stage where they develop the ability to recognize the soundness (or lack thereof) of various perspectives on a topic, to a final stage where they are able to make a reflective commitment to a single well-reasoned and well-

defended position on an issue. It is in the last two stages, Perry noted, that one expects college students to exhibit critical thinking ability.

Perry's classification of the final stages of intellectual development as a manifestation of critical thinking is evidenced, albeit indirectly, in the index of his book, *Forms of Ethical and Intellectual Development in the College Years: A Scheme*, which was originally published in 1968. (The last edition of this book was published in 1999, shortly after Perry's death.)

In the index of his book, Perry included several entries for "critical thinking" (p. 280). The pages listed for critical thinking include passages describing the two later stages of his model of intellectual development. For example, the following, from page 106:

> At this point of development, then, the less combative student, perceiving Authority as 'wanting' him to think relativistically, will cooperate in his instruction with anything from compliance to eagerness and more readily 'catch on' to the skills of critical thought. This achievement hardly makes him independent in any spiritual sense. A certain creative judgment and a willingness to risk are of course required by any critical comparison of competing interpretations of data.

Many subsequent descriptions of intellectual development in college students are derived from Perry's original scheme (Evans, Forney & Guido-DiBrito, 1998; Knefelkamp, 1999).

The model of critical thinking developed by Robert H. Ennis, currently a professor of education at the University of Illinois, was created in response to contemporary confusion about definitions of the construct. In acknowledgement of this confusion, Ennis has developed what he has described as a "super-streamlined"

definition: "critical thinking is reasonable reflective thinking focused on deciding what to believe or do" (Ennis, 2002).

Ennis' full model of critical thinking includes the following eleven traits used to describe a critical thinker: open-minded and mindful of alternatives; tries to be well-informed; judges well the credibility of sources; identifies conclusions, reasons, and assumptions; judges well the quality of an argument, including the acceptability of its reasons, assumptions, and evidence; can well develop and defend a reasonable position; asks appropriate clarifying questions; formulates plausible hypotheses; plans experiments well; defines terms in a way appropriate for the context; draws conclusions when warranted, but with caution; integrates all items in this list when deciding what to believe or do (Ennis, 2002).

In comparing Ennis' definition of critical thinking to Perry's, it is apparent that language on 'reflective thinking used to make decisions' is included in both descriptions. Ennis' model has other similarities to the Perry model as well. Although Ennis' model doesn't include stages of critical thinking development, as Perry's does, Ennis does note that open-mindedness is important in a critical thinker, which compares to Perry's stage in which the recognition of multiple perspectives develops. Several other Ennis descriptions of a critical thinker are also part of the Perry model: Ennis notes that judging the quality of arguments and developing and defending reasonable positions are important components of critical thinking. These qualities are components of the final stages of the Perry model also.

Jones (1995), in *National Assessment of College Student Learning: Identifying College Graduates' Essential Skills in Writing, Speech and Listening, and Critical*

Thinking, stated that "critical thinking involves reasoning about issues that have no single solution" (p. 15). This description is consistent with the Perry concept of evaluating multiple valid viewpoints, from stage three of his scheme.

Richard Paul, Director of the Center for Critical Thinking at Sonoma State University, defined critical thinking as "thinking that explicitly aims at well-founded judgment, and hence utilizes appropriate evaluative standards in the attempt to determine true worth, merit or value of something" (Paul et al., 1997, p. 2).

When asked in an interview, "What is your conception of critical thinking?" Paul responded:

> I think the best way to get to the nub of it is to see that everyone thinks and that their thinking is deeply involved in every dimension of their daily life. If there's one thing that you can't escape, it's your own thinking. It's everywhere you are and it's always shaping and influencing everything you do—your emotions and all your decisions. Every nook and cranny that's in you is thoughtful, i.e. full of thought. The key question is: Are you in charge of your thinking; or is your thinking in charge of you? You discover critical thinking when you realize how deeply the quality of your life is dependent on the quality of your thinking to make it what you want it to be rather than what it has been made to be by your environment, your parents, your society, the media and so on. That's the basic idea behind critical thinking. It's intrinsically connected with a self determining way of living. It's a commitment to continually upgrade the quality of your thinking so as to upgrade the quality of your life" (Paul et al., 1997, pp. 5-6).

The Paul model, which focuses on the 'elements of reasoning' and the 'standards of critical thinking' is largely theoretical, and as such, is not based on empirical evidence (Nosich, 2005). Paul's 'elements of reasoning' entail reasoning about point

of view, purpose, questions at issue, information, interpretation and inference, concepts, assumptions, as well as implications and consequences. His 'standards of critical thinking' are: clarity, accuracy, precision, relevance, depth, breadth, and logic (Nosich, 2005; Paul & Elder 2004).

As with Ennis' model, there is similarity between Perry's and Paul's descriptions of critical thinking in that Paul described the construct as a process of evaluation and judgment. This can be likened to Perry's description of it as evaluation and commitment. Paul's model, with its 'elements of reasoning' and 'standards of critical thinking,' expands on the evaluation and commitment stages in the Perry model, and offers specific details about the qualities of reasoning and judgment which Paul has designated as necessary to sound thinking and evaluation of an argument.

There exists some empirical evidence that critical thinking is evident in students in the final stages of the Perry development model. "Relationships have been established between performance in a range of critical thinking instruments and a student's stage of cognitive development as operationalized through the Bloom developmental taxonomy, or through the Perry-based Reflective Judgment Interview" stated Ewell (1994), in *A Preliminary Study of the Feasibility and Utility for National Policy of Instructional "Good Practice" Indicators in Undergraduate Education* (p. 6). Ewell explained that in a review of literature on critical thinking and higher education he located a study by Widick, Knefelkamp, and Parker, that demonstrated "developmental gain on the Perry scale after students participated in a class designed around such activities as debates, role-playing, and the use of learning logs" (p. 15). The Widick et al. study was conducted with a sample of 31 college students. Results

showed that the curriculum intervention designed by the researchers increased the number of subjects in the higher stages of the Perry development model from 20 percent of the sample to 68 percent of the sample (Widick, Knefelkamp & Parker, 1975).

Because the Perry model of intellectual development is drawn from the empirical study of college students and because it has been the model for many subsequent and current theories of college student development (Evans, Forney & Guido-DiBrito, 1998; Knefelkamp, 1999), it is the model of critical thinking used for this study.

Creativity Defined

As with the construct of critical thinking, there are many definitions and models of creativity, from Guildford's 1950 description of creativity "as being grounded in the ability to manipulate ideas in fluent, flexible, elaborate, and original ways" (VanTassel-Baska, 1998, p. 381) to Feldhusen and Eng Goh's contemporary model of creativity which includes "related cognitive activities such as decision making, critical thinking, and metacognition" (Feldhusen & Eng Goh, 1995, p. 231). What follows is a sample of descriptions of the construct.

In a creativity and higher education study, *Supportive Classroom Environments for Creativity in Higher Education,* Cole, Sugioka, & Yamagata-Lynch (1999) defined creativity as "the production of novel thoughts, solutions, or products based on previous experience and knowledge" (p. 277). Downs-Lombardi (1996) used a similar definition of creativity in her paper, *Society's Child: A Mini-Workshop in Critical and Creative Thinking*. She noted that "creative thinking is characterized by a personal aesthetic with a powerful drive to wrest order from chaos and to explore

original options for solving problems" (p. 1). She goes on to explain that "creative thinkers value and seek new approaches which include opposition and synthesis" (p. 1). This description, in its reference to "approaches which include opposition" has similarities to Perry's description of critical thinking, as noted above, in that both descriptions mention the consideration of varying, or opposing, viewpoints.

In other literature on creativity, the definition of the construct is similar to that of Cole et al. and Downs-Lombardi. For example, in their book, *Understanding and Recognizing Creativity: The Emergence of a Discipline*, Isaksen and Murdock (1993) explained that

> The Center for Creative Leadership studies the managerial and organizational applications of creativity and innovation. The definition they use notes that 'creativity is novel associations that are useful.' Isaksen and Treffinger (1985) defined creativity as making and communicating meaningful new connections in order to: (a) think of many possibilities, (b) think and experience in various ways and use different points of view, (c) think of new and unusual possibilities, and (d) guide in generating and selecting alternatives (p. 18).

In *Understanding and Recognizing Creativity: The Emergence of a Discipline*, Isaksen and Murdock further noted that

> MacKinnon (1978) offered the following summary of the research done at the Institute for Personality Assessment and Research at Berkeley: The full and complete picturing of the creative person will require many images. But if despite this caution, one insists on asking what most generally characterizes the creative individual as he [sic] has revealed himself in the Berkeley studies, it is his high level of effective intelligence, his openness to experience, his freedom from crippling restraints and impoverishing

inhibitions, his esthetic sensitivity, his cognitive flexibility, his independence in thought and action, his unquestioning commitment to creative endeavor, and his unceasing striving for solutions to the ever more difficult problems that he constantly sets for himself (p. 27).

Amabile (2002) described creativity as:

> The formation of a large number of associations in the mind, followed by the selection of associations that may be particularly interesting and useful. In a sense, it's as if the mind is throwing a bunch of balls into the cognitive space, juggling them around until they collide in interesting ways. The process has a certain playful quality to it; in fact, Einstein once referred to creativity as 'combinatorial play.' If associations are made between concepts that are rarely combined—that is, if balls that don't normally come near one another collide—the ultimate novelty of the solution will be greater (p. 58).

Amabile (1983) acknowledged the difficulty contemporary scholars face in defining creativity. She states that because, "empirical studies of creativity cannot at this time apply specific criteria for identifying creative products, any theoretical formulation of creativity must make assumptions about these criteria and their characteristics" (p. 32). For her research on the social psychology of creativity, Amabile (1996), operating within the limitations of empirical findings on the construct, formulated both an operational definition of creativity and a conceptual definition in an effort to build on existing theory. Her operational definition is that creativity "rests on the consensus judgment of some social group at some point in time" (p. 38). Her conceptual definition stated "that creativity is a novel, appropriate response to a heuristic (or open-ended) task" (p. 38). Amabile described heuristic

tasks as the direct contrast of algorithmic tasks: "those for which the path to the solution is clear and straightforward—tasks for which an algorithm exists" (p. 35).

Amabile's creativity model is built around the link between her operational definition and her conceptual definition and is founded on the elements of "novelty, and acceptability or appropriateness" (p. 38). Amabile found that her first key element, novelty, was the most important criterion for creativity among experts in creativity assessment. Her other key element of creativity, acceptability or appropriateness, refers to the importance of consensus judgment by a group, at some point in time, on the utility or usefulness of creative solutions within a particular context.

Well before Amabile acknowledged in the 1980s that researchers faced difficulties in defining creativity, Torrance (1969), noted in his writing that there were many ways to define the construct. He explained that creativity was usually defined in terms of a process or product but it could also be defined it in terms of a personality trait or environmental condition. Torrance chose to define creativity as, "the process of sensing problems or gaps in information, forming ideas or hypotheses, testing and modifying these hypotheses, and communicating the results" (p. 4). Torrance believed that this definition included the major elements of most other definitions. Novelty, he explained, was included in most definitions of creativity. Torrance believed that novelty was the process of finding new or unusual missing pieces for existing gaps, even if it the newness existed only for the creator, such as a child. If a child designs a solution or a song that they have never known, Torrance stated, then the child is exhibiting creativity.

Gardner (1993) developed what he referred to as a multifaceted model of creativity. His definition referred to the creative individual, who he described as "a person who regularly solves problems, fashions products, or defines new questions in a domain in a way that is initially considered novel but that ultimately becomes accepted in a particular cultural setting" (p. 35). Gardner emphasized that in his definition creativity occurs within a specific domain that an individual works, that it occurs regularly, that at its highest levels it involves devising new problems or questions (not just the solving of existing questions), and that creativity is only recognized when it is accepted by a particular culture—even if a century or a millennium passes before this acceptance occurs. Notably, as with so many other definitions of creativity, Gardner's model is hinged on the concept of novelty.

The above descriptions of creativity, developed by various researchers who have studied the construct in the past half-century, are similar to one another in that they refer to the motivation to seek novel solutions derived from divergent thinking about multiple perspectives, or many possible solutions, to open-ended problems. This is noteworthy because such an approach is also essential in critical analysis, which requires the reflective consideration of various possibilities or interpretations.

Because Feldhusen and Eng Goh's description of creativity is a comprehensive one, with aspects grounded in critical analysis, it is the operational model for this study. Feldhusen and Eng Goh (1995) acknowledged that "traditional approaches to creativity training and testing have been much more circumscribed in scope and have often conceptualized critical thinking, decision making, and metacognition as being outside the realm of creative thinking"(p. 231). Their model, however, recognizes that

"creative thinking is a complex cognitive activity...that hopefully results in creative products, solutions, understanding, or behaviors....Modern conceptions of creativity are so diverse and extensive that a definition of creativity must include related cognitive activities such as decision making, critical thinking, and metacognition" (p. 231).

Dispositions Defined

In this study, critical thinking dispositions, rather than critical thinking skills were examined. The definition of dispositions that is used for this study—dispositions are the inclination to use existing skills—is based on the model by Facione and Facione, who developed the dispositions instrument utilized in the study. The critical thinking dispositions that the instrument measures are: inquisitiveness, systematicity, analyticity, truth-seeking, open-mindedness, critical thinking self-confidence, and critical thinking maturity (P. Facione & Facione, 1992).

Paul and Elder (2004) noted eight intellectual virtues as essential to critical thinking. These critical thinking virtues have some similarities to the critical thinking dispositions which are measured by the instrument in this study. Paul and Elder's intellectual virtues are: intellectual humility, courage, empathy, autonomy, integrity, perseverance; confidence in reason; and fairmindedness. Both Facione and Facione's and Paul and Elder's models contain dispositions related to critical reasoning confidence; and the Paul and Elder intellectual integrity virtue, described as the ability to "admit discrepancies and consistencies in one's own thought and action" (p. 14), has parallels to Facione and Facione's truth-seeking disposition, which is described as honesty about "pursuing inquiry even if the findings do not support

one's self-interests or one's preconceived opinions" (N. Facione et al., 1994, pp. 345-347). The Paul & Elder fair-mindedness virtue, described as "a consciousness of the need to treat all viewpoints alike" (p. 14) is similar to Facione and Facione's open-mindedness disposition, which is described as the tolerance of "divergent views with sensitivity to the possibility of one's own bias" (N. Facione et al., 1994, pp. 345-347.

Dispositions are often noted in contemporary literature on education as important to the knowledge acquisition process. Without the disposition toward learning, students may be unwilling to use the abilities they possess. In the article, *The Disposition Toward Critical Thinking*, Facione, Giancarlo, Facione & Gainen (1995) noted that "strength in a given dispositional attribute indicates that a person is more inclined to use what skills he or she may have, while opposition to a given aspect of the overall disposition toward critical thinking suggests that a person would be inclined not to use his or her skills, even if they were considerable" (p. 10).

In the field of education, the construct of dispositions is now closely linked to that of epistemologies, or beliefs about knowledge. In a report by Kardash and Sinatra (2003), *Epistemological Beliefs and Dispositions: Are We Measuring the Same Construct?,* dispositions were significantly correlated with epistemologies.

Many permutations are currently emerging on definitions of the two constructs, as is the case with the constructs of critical thinking and creativity. As well, researchers in the field are now classifying Perry's scheme as an epistemology (Hofer & Pintrich, 1997). For this study, such a classification is consistent with examining students' dispositions toward critical thinking—which Perry deemed are evident in the later two stages of what is now referred to as his epistemological scheme.

Of the difficulty of defining the construct of dispositions, Perkins, Jay & Tishman (1993) said:

> Yes, dispositions inevitably include reference to things that are genuinely hard to pin down: motivations, affect, sensitivities, values, and the like. But these factors exert no less of an influence on behavior simply because they are hard to define (p. 18).

Critical Thinking and Higher Education

An examination of studies on critical thinking in higher education by McMillan (1987), remains to this day one of the most comprehensive reviews of literature on the topic (Pascarella et al., 1996; Tsui, 1998). In his review, McMillan compared twenty-seven studies that examined changes in college students' critical thinking ability. A majority of the studies evaluated by McMillan utilized a pretest-posttest design with the Watson-Glaser Critical Thinking Appraisal, the Test of Science Reasoning and Understanding, or the Test of Critical Thinking in Social Science instruments. McMillan concluded that "the results [of his analysis] failed to support the use of specific instructional or course conditions to enhance critical thinking, but did support the conclusion that college attendance improves critical thinking" (p. 3).

Pascarella, Bohr, Nora & Terenzini (1996) supported McMillan's conclusion that college-level instruction enhances critical thinking ability. Their longitudinal study of 2092 freshmen found "modest but significant positive effects on end-of-first-year critical thinking" (Pascarella et al., 1996) but included no data on postsecondary instructional techniques which might influence this gain.

In a 1998 review of literature on critical thinking, Tsui stated that

> McMillan's 1987 review of 27 studies on critical thinking at the higher education level is considered by many to be the most significant overview of research on this subject. More than a decade has elapsed since that publication, and the pool of research studies on critical thinking has expanded significantly. A re-examination of the state of educational research on this important topic is thus again warranted (p. 1).

In her review, Tsui concurred with the researchers noted above in their finding that undergraduate education enhances critical thinking ability. Like those researchers, she found little conclusive information on links between specific instructional practices and critical thinking as an outcome. In her conclusion she stated that

> A preponderance of research findings firmly suggests that students grow in critical thinking while in college....The bulk of research on critical thinking examines the effects of instruction, curriculum, or academic major. A substantial body of findings suggests that curriculums emphasizing the synthesis of knowledge and employing an integrative approach to teaching various disciplines tend to enhance students' critical thinking skills. Studies examining differences in critical thinking performance by academic major generally have not uncovered significant differences. Mixed findings, however, emerge regarding effects on critical thinking stemming from specific pedagogical techniques and courses specifically designed to raise critical thinking capabilities. These inconsistent results might be linked to a number of research design limitations, including small sample size, insufficient duration between pre-test and post-test, and failure to control for the potential effects of instructor differences and simultaneous exposure to other coursework (pp. 20-21).

Following her literature review in 1998, Tsui (2002) conducted a case study which examined specific postsecondary instructional techniques and their relation to

critical thinking. In her qualitative study of four undergraduate institutions, she collected data from physical science, social science, and humanities classes and found that of the four institutions studied, the two which showed greater growth toward critical thinking skills in its students were institutions which placed an emphasis on writing intensive courses and on discussion classes, rather than lecture and multiple choice exams. She concluded that "because of a premium placed on critical analysis, writing assignments typically ask students to demonstrate more than a mere understanding of someone's work...but also a focus on the synthesis, analysis, and refinement of ideas through the medium of writing" (p. 748). As well, she found that with class discussions "this active learning approach might be facilitating critical thinking development by encouraging students to verbalize and try out ideas" (p. 750). Because writing assignments and discussions are based in the disciplines of English and Speech, these approaches can be considered to be grounded in the Humanities, a point which will prove relevant in relation to findings from several other studies. In this regard, Tsui stated that

> A curricular emphasis on writing comes about more readily in some disciplines (e.g., humanities and social sciences) than in others (e.g., math, science, and engineering). This, however, can be overcome as demonstrated by the successful efforts at Schools A and D to stress writing across the curriculum (p.749).

Findings from a major study by Astin in 1993, of data on 82 outcome measures, with 16,658 college students, at 309 four-year institutions, support the conclusions of Tsui (2002) that a curricular emphasis on the Humanities impacts undergraduates' ability to think critically. Astin noted that "the environmental variable showing the

strongest positive effect on self-reported growth in ability to think critically is the Humanities orientation of the institution" (p. 226). The data for this study was obtained from the Cooperative Institutional Research Program (CIRP). This program collects data on undergraduates through the use of student entrance and exit questionnaires, faculty surveys, student retention information from registrars, as well as through student testing organizations, such as the SAT and GRE, and from the U.S. Department of Education. The data is statistically analyzed with multiple regression techniques (Astin, 1993b).

In a longitudinal study, done at a private, four-year liberal arts and comprehensive university, Giancarlo & Facione (2001) used the California Critical Thinking Disposition Inventory to test the critical thinking dispositions of freshmen in 1992, and then again to test seniors four years later.

In this investigation, Giancarlo & Facione found that, over the four years spent at the institution where the study was conducted, students "came to endorse more strongly the ideal of putting aside personal biases in the pursuit of good evidence and reason" (p. 14). Overall, the researchers discovered more increases than decreases in scores on the various scales of disposition toward critical thinking. An additional finding indicated that there was a statistically significant difference in attitudes in four of the scales when comparing students by discipline. The Humanities, Letters, and Languages students scored highest on Truthseeking and Openmindedness of all the discipline clusters represented—the other discipline clusters being Natural and Physical sciences; Mathematics, Computer Science, and Engineering; Business Administration and Communication; Social and Behavioral Science and Liberal

Studies; and Undeclared. Business and Communications students scored lowest of all the discipline clusters on Inquisitiveness and Maturity of Judgment.

The Fine and Performing Arts students were dropped out of this study due to insufficient sample size. Giancarlo & Facione noted in their report that "because this study used discipline clusters as opposed to individual discipline areas the findings must be interpreted with caution. It remains to be seen whether these findings can be replicated in other data sets. Certainly the implications of these findings merit further investigation" (Giancarlo & Facione, 2001, p. 21).

In the 1990s, the National Center for Education Statistics commissioned a series of reports as part of its plan to develop a process for the assessment of college student learning. Peter Ewell, of the National Center for Higher Education Management Systems, was the principal author of one of these reports: *A Preliminary Study of the Feasibility and Utility for National Policy of Instructional 'Good Practice' Indicators in Undergraduate Education.* For the report, Ewell (1994) did an extensive review of literature on higher education outcomes, including a review of empirical studies on critical thinking.

From his review of literature on critical thinking Ewell drew conclusions similar to those of Astin, Tsui, and Giancarlo & Facione on the influence of an institution's 'humanities' orientation in the development of critical thinking. Ewell indicated that a 1981 study by Winter, McClelland and Stewart, and a 1990 study by Pace supported Astin's 1993 findings, that a cluster of factors are "related to self-reported gains in critical thinking. They include such things as considerable writing, substantial contact with faculty...use of essays in examinations, high levels of participation in class, and

an interdisciplinary orientation (p. 19). Ewell concluded that "what seems clear from this pattern of results...is that student reports about what happens to them in particular classroom and college environments appear reliably associated with general cognitive gains" (p. 20).

Ewell concluded that "the empirical literature provides broad confirmation that general cognitive growth is associated with specific types of classroom activities and instructor behaviors" (p. 17). He cited a 1986 literature review by McKeachie, Pintrich, Lin and Smith which showed that "three distinct kinds of in-class activities made a difference in promoting thinking skills—student discussion, an explicit emphasis on problem-solving procedures and applications, and stressing the use of 'verbalization' and modeling strategies in which students think through a problem" (p. 17). Ewell noted that this finding is sustained by several other empirical studies. His conclusions are consistent with Tsui's finding that class discussions "might be facilitating critical thinking development by encouraging students to verbalize and try out ideas" (Tsui, 2002, p. 750).

Ewell also noted that "there is considerable evidence of positive impact (both direct and indirect) in the development of higher-order thinking skills" (p. 18) through the active learning techniques of group work and peer interaction. He explains that Astin noted "peer interaction as one of the three most important factors in explaining growth, together with faculty/student interaction and time on task" (p. 18). Ewell also cited instructors' use of frequent feedback on performance as a significant component in active learning and as a by-product of high faculty/student interaction and the humanities orientation of an institution. He categorized Astin's

third important growth factor—time on task—as empirically linked not only to higher order thinking skills, but also to gains in mastery of content.

The conclusions that Ewell teased out of his review of literature on critical thinking are consistent with the findings of all of the studies in this section: what can be called a strong humanities orientation in higher education has been linked to gains in the critical thinking development of undergraduates. The research indicated that a humanities orientation includes an emphasis on discussion, writing, and analysis of various ideas, as well as a high level of student/faculty interaction, peer interaction, and student engagement with content.

However, like other researchers who have investigated the literature on critical thinking (Halpern, 1993; McMillan, 1987; Tsui, 1998, 2002), Ewell cautioned that there are limitations in the available research. He explains that few multi-institutional, longitudinal studies using control variables have been conducted, making it difficult to determine if students are coming into institutions with factors related to critical thinking skills. For example, it has yet to be determined if the selectivity at institutions with a high humanities orientation impacts findings on the student samples studied at those institutions.

For over a decade, Alison King, of California State University San Marcos, has pursued a line of inquiry on university-level instructional techniques which facilitate critical thinking. Her findings are consistent with the above conclusion that a humanities orientation enhances critical thinking in that she focuses on ways in which classroom discussion and analysis of subject matter induce higher order reasoning. She has developed a method of engaging learners, through questioning techniques, to

go beyond mere recall of the material into elaborated, higher order thinking about content (King 1990; 1992; 1994; 1995; King, Staffieri, & Adelgais 1998). King's model for interactive learning involves the use of 'question stems' which are "based on the higher levels of Bloom's (1956) taxonomy of thinking—application, analysis, and evaluation—and are designed to teach the skills of critical thinking" (King, 1994, p. 23). King's studies showed critical thinking gains in students who question each other about subject matter and in students who independently develop higher order questions on content. She assists students with, or scaffolds, this process by providing them with 'question stems' such as: "What are the implications of...? Explain why...Explain how...What is the counterargument for...?" (King, 1994, p. 24).

King originally grounded her interactive learning model in the theories of social construction of knowledge which were developed by Vygotsky, Mugny & Doise, and others. She explained:

> According to this view, an individual gains understanding by constructing new knowledge or transforming old knowledge into new, and this process is facilitated through peer interaction during which differing individual perceptions arise and are reconciled. (Differing perceptions can range from simply having more or less information about a topic to holding completely opposing and contradictory viewpoints.) It is the resolution of these 'socio-cognitive conflicts' (see Mugny & Doise, 1978) that results in the social construction of knowledge, and the social coordination of conflicting individual perspectives is the process through which new understanding is formed (King, 1990, p. 666).

When King's research studies on this theory showed similar gains in higher order thinking in students utilizing 'question stems' independently as when they used them

with peers, she used contemporary constructivist learning theory as a foundation for her work. She explained:

> To succeed in high school and college, students need to be able to understand and remember material presented to them in classroom lectures....According to Wittrock's model of generative learning, students comprehend and remember new material best when they use their own prior knowledge and experience to reconstruct presented information in new, personally meaningful ways and in particular, when they build relationships among the new ideas and between that new information and their own knowledge and experience base (Wittrock, 1990)....This approach to learning is consistent with current constructivist views of learning (for reviews, see Meyers, Cohen, & Schleser, 1989; Paris & Byrnes, 1989), which argue that reformulating given information or generating new information based on what is provided helps a student to build extensive cognitive structures connecting the new ideas together and linking them to what that student already knows (King, 1992, p. 304).

Whether looking at King's work on students using inquiry independently or in groups, the essence of her findings on higher order thinking in students is consistent with the age-old use of the 'Socratic Method.' Her research suggests that when students are urged through Socratic-type questioning to consider multiple perspectives on an issue, the process of reconciling conflicting viewpoints aids them in constructing elaborate, higher-order cognitive connections on the subject matter. From her research, King (1994) has concluded that the level of thinking in a college classroom "is influenced by the level of questions asked" (p. 18). She explained that although research has demonstrated a connection between critical thinking and questioning, college professors are still more likely to ask students routine questions

on content rather than asking students questions which induce higher order thinking. King stated that, "fewer than 5 percent of teacher questions are high-level cognitive ones" (p. 18).

Although there is evidence (as noted below in the *Critical Thinking and Creativity in K-12 Education* section) that the critical thinking dispositions of middle school students have been enhanced with instructional techniques (Burton, Horowitz & Abeles, 1999) and King was able to show some gains in higher order thinking when her model of reciprocal peer questioning was tested with 7th graders (King, et al., 1998), King concluded that the ability to think critically may best be fostered at the college level, rather than at the K-12 level. She explained that "the kind of elaborations elicited by the stems and the kinds of questions on the tests used in this study are characterized by high-level thinking, and represent the type of learning commonly emphasized at the college level" (King, 1990, p. 683). For the primary grades, King (1990) recommended using comprehension 'question stems' rather than higher order inquiry stems.

Brookfield (2003) supported the idea that the ability to think critically may best be fostered at the college level, rather than at the K-12 level. In *Critical Thinking in Adulthood*, he explained that

> Although encouraging critical thinking in children is a valid and important educational objective, I believe it is in adulthood that critical thinking is learned and lived at its deepest and most significant level....The last decade has seen a number of diverse strands of empirical research, philosophical speculation, and theory-building focusing on the forms of learning most characteristically adult. These strands are drawn from varying disciplines....They are united, however, by their central focus on the

exercise of critical thought in adults.

> Crossing these theoretical areas is a common interpretation of the process by which adults become critically reflective regarding the assumptions, beliefs, and values that they have assimilated during childhood and adolescence. Becoming critically reflective involves assessing the accuracy and validity of these norms for the contexts of adult life (pp. 144-146).

The above passage may illuminate one of the reasons why critical thinking ability is often boosted by an undergraduate education. As Perry observed, many college students enter college as they are passing from adolescence into adulthood, when they are naturally, developmentally assessing the assumptions, beliefs, and values of childhood and adolescence.

Creativity and Higher Education

For this literature review, in doing topic searches in the ERIC database, as well as in other research databases, for articles related to creativity and higher education, I found few research reports available under the search phrases 'creativity and higher education' or 'creative arts and higher education.' One of the few relevant studies I was able to locate is a report entitled, *Supportive Classroom Environments for Creativity in Higher Education*, by Cole, Sugioka, & Yamagata-Lynch (1999).

In this study's literature review section, the authors noted that "research has shown that environments that encourage independence, risk-taking, and intrinsic motivation have been found most conducive to creativity" (p. 279). In examining the sources for this statement, I discovered that the authors used a mix of resources, some of which focused on K-12 education and others which focused on postsecondary instruction. This fact may be relevant to studies on college students and creativity, as

much of the existing creativity research focuses on the K-12 student. As Amabile (1996) noted "many investigators have, in fact, examined the impact of various facets of educational environments on creativity. Virtually all of this research has focused on elementary school children" (p. 203).

For example, many of the research articles and books on creativity which are distributed by Harvard's Project Zero, an organization which studies thinking and learning in the arts (President and Fellows of Harvard College, 2003), are focused on children. As with the Cole et al. study, information may sometimes be extrapolated from K-12 studies, such as those conducted by Project Zero, and applied to discussions of creativity in the college environment. As of yet, I have found no research on whether or not findings on creativity in elementary and secondary students can validly be applied to discussions on the creative development of postsecondary students. However, in reviewing the literature on creativity in both K-12 and in higher education, it was clear that the conclusions about the impact of classroom culture on creative output are similar for both settings, as is evident in the following sections.

The Cole et al. study mentioned above was a qualitative examination of an 18-student, undergraduate graphics communication course held at a large Midwestern University. The data collection methods which were employed were: "document review of the course syllabus, instructor interview, six student interviews, and classroom observations" (p. 283).

The authors found that the environment in this college classroom supported creativity in the following ways: there was a de-emphasis on grades; the teacher was

accessible and friendly; students were encouraged to think divergently through guided emphasis on brainstorming, research and synthesis; multiple perspectives were encouraged—it was emphasized that there was 'no one right answer;' and freedom of choice was encouraged. Because students "were not searching for a particular answer or the teacher's 'correct' view, students were free to consider many ideas and perspectives" (p. 287).

The findings of this study are highly consistent with the premise I tested, that of examining a relationship between higher education creative arts instruction, (such as that described by Cole et al.) and the development through such instruction, of an understanding of multiple perspectives, a key component in a disposition toward critical thinking.

Another relevant study on creativity and higher education that I was able to locate was entitled, *Creativity Enhances Learning in College Classes*, by Cromwell (1994). In this qualitative study, Cromwell interviewed 20 people in the Seattle area who were known and respected in the community as highly creative individuals. The sample included "authors, poets, community action leaders, actors, dancers, and business leaders" (p. 218).

From this sample, Cromwell discovered a common ability that he referred to as "creative visioning...a deep sense of knowing, enabling one to sense new possibilities, dimensions, and connections" (p. 218). From these interviewees, Cromwell developed the recommendation that "schools need to create environments that promote, support, nurture and celebrate creative visioning" (p. 222). He explained that he "implements activities designed to encourage creativity in the

college [education] classes that he teaches" (p. 223). Cromwell reported that his "students are asked to learn, to demonstrate learning, and to assess learning through creative and risk-taking methods [such as]...poems, skits, plays...drawings, songs, visual presentations, and body/kinesthetic demonstrations" (p. 223). He noted that "the students' evaluations serve as an indicator to suggest that this pedagogical approach is of value" (p. 223). He recommended that to encourage creativity in students "teachers and administrators...need to create an environment free of fear; structured but not rigid; tied to history but not chained to one answer; open to new discoveries, connections and delights" (p. 222).

In *Creativity in Context*, Amabile (1996) described the small number of studies on creativity and higher education that she has been able to locate in her research on the social psychology of creativity. One study from 1973, by Chambers, asked several hundred psychologists and chemists to describe the characteristics of teachers who had facilitated their creative development. Those characteristics included factors such as: treating students as individuals; serving as a model of creative activity; encouraging students to be independent; enthusiasm; rewarding creative behavior; and expecting excellence. This study showed that factors which had inhibited creativity include: discouraging students' ideas and creativity; hypercriticism and sarcasm; and emphasis on rote learning.

Amabile also described a 1960 study by Hyman, in which subjects were asked to evaluate each other's solutions to a problem. One group was asked to list positive features, and the other to list weaknesses and faults. Later, when giving their own solutions to the problem, subjects in the positive comment group were more creative

than those in the negative comment group. Amabile concluded that "Although these studies did not directly examine teaching methods, the results suggested that teachers who encourage positive, constructive criticism may foster creativity" (p. 209).

There are similarities in each of the above studies on creativity and higher education in that each indicates that classroom culture and teacher behavior may impact the creative output of students. The studies suggest that undergraduates may demonstrate enhanced creativity when they are in classes in which they are encouraged by positive, friendly instructors to strive for excellence, and to develop independent solutions to open-ended problems (Amabile, 1986; Amabile, 1993; Cole et al., 1999; Cromwell, 1994).

Creativity and K-12 Education

Whereas Amabile (1996) discovered few studies on creativity and higher education for *Creativity in Context* (an update to her 1983 book, *A Social Psychology of Creativity*) she reviewed many studies on the influences of K-12 classroom environments on creativity. One of her most vivid descriptions of how influential a school environment can be on a child's creativity is her account of Einstein's schooling:

> Although Einstein wrote little of his life and work, what he did record contains a recurrent them: His interest in science, and presumably, his creativity, were undermined by forces that exerted external control over his work. As a youth, he attended a regimented, militaristic school in Germany where the pressures of exam period so overwhelmed him that he temporarily lost his interest in science which was, even at that time, quite substantial. 'This coercion had such a deterring effect upon me that, after I had passed

the final examination, I found the consideration of any scientific problems distasteful to me for an entire year' (1949, p.18).

Partly in an attempt to escape from such a strictly regimented learning environment, Einstein left Munich for Zurich when he was 15, hoping to enroll in the Polytechnic Institute there. To his dismay, however, he failed the entrance examination and was required to enroll in a Swiss school for remedial coursework. According to one Einstein analyst (Holton, 1972), this episode represented a turning point in Einstein's schooling and, perhaps, in his scientific thinking as well. In sharp contrast to what he had known, this school was humanistic in orientation, stressing the individual's unencumbered search for knowledge. This social atmosphere was ideally suited to Einstein's independent style of thinking and working. There was little emphasis on memorization, much emphasis on individual laboratory work and student-initiated investigation, and a concentration on the development of relaxed, democratic exchanges between students and teachers. To the end of his life, Einstein remembered this school fondly: 'It made an unforgettable impression on me, thanks to its liberal spirit and the simple earnestness of the teachers who based themselves on no external authority' (Holton, 1972, p. 106). It was here that Einstein devised the first *Gedankenexperiment* that would lead him to the theory of relativity (p. 7).

Several studies that Amabile reviewed on creativity in K-12 classes sustain the findings of the studies of college classrooms and creativity from the previous section. A 1974 study by Rosenthatl, Baratz, & Hall showed:

> Those teachers whose pupils showed the greatest gains in creativity were rated by classroom observers as significantly more likeable, more interested in children, more satisfied, more enthusiastic, more courteous, more business-like, more professional and more encouraging at the beginning of the school year (p. 205).

In her review, Amabile looked at a number of studies from the 1960s, 70s and 80s which compared the effects of 'open' classrooms, with those of 'traditional' classrooms. The descriptions of open and traditional vary somewhat from study to study, but generally open classrooms are identified as those which "develop critical techniques of inquiry. The stated goal of the open school is to familiarize a child with the knowledge and techniques necessary to participate in the society thoughtfully, creatively, and with intellectual curiosity" (Ramey & Piper, 1974, p. 557). Open classrooms typically give students choice of activity, a richness of learning materials and individualized or small-group instruction. In contrast, the traditional classroom is described as one in which large group instruction and authoritative teaching is the norm, as well, a carefully prepared curriculum is followed with little variation (Amabile, 1996).

From the several open vs. traditional studies that Amabile reviewed, she concluded that

> There is qualified support for the prediction that relatively informal classroom environments will facilitate creativity more effectively than traditional, restrictive classroom environments...Clearly, one viable explanation is that intrinsic task motivations are encouraged by the relative lack of extrinsic constraints in open classrooms. Children, instead of concerning themselves with pleasing the teacher, doing better than other students, winning good grades, or meeting deadlines, may instead concentrate their efforts on playful and innovative exploration with materials and ideas (pp. 207-208).

Again, Amabile's conclusions on the effects of K-12 classroom culture support those in the creativity and higher education studies from the previous section.

Creativity and the Theoretical Link to Critical Thinking

The research on both K-12 and college classroom environments which promote creativity describes the importance of instructors emphasizing independent inquiry into problems for which there is not only 'one right answer.' This concept is strikingly similar to that of encouraging the discussion of 'multiple viewpoints' in a classroom environment, as detailed in the review of literature on critical thinking—an approach that research shows is essential in developing the skills and dispositions of critical thinking. These strong similarities in research findings on the two constructs suggest that an overlap exists between creative and critical thinking. The following section documents the comments and theories of several authors on this theoretical overlap between critical and creative thinking.

David Perkins (1994), of Harvard's Project Zero, noted that one of the central benefits of studying art is its strengthening effect on the disposition toward acceptance of and understanding of 'multiple interpretations.'

Perkins explained that

> Art tends to be multiconnected. We can find links with many things—social issues, aesthetic concerns, trends of the times, personal commitments, even science and mathematics sometimes. Art is generally richly connected culturally and historically. The connections range from ones easily accessible to most human beings to arcane references only penetrable by a scholar of the plane and time of origin. The multiconnectedness of art creates an opportunity to bridge thinking dispositions across to diverse other contexts explored in tandem with the work of art (p. 86).

In his largely theoretical book, *The Arts and Critical Thinking in American Education*, Ivan Olson (2000) made a point similar to that of Perkins:

> Even before scholars and neuroscientists were proving theories relating to field, ground effects, intensity, and the like, artists were painting landscapes and still life forms with understanding of the general concept that in any real visual impressions the value (brightness) of the hues and the saturation level in a painting are very much relative. A stationary object in a scene might on a sunny day appear brilliant, yet on a cloudy day seem moderately light and faded in comparison. This relative in value would probably be exhibited by other objects in the scene as well (Olson, 2000, p. 15).

Olson linked aesthetic processes such as those described above to critical thinking in the following way:

> When we are considering models for learning—or learning processes—in the arts, we cannot omit aesthetic process nor critical thinking. From an aesthetic position, we not only deal with the modes of creating, presenting, or receiving; we must add to all that the processes that tell us what, how or why. That is, we deal with analysis and synthesis. When we do this, we engage in critical thinking. When we paint a landscape or a still life, when we compose a song or a flute and guitar duet, we are involved with all these things. This activity seems to be so strong in the aesthetic experience that it becomes part of its 'character' and sets it apart from other cognitive and affective processes (p. 87).

Perkins similarly described the link between creativity and critical thinking in a 1986 interview. The interviewer, Robert Brandt (1986), asked Perkins the following

> We hear more and more about critical thinking these days. How do you relate critical thinking to creative thinking? Do they have similar attributes, or are they quite different? Do you find them in the same individuals, or do some people do one better than the other? (p. 15).

Perkins responded,

> From a philosophical standpoint, the two can't be clearly separated. The creative thinker has to be critically aware, because creative thinking, except in the simplest situations, involves the generation and sifting of possibilities and reworking them. That has to be a critical process (Brandt, 1986, p. 15).

In his book, *The Intelligent Eye: Learning to Think by Looking at Art*, Perkins (1994) elaborated on theoretical connections between creative and critical thinking:

> Some subjects lend themselves more so than others to fostering better thinking dispositions. For various reasons, art is an especially supportive context....art thoughtfully recruits many kinds and styles of cognition—visual processing, analytical thinking, posing questions, testing hypotheses, verbal reasoning, and more....puzzling over a work of art is a far cry from figuring out the one-and-only answer to a textbook algebra problem. Multiple interpretations are possible as we dig deeper and share readings with one another (pp. 4-21).

Winner & Hetland (2001), researchers associated with Perkins at Project Zero, conducted a meta-analysis of studies on the cognitive transfer from arts education to academic outcomes. They found "mixed support for the claim that the arts boost academic achievement" (p. 143). They explained, however, that their

> Work should not be used to conclude that researchers should stop looking for transfer from the arts to non-arts academic areas....All too often researchers, practitioners, and advocates simply assert all the wonderful things that the arts can do—from engendering perseverance to training critical judgment....We believe that links between arts and non-arts outcomes are most likely to be demonstrated when there is an explicit theoretical argument and psychological mechanism that relates an arts skill to another valued ability (p. 144).

Winner & Hetland argued that, currently, they see three possible theories worthy

of exploration in the area of transfer, one of which is the transfer of critical thinking ability. They explained that:

> A third possible theory is also dispositional. Students in a strong arts program may learn a 'disposition' to be reflective about their work and to step back and make critical judgments about what they are doing. This critical judgment faculty may then be used in history class, showing up in the form of considering more nuanced interpretations based on multiple points of view, probing the ambiguity of various interpretations for common assumptions and themes, or finding novel problems to explore by interpreting complex chains of evidence about historical causes and effects (p. 145).

Winner & Hetland's description of how a disposition toward critical analysis in the arts may transfer to other areas illustrates the way in which considering a humanities topic from multiple points of view is nearly identical to considering multiple perspectives in the arts. Hence, research showing higher dispositions toward critical thinking ability in humanities students is a strong indication of similar or perhaps even higher dispositions toward such ability in arts students. As well, discussions of various viewpoints in humanities classes are similar to critique discussions of individual perspectives in art classes.

Using language on both dispositions and multiple perspectives, Elliott Eisner (1998) noted the following about cognitive outcomes of arts education:

> Dispositions that appear to be cultivated through programmes that engage students in the process of artistic creation: a willingness to imagine possibilities that are not now, but which might become; a desire to explore ambiguity, to be willing to forestall premature closure in pursuing

resolutions; and the ability to recognize and accept the multiple perspectives and resolutions that works in the arts celebrate (p. 58).

In describing his model of higher order thinking, Marzano (1993) included the term dispositions in his discussion of critical and creative thinking. He explained that "for higher order thinking to take place, certain dispositions or 'mental habits' must be utilized....These mental habits can be organized into three broad categories: (a) self-regulation, (b) critical thinking, and (c) creative thinking" (p. 158).

King, who has extensively researched instructional techniques for enhancing college students' critical thinking, sees an overlap between critical and creative thinking. She explained:

> In terms of the skills and strategies of thinking that must be addressed during instruction, it is important to emphasize that critical thinking, problem solving, decision making, and creative thinking are not separate areas; rather they are all aspects of thoughtfulness, or sets of related and overlapping skills (King, 1994, p. 19).

In *Mind in Art: Cognitive Foundations in Art Education*, art educator Charles Dorn (1999), tied the heuristics of creating artwork to higher order thinking:

> Some psychologists also believe that ill-defined hard cases can teach higher order thinking skills better than those where tried-and-true rules apply. In well-structured domains, the student must perceive the complexity of the material being learned, whereas in ill-structured domains, students must pay attention to particular details of individual cases and develop case-by-case interpretations. Problem solving in such cases are much closer to real-life problems and are certainly more compatible with the problem-finding behaviors associated with creative thinking. It is thought that artistic

problem solving may indeed be more true to life than the inductive and deductive models used in most science and humanities programs (p. 188).

In discussing art education in the book, *Art Criticism and Education,* Geahigan (1997) hypothetically tied the critique and interpretation of a work of art to the teaching of reflective thinking:

> In seeking to translate the practice of criticism into educational terms I have been greatly influenced by the ideas of John Dewey, the first to recognize the need to structure learning around different forms of inquiry and argue for the teaching of reflective thinking in the classroom. His ideas continue to be an important influence on American education. They have informed the general curriculum reform movement of the 1950s and 1960s, the aesthetic education movement, the reader response movement in English literature, the philosophy for children movement, and the critical thinking movement. For this reason, proponents of such movements are likely to subscribe to many of the same ideas and teaching strategies. Inquiry and the teaching of reflective thinking are at the heart of all of these movements, and all rely upon class discussion, the teaching of concepts, and other forms of instruction that Dewey recommends in his classic *How We Think.*
>
> Because discipline-based art education grows out of the aesthetic education movement...talk about critical inquiry has been part of the rhetoric of visual arts education for many years. Educators, however, have yet to work out a systematic and effective plan for teaching critical inquiry. In 1989 I agreed to coauthor this volume because of my conviction that prevailing approaches to teaching art criticism were not effective in helping students develop an understanding and appreciation of art and that Dewey's ideas offered a more fruitful alternative. Since the completion of this manuscript in early 1994 I have begun to see other educators also question prevailing approaches to teaching criticism. Articles and papers have begun to appear about reflective thinking and problem solving in relation to works

of art, about collaborative learning, about structuring class discussion, and about techniques of questioning...Clearly, something of a trend is developing (p. 130).

In a description of how art is experienced, which is similar to how Perkins (1994) described the process, Geahigan explained how he believes art stimulates critical inquiry:

> Critical inquiry starts with the personal experience that students have with a work of art and with reflection upon the adequacy of that experience. Reflection, in turn, begins when students confront what John Dewey called a problematic situation. Works of art are potentially problematic because they can be understood and evaluated in different ways (p.146).

Art educator Candace Stout (1999) referred to her method of using primary sources in art education as a form of 'problem-posing' education which stimulates critical reflection:

> In moving students from largely secondary sources into the essays, letters and diaries of artists, I was initiating a transference of learning responsibility, trying to move teaching and learning from what Freire calls the 'banking concept of education,' (1996, p. 54) where students store deposits of knowledge entrusted to them by others, to a 'problem-posing' education, where, through critical reflection, students are challenged to analyze, on their own, the creative thinking and production of particular artists. In a problem-posing education, the teacher relinquishes the role of academic authority and redistributes the power into a teacher-student partnership. Within this relationship, the teacher nurtures resourcefulness and encourages students' initiative, bringing them into their own dialogue with new concepts and ideas, spurring them to inquire, imagine, and construct meaning for themselves (pp. 228-229).

Critical Thinking and Creativity in K-12 Education

The excerpts and synopses in the above *Creativity and the Theoretical Link to Critical Thinking* section document the theoretical and hypothetical reasoning of many authors on a link between the arts and critical thinking. Although, as shown, literature is readily available on a theoretical link between these two constructs, empirical studies documenting such a link are rare. I was able to locate only one empirical study on K-12 art outcomes that bears out the above theoretical link between critical and creative thinking. In an award-winning mixed methods study by Burton, Horowitz & Abeles (2000) 2,406 public school students in grades 4, 5, 7, and 8 were evaluated with both quantitative and qualitative measures. The researchers found, among other things, that students with high arts exposure showed clear evidence of an understanding of "multiple or alternative vantage points" (p. 246). They also found that these students were more fluent, imaginative, exploratory, elaborative, and creative in their thinking than low-arts exposure students. The researchers refer to these competencies as "'habits of mind' rather than higher order thinking" (Burton, Horowitz & Abeles, 1999, p. 43), but the competencies they describe can be likened in many ways to those described by researchers as components of critical and creative thinking.

Critical Thinking and Creativity in Higher Education

Just as with empirical reports on creativity and critical thinking in K-12 education, scant evidence is available on the relationship between critical thinking and creativity as outcomes of postsecondary instructional practices. Astin's 1993

study indicated that "artistic inclination shows...weak indirect effects on self-reported growth in...critical thinking abilities" (p. 357).

A 1974 study by Simon & Ward, in which 79 "third-year British university students were randomly selected and tested on the Watson-Glaser Critical Thinking Appraisal" (p. 957) showed that

> There was no difference in performance which could be related to enrollment in an Arts or Science course, except for the test of Inference in which Science students did have a very significantly higher score than Arts students did (p. 957).

Conclusion

Several of the above noted studies, opinion papers and books present a great deal of theory and some evidence that creativity and creative products play a role in stimulating reflective, critical, and higher order thinking. The open-mindedness and cognitive flexibility required to perceive multiple perspectives, which many writers theorize is fostered by exploring, studying and practicing art, can be considered a foundation for the theory of a link between critical thinking and the study of creative arts in higher education. It is on the theory of such a link that I based my hypothesis that college students in the creative arts possess a higher disposition toward critical thinking than college students in many other disciplines.

The instructional techniques which have been shown by researchers to foster critical thinking in undergraduates—classroom discussion, independent inquiry, problem-solving and analysis (Astin, 1993; Ewell, 1994; King, 1994; Tsui, 2002) are pedagogical techniques commonly used in K-12 and higher education art classrooms (Amabile, 1993; Burton et al., 2000; Cole et al., 1999; Cromwell, 1994; Dorn, 1999;

Eisner, 1998; Geahigan, 1997; Stout, 1999), indicating that although the premise has rarely, if ever, been tested, critical thinking might naturally be expected as an outcome of standard practices in arts instruction.

CHAPTER 3: METHODOLOGY

Introduction

To examine whether or not undergraduate study of the arts impacts critical thinking dispositions, this study compared the critical thinking dispositions of freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students.

Research Questions

Does the disposition toward critical thinking vary between arts and non-arts undergraduates?

Does the disposition toward critical thinking vary between freshmen and juniors/seniors?

Is GPA related to the disposition toward critical thinking?

Hypotheses

The disposition toward critical thinking will be higher in arts undergraduates than in non-arts undergraduates.

The disposition toward critical thinking of juniors/senior arts and non-arts undergraduates will be higher than that of freshmen arts and non-arts undergraduates.

GPA is related to the disposition toward critical thinking.

Null Hypotheses

The disposition toward critical thinking will not be higher in arts undergraduates than in non-arts undergraduates.

The disposition toward critical thinking of juniors/senior arts and non-arts

undergraduates will not be higher than that of freshmen arts and non-arts undergraduates.

GPA is not related to the disposition toward critical thinking.

Research Design and Method

This study utilized inferential statistics to estimate population values from known sample statistics (Keiss, 2002). The California Critical Thinking Disposition Inventory (P. Facione & Facione, 1992) was administered to freshmen and junior/senior arts, and non-arts undergraduates. Scores on the Inventory were compared and contrasted between groups of arts and non-arts students, and between freshmen and juniors/seniors. Comparisons were done of four groups: freshmen arts students, junior/senior arts students, freshmen non-arts students, and junior/senior non-arts students, to determine if there were differences between arts and non-arts students in general, and/or between groups by class level.

Correlations between CCTDI scores and GPA were also conducted to examine whether or not GPA had any bearing on the CCTDI outcomes.

Population and Sample

The participants in the study were undergraduate students at a state university on the east coast. Overall, 28,000 students are enrolled at this university. The graduate fine arts program at the institution is highly ranked by *U.S. News and World Report* (U.S. News, 2003). Undergraduate fine arts programs are not ranked by *U.S. News* (U.S. News, 2004a), so the undergraduate program in unranked. Overall, the university is ranked in the third tier in the peer review that *U.S. News* conducts (U.S.

News, 2004b).

Subjects in the study were undergraduate students in introductory psychology classes and in undergraduate Fine Arts courses. There were 141 subjects; 35 were males and 106 were females. Subjects were classified into four groups. In Group One there were 32 subjects. All subjects in Group One were freshmen majoring in subjects other than the arts—such as forensic science, engineering, English, math, mass communications, etc. The mean GPA of this group was 3.04. The mean SAT of the non-art freshmen class from which this sample was drawn was 1075.

In Group Two there were 32 subjects. All subjects in Group Two were freshmen art students. The mean GPA of this group was 3.12. The mean SAT of the visual arts freshmen class from which this sample was drawn was 1108.

In Group Three there were 32 subjects. All subjects were juniors or seniors majoring in subjects other than the arts—such as forensic science, engineering, English, math, mass communications, etc. The mean GPA of this group was 2.87. The mean SAT of the non-arts junior/senior classes from which this sample was drawn was 1050.

In Group Four there were 45 subjects. 8 subjects were studio art and design juniors or seniors; 37 subjects were art education juniors or seniors whose curriculum includes studio instruction as well as education courses. The mean GPA of this group was 3.36. The mean SAT of the arts junior/senior classes from which this sample was drawn was 1080. (Appendix B shows examples of degree requirements for a studio art student from this sample and for an art education student from this sample.)

Data Collection

The CCTDI was administered to all 141 student subjects in the spring semester of 2005.

Instrumentation

The instrument that was used for this study is the California Critical Thinking Disposition Inventory (CCTDI). The CCTDI is a 75-item Likert-type attitudinal measure which tests the discipline-neutral internal motivation to approach problem framing or problem solving by using thinking and reasoning (Giancarlo & Facione, 2001).

In a review of the instrument, in *The Mental Measurements Yearbook*, Callahan (1995) stated that

> The alpha reliabilities for the total score on the CCTDI are reported as between .90 and .91 across high school and college students (baccalaureate and post-baccalaureate)....The test authors indicate the test may be used with any individuals who can read the items, but no reliability data are provided for any adult populations other than college populations....The content validity of the test is based on claims the items are derived from the consensus of 46 theoreticians regarding the dispositional dimension of critical thinking....The authors wisely caution against using the instrument for high-stakes assessment of individuals and their caution should be heeded. A researcher or evaluator who is willing to pursue a careful match between the items and program outcomes or research questions and who is willing to establish the stability of the instrument prior to the assessment of program change may find this a useful tool (p. 2).

The above stated caution on use of the CCTDI has been heeded for this research study in the following manner. This study does not constitute high-stakes testing of

individuals; rather, it is used solely for the purpose of research. As well, the instrument was used for testing college populations—the populations from which the instrument's reliability data is drawn. The instrument itself is carefully matched to the research questions in that comparisons of both the overall scores and the subscales scores are a component of the statistical analysis. The implications of the overall score and particular subscale score comparisons, as possible effects of instructional strategies in arts and non-arts classrooms, are discussed in Chapter 5.

The seven dispositional subscales of the Critical Thinking Disposition Inventory measure the following:

> The *inquisitiveness* subscale on the CCTDI measures one's intellectual curiosity and one's desire for learning, even when the application of the knowledge is not readily apparent.
>
> The *systematicity* subscale measures the tendency toward organized, orderly, focused, and diligent inquiry. No particular kind of organization (e.g. linear or nonlinear) is given priority on the CCTDI.
>
> The *analyticity* subscale targets prizing the application of reasoning and the use of evidence to resolve problems, anticipating potential conceptual or practical difficulties, and consistently being alert to the need to intervene.
>
> The *truth-seeking* subscale targets the disposition of being eager to seek the best knowledge in a given context, courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one's self-interests or one's preconceived opinions.
>
> The *open-mindedness* subscale addresses being tolerant of divergent views with sensitivity to the possibility of one's own bias.
>
> The *critical thinking* (CT) self-confidence subscale measures the trust one places in one's own reasoning processes. CT self-confidence allows one to trust the soundness of one's judgments and to lead others in the resolution of problems.

The *maturity* subscale targets the disposition to be judicious in one's decision making. The CT-mature person can be characterized as one who approaches problems, inquiry, and decision making with a sense that some problems are necessarily ill-structured, some situations admit of more than one plausible option, and many times judgments must be made based on standards, contexts, and evidence that preclude certainty.

Two investigations (N=20, N=180) of the overall relationship between scores on the CCTDI and the California Critical Thinking Skills Test (CCTST) demonstrate highly significant correlations (r = .66, .67, p <.001) (N. Facione et al., 1994, pp. 345-347).

Facione et al. (1995) noted that

> A score of 30 and below on any of the scales indicates consistent opposition or weakness in relation to the given attribute or characteristic, a score of 40 indicates minimal endorsement on average, and scores above 50 indicate consistent endorsement or strength of the given characteristic (p. 4)
>
> Preliminary empirical studies using the CCTDI and its companion skills test, the CCTST, are beginning to suggest that perhaps truth-seeking is the most crucial dispositional attribute in predicting CT skills. If this turns out to be the case, then general education programs which emphasize and reward unbiased, objective, courageous, fair-minded inquiry which follows where reasons and evidence lead could turn out to be the most effective programs to the development of CT skills (pp. 11-12).

The CCTDI was developed to measure the dispositional dimension of critical thinking as it was defined by a two-year Delphi expert consensus project on critical thinking sponsored by the American Philosophical Association. Facione, Facione, & Sanchez (1994) explain that:

> 46 theoreticians drawn from throughout the United States and Canada

> and representing several academic fields...[determined] a style and set of attitudes that define a personal disposition to prize and to use critical thinking in one's personal, professional, and civic affairs ....The California Critical Thinking Disposition Inventory uses the Delphi Report's consensus definition of critical thinking as the theoretical basis to measure critical thinking disposition (p. 345).

The consensus definition of critical thinking arrived at by the Delphi Study of experts in critical thinking is 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 the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT [Critical Thinking] 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. 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 the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit. Thus, educating good critical thinkers means working toward this ideal. It combines developing CT skills while nurturing those dispositions which consistently yield useful insights and which are the basis of a rational and democratic society (Facione, 1990b, p. 2).

The above consensus definition of the disposition toward critical thinking is operationalized in this study through the use of the overall and subscale CCTDI

scores which measure the various dispositions described in *The Delphi Report.*

Data Analysis

In the first phase of analysis, SPSS software was used to run one-way and two-way ANOVAs on the total and subscale CCTDI scores of the following four groups: freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students, to compare the amount of between-groups variance with the amount of within-groups variance, and to analyze whether there was an interaction between the following variables: CCTDI scores, arts versus non-arts academic major, and class rank.

Secondly, correlations between CCTDI scores and GPA were conducted to examine whether or not GPA has any bearing on the CCTDI outcomes.

Ethical Safeguards and Considerations

The Institutional Review Board (IRB) of the university where the experiment was conducted was given all required documentation of the proposal, and all standards and regulations of the IRB were met and followed by the researcher. The data gathered from the subjects was freely given survey data. Some of this data was analyzed in relation to student academic records. The information was recorded by the investigator in such a manner that subjects can not be identified directly, or through identifiers linked to them.

To comply with ethical standards for research, subjects were asked to sign a consent statement. The consent form is included in Appendix A.

Conclusion

This chapter detailed the methodology of the study which compared the critical thinking dispositions of freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students. The purpose of the study was to examine whether or not study of the arts impacts the critical thinking dispositions of undergraduates. Chapter Four reports the findings of the study; and Chapter Five presents a summary and discussion of the findings.

CHAPTER 4: THE RESULTS OF THE COMPARISON OF THE CRITICAL THINKING DISPOSITIONS OF ARTS AND NON-ARTS UNDERGRADUATES

Introduction

Through statistical comparisons of scores on the California Critical Thinking Disposition Inventory (CCTDI) this study contrasted the critical thinking dispositions of freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students.

This chapter is organized in terms of the three specific research questions posed in Chapter 1. Those research questions are:

1.) Does the disposition toward critical thinking vary between arts and non-arts undergraduates?

2.) Does the disposition toward critical thinking vary between freshmen and juniors/seniors?

3.) Is GPA related to the disposition toward critical thinking?

Research Questions 1 and 2

To investigate research questions 1 and 2, several ANOVAs were performed with SPSS statistical software. These ANOVAs compared CCTDI scores of the various groups in the sample: all arts undergraduates and all non-arts undergraduates; all freshmen and all juniors/seniors; all arts freshmen and all arts juniors/seniors; and all non-arts freshmen and all non-arts juniors/seniors.

The first three ANOVAs compared total CCTDI scores between the groups, and the remaining ANOVAs compared CCTDI subscale scores between the groups. The results of analysis of data for Research Questions 1 and 2 are reported in the following sections as *ANOVAs One, Two and Three,* which report total score comparisons, and as *CCTDI Subscale Scores*, which reports the subscales score comparisons. Following the results sections the research questions are answered. For all statistical comparisons, $p = .05$ is the critical value used.

ANOVA One—Comparison of Arts and Non-Arts Undergraduates

ANOVA One was a one-way ANOVA which compared the CCTDI total score of all arts undergraduates with that of all non-arts undergraduates. Although the mean total CCTDI score for all arts undergraduates was higher than that of all non-arts undergraduates, the difference was not statistically significant at $p = .064$ (see Tables 2 and 3, and Figure 1).

A score of less than 280 indicates an overall deficiency in the disposition toward critical thinking (Insight Assessment, 2005). The mean non-arts total CCTDI score was 296; the mean arts total CCTDI score was 304.

Table 2—Mean Descriptives of Non-Arts (Group 1) and Arts Undergraduates (Group 2) Total CCTDI Score

Descriptives

TOTAL

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	64	295.5781	26.30698	3.28837	289.0068	302.1494	229	362
2	77	303.9870	26.90798	3.06645	297.8797	310.0944	251	373
Total	141	300.1702	26.87244	2.26307	295.6960	304.6444	229	373

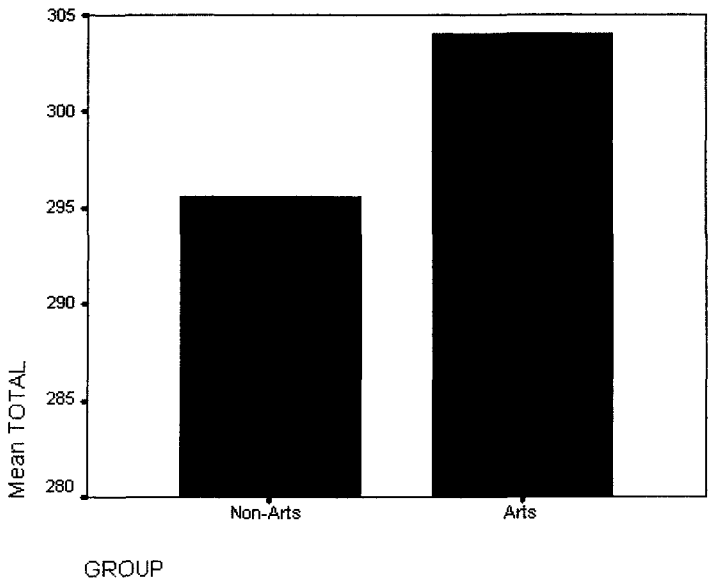
Table 3—ANOVA One
Mean Comparison of Non-Arts and Arts Undergraduates Total CCTDI Score

ANOVA

TOTAL

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2471.319	1	2471.319	3.483	.064
Within Groups	98626.596	139	709.544		
Total	101097.9	140			

Figure 1—Graphic Mean Comparison
of Non-Arts and Arts Undergraduates Total CCTDI Score



ANOVA Two—Comparison of Freshmen and Juniors/Seniors

ANOVA Two was a one-way ANOVA which compared the CCTDI total score of all freshmen with that of all juniors/seniors. The mean total CCTDI for juniors/seniors (305) was significantly higher than that of freshmen (293) at $p = .010$ (see Tables 4 and 5, and Figure 2).

Table 4—Mean Descriptives of Freshmen (Group 1) and Juniors/Seniors (Group 2) Total CCTDI Score

Descriptives

TOTAL

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
1	64	293.8438	29.11838	3.63980	286.5702	301.1173	229	373
2	77	305.4286	23.78380	2.71042	300.0303	310.8268	255	362
Total	141	300.1702	26.87244	2.26307	295.6960	304.6444	229	373

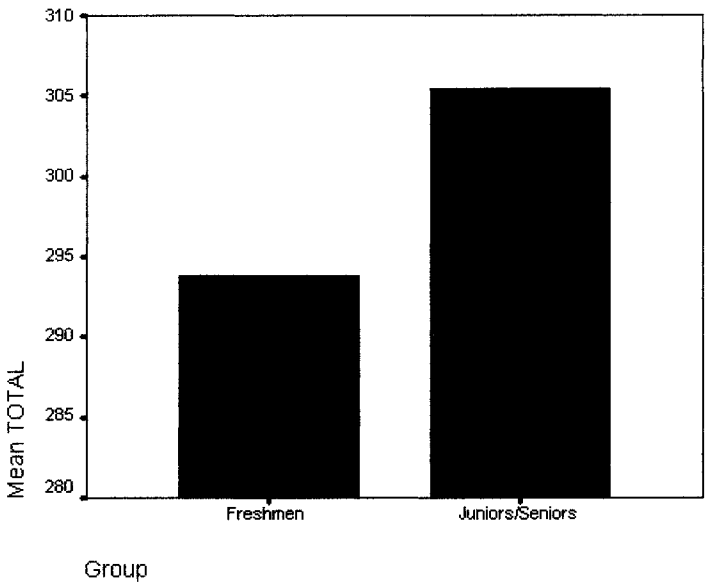
Table 5—ANOVA Two
Mean Comparison of Freshmen and Juniors/Seniors Total CCTDI Score

ANOVA

TOTAL

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	4690.620	1	4690.620	6.763	.010
Within Groups	96407.295	139	693.578		
Total	101097.9	140			

Figure 2—Graphic Mean Comparison of Freshmen and Juniors/Seniors Total CCTDI Score



ANOVA Three—Interaction between Class Rank and Arts/Non-Arts

ANOVA Three was a two-way ANOVA which compared the CCTDI total scores between four groups: non-arts freshmen; arts freshmen; non-arts juniors/seniors; and arts juniors/seniors (see Tables 6 and 7, and Figure 3). A Tukey HSD post-hoc analysis (Table 8) showed that the arts juniors/seniors (Group 4) scored significantly higher than the non-arts freshmen (Group 1), at $p = .014$. There were no significant differences between the other groups.

Table 6—Mean Descriptives of Non-Arts Freshmen (Group 1), Arts Freshmen (Group 2), Non-Arts Juniors/Seniors (Group 3), and Arts Juniors/Seniors (Group 4) Total CCTDI Score

Descriptive Statistics

Dependent Variable: TOTAL

GROUP	Mean	Std. Deviation	N
1	289.5625	29.33888	32
2	298.1250	28.71411	32
3	301.5938	21.70158	32
4	308.1556	25.03902	45
Total	300.1702	26.87244	141

Table 7—ANOVA Three
Mean Comparison of the Four Groups Total CCTDI Score

Tests of Between-Subjects Effects

Dependent Variable: TOTAL

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6668.910[a]	3	2222.970	3.225	.025
Intercept	12363778.8	1	12363778.81	17937.684	.000
GROUP	6668.910	3	2222.970	3.225	.025
Error	94429.005	137	689.263		
Total	12805502.0	141			
Corrected Total	101097.915	140			

a. R Squared = .066 (Adjusted R Squared = .046)

Figure 3—Graphic Mean Comparison of the Four Groups Total CCTDI Score

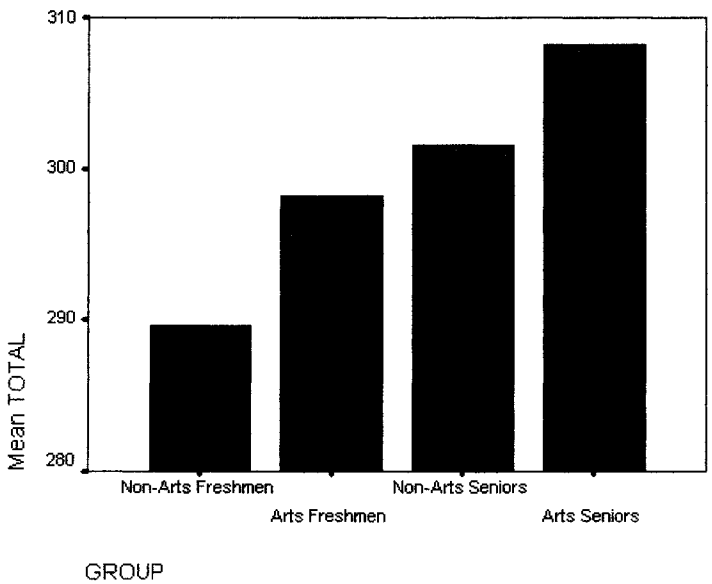


Table 8—Post-Hoc Analysis of ANOVA Three: Comparison of the Four Groups Total CCTDI Score

Multiple Comparisons

Dependent Variable: TOTAL

	(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	1	2	-8.5625	6.56345	.562	-25.6330	8.5080
		3	-12.0313	6.56345	.262	-29.1018	5.0393
		4	-18.5931*	6.07095	.014	-34.3826	-2.8035
	2	1	8.5625	6.56345	.562	-8.5080	25.6330
		3	-3.4688	6.56345	.952	-20.5393	13.6018
		4	-10.0306	6.07095	.353	-25.8201	5.7590
	3	1	12.0313	6.56345	.262	-5.0393	29.1018
		2	3.4688	6.56345	.952	-13.6018	20.5393
		4	-6.5618	6.07095	.702	-22.3514	9.2278
	4	1	18.5931*	6.07095	.014	2.8035	34.3826
		2	10.0306	6.07095	.353	-5.7590	25.8201
		3	6.5618	6.07095	.702	-9.2278	22.3514

Based on observed means.

*. The mean difference is significant at the .05 level.

CCTDI Subscale Comparisons

ANOVAs on the various subscales showed no significant differences among any of the groups on three of the subscales: open-mindedness, analyticity, and critical thinking confidence. There were significant differences between groups on the four remaining subscales: truth-seeking, maturity, inquisitiveness, and systematicity.

Truth-seeking

A two-way ANOVA, with Tukey post-hoc analysis, showed that arts juniors/seniors (Group 4) scored significantly higher than non-arts freshmen (Group 1) on truth-seeking, at $p = .005$, (see Tables 9 and 10). There were no significant differences between the other groups.

Table 9—Mean Descriptives of Non-Arts Freshmen (Group 1), Arts Freshmen (Group 2), Non-Arts Juniors/Seniors (Group 3), and Arts Juniors/Seniors (Group 4) CCTDI Truth-seeking Subscale Score

Descriptive Statistics

Dependent Variable: TRUTH

GROUP	Mean	Std. Deviation	N
1	34.281	5.8982	32
2	38.281	6.3308	32
3	37.562	5.6793	32
4	39.156	6.5607	45
Total	37.489	6.3747	141

Table 10—Post-Hoc Analysis of Mean Comparison Between All Groups on Truth-seeking Subscale

Multiple Comparisons

Dependent Variable: TRUTH

Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-4.000	1.5424	.051	-8.012	.012
	3	-3.281	1.5424	.150	-7.293	.730
	4	-4.874*	1.4267	.005	-8.585	-1.164
2	1	4.000	1.5424	.051	-.012	8.012
	3	.719	1.5424	.966	-3.293	4.730
	4	-.874	1.4267	.928	-4.585	2.836
3	1	3.281	1.5424	.150	-.730	7.293
	2	-.719	1.5424	.966	-4.730	3.293
	4	-1.593	1.4267	.680	-5.304	2.117
4	1	4.874*	1.4267	.005	1.164	8.585
	2	.874	1.4267	.928	-2.836	4.585
	3	1.593	1.4267	.680	-2.117	5.304

Based on observed means.

*. The mean difference is significant at the .05 level.

Maturity

A two-way ANOVA, with Tukey post-hoc analysis, showed that arts juniors/seniors (Group 4) scored significantly higher than non-arts freshmen (Group 1) on maturity, at $p = .004$, and they scored significantly higher than non-arts juniors/seniors (Group 3), at $p = .032$ (see Tables 11 and 12, and Figure 4). There were no significant differences between the other groups.

Table 11—Mean Descriptives of Non-Arts Freshmen (Group 1), Arts Freshmen (Group 2),Non-Arts Juniors/Seniors (Group 3), and Arts Juniors/Seniors (Group 4) CCTDI Maturity Subscale Score

Descriptive Statistics

Dependent Variable: MATURE

GROUP	Mean	Std. Deviation	N
1	42.250	6.8721	32
2	44.719	5.3475	32
3	43.219	6.2976	32
4	46.978	5.0833	45
Total	44.539	6.0998	141

Table 12—Post-Hoc Analysis of Mean Comparison Between All Groups on Maturity Subscale

Multiple Comparisons

Dependent Variable: MATURE

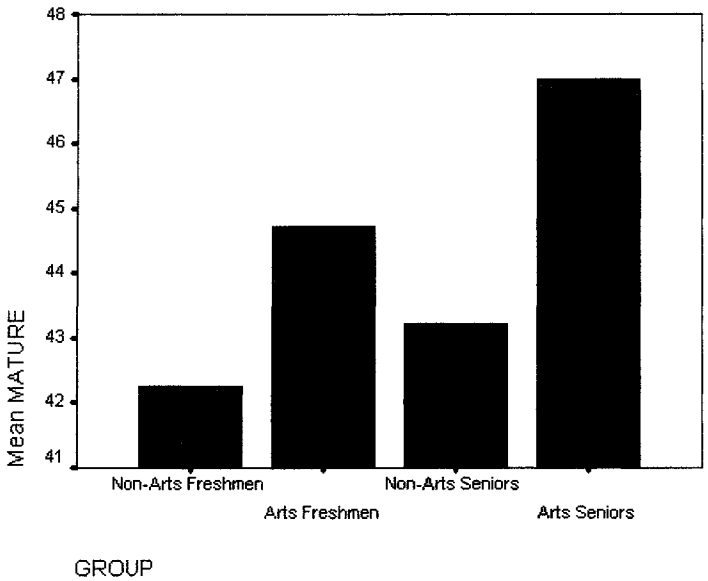
Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-2.469	1.4669	.337	-6.284	1.347
	3	-.969	1.4669	.912	-4.784	2.847
	4	-4.728*	1.3569	.004	-8.257	-1.199
2	1	2.469	1.4669	.337	-1.347	6.284
	3	1.500	1.4669	.737	-2.315	5.315
	4	-2.259	1.3569	.346	-5.788	1.270
3	1	.969	1.4669	.912	-2.847	4.784
	2	-1.500	1.4669	.737	-5.315	2.315
	4	-3.759*	1.3569	.032	-7.288	-.230
4	1	4.728*	1.3569	.004	1.199	8.257
	2	2.259	1.3569	.346	-1.270	5.788
	3	3.759*	1.3569	.032	.230	7.288

Based on observed means.

*. The mean difference is significant at the .05 level.

Figure 4—Graphic Mean Comparison of the Four Groups Maturity Subscale Score



Inquisitiveness

A two-way ANOVA, with Tukey post-hoc analysis, showed that arts juniors/seniors (Group 4) scored significantly higher than the non-arts freshmen (Group 1) on inquisitiveness, at $p = .037$ (see Tables 13 and 14). There were no significant differences between the other groups.

Table 13—Mean Descriptives of Non-Arts Freshmen (Group 1), Arts Freshmen (Group 2), Non-Arts Juniors/Seniors (Group 3), and Arts Juniors/Seniors (Group 4) CCTDI Inquisitiveness Subscale Score

Descriptive Statistics

Dependent Variable: INQUIZ

GROUP	Mean	Std. Deviation	N
1	44.469	7.1029	32
2	46.156	6.7733	32
3	47.406	6.2829	32
4	48.511	5.7431	45
Total	46.809	6.5421	141

Table 14—Post-Hoc Analysis of Mean Comparison Between All Groups on Inquisitiveness Subscale

Multiple Comparisons

Dependent Variable: INQUIZ

Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-1.688	1.6071	.720	-5.867	2.492
	3	-2.938	1.6071	.265	-7.117	1.242
	4	-4.042*	1.4865	.037	-7.908	-.176
2	1	1.688	1.6071	.720	-2.492	5.867
	3	-1.250	1.6071	.864	-5.430	2.930
	4	-2.355	1.4865	.391	-6.221	1.511
3	1	2.938	1.6071	.265	-1.242	7.117
	2	1.250	1.6071	.864	-2.930	5.430
	4	-1.105	1.4865	.879	-4.971	2.761
4	1	4.042*	1.4865	.037	.176	7.908
	2	2.355	1.4865	.391	-1.511	6.221
	3	1.105	1.4865	.879	-2.761	4.971

Based on observed means.

*. The mean difference is significant at the .05 level.

Systematicity

A two-way ANOVA, with Tukey post-hoc analysis, showed that arts freshmen (Group 2) scored significantly lower on systematicity than the non-arts juniors/seniors (Group 3), at $p = .006$, and significantly lower than the arts juniors/seniors (Group 4), at $p = .022$ (see Tables 15 and 16, and Figure 5). There were no significant differences between the other groups.

Table 15—Mean Descriptives of Non-Arts Freshmen (Group 1), Arts Freshmen (Group 2), Non-Arts Juniors/Seniors (Group 3), and Arts Juniors/Seniors (Group 4) CCTDI Systematicity Subscale Score

Descriptive Statistics

Dependent Variable: SYSTEM

GROUP	Mean	Std. Deviation	N
1	39.344	5.7843	32
2	36.000	6.6865	32
3	41.438	4.6555	32
4	40.356	7.8107	45
Total	39.383	6.7206	141

Table 16—Post-Hoc Analysis of Mean Comparison Between All Groups on Systematicity Subscale

Multiple Comparisons

Dependent Variable: SYSTEM

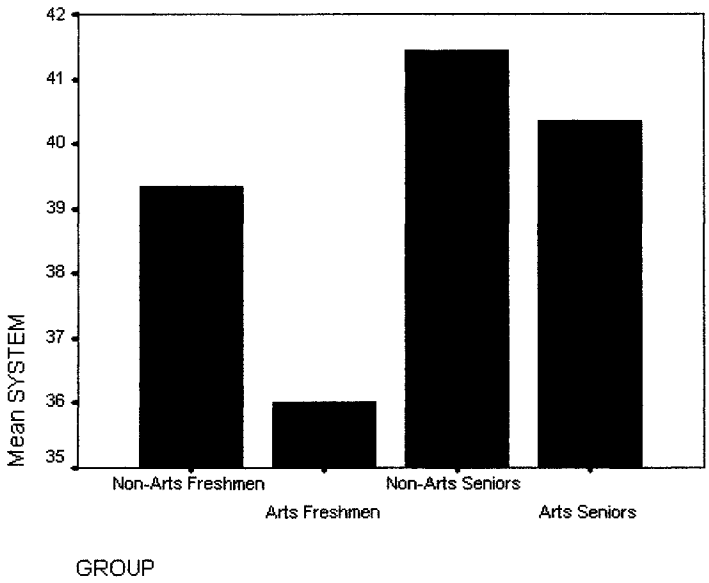
Tukey HSD

(I) GROUP	(J) GROUP	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	3.344	1.6238	.172	-.879	7.567
	3	-2.094	1.6238	.571	-6.317	2.129
	4	-1.012	1.5019	.907	-4.918	2.894
2	1	-3.344	1.6238	.172	-7.567	.879
	3	-5.438*	1.6238	.006	-9.661	-1.214
	4	-4.356*	1.5019	.022	-8.262	-.449
3	1	2.094	1.6238	.571	-2.129	6.317
	2	5.438*	1.6238	.006	1.214	9.661
	4	1.082	1.5019	.889	-2.824	4.988
4	1	1.012	1.5019	.907	-2.894	4.918
	2	4.356*	1.5019	.022	.449	8.262
	3	-1.082	1.5019	.889	-4.988	2.824

Based on observed means.

*. The mean difference is significant at the .05 level.

Figure 5—Graphic Mean Comparison of the Four Groups Systematicity Subscale Score



Research Question 1 Findings

Research Question One asks: Does the disposition toward critical thinking vary between arts and non-arts undergraduates? The disposition toward critical thinking does vary between arts and non-arts undergraduates. The arts/non-arts variance exists between two of the four groups in this study: the freshmen non-arts students and the junior/seniors arts students. The overall critical thinking disposition scores of junior/senior arts students are significantly higher than those of freshmen non-arts students.

A significant variance also exists between the groups in several of the subscale comparisons. Following the trend on the overall score comparisons, the arts juniors/seniors scored significantly higher than the non-arts freshmen on the truth-seeking and inquisitiveness subscales.

In a variation on the pattern of overall scores, the arts juniors/seniors scored significantly higher than *all* non-arts undergraduates (both the freshmen and juniors/seniors groups) on the maturity subscale.

Non-arts juniors/seniors scored significantly higher than arts freshmen on the systematicity subscale. On this subscale, the arts juniors/seniors also scored significantly higher than the arts freshmen.

In regard to the subscale score averages, the mean subscale score in this study was above 40 for all groups for each subscale, except for truth-seeking and systematicity. On systematicity, the mean score of the non-arts and arts freshmen was below 40. The mean score of the non-arts and arts juniors/seniors was above 40.

Facione et al. (1995) noted that

> A score of 30 and below on any of the scales indicates consistent opposition or weakness in relation to the given attribute or characteristic, a score of 40 indicates minimal endorsement on average, and scores above 50 indicate consistent endorsement or strength of the given characteristic (p. 4).

On the truth-seeking subscale, the mean score for all groups was below 40. This result is similar to one which occurred in a longitudinal study by Giancarlo and Facione (2001) that also utilized the CCTDI. In the report of this study, Giancarlo and Facione noted that, "mean scores for Truthseeking were below 40 points for both lower- and upper-division students, whereas the remaining scale scores were between 40 and 50 points on average for both groups" (p. 17).

Research Question 2 Findings

Research Question Two asks: Does the disposition toward critical thinking vary between freshmen and juniors/seniors? The disposition toward critical thinking does

vary between freshmen and juniors/seniors. Following the same pattern which occurred in analysis of Research Question One, the significant variance on overall critical thinking disposition score comparisons exists between non-arts freshmen and junior/senior arts students. The overall critical thinking disposition scores of junior/senior arts students are significantly higher than those of freshmen non-arts students.

Again, following the same pattern seen for Research Question One, a significant variance also exists between freshmen and juniors/seniors in several of the subscale comparisons. The arts juniors/seniors scored significantly higher than the non-arts freshmen on the truth-seeking and inquisitiveness subscales.

Arts juniors/seniors also scored significantly higher than non-arts freshmen on the maturity subscale. And both arts and non-arts juniors/seniors scored significantly higher than arts freshmen on the systematicity subscale.

Research Question 3

Research Question Three asks: Is GPA related to the disposition toward critical thinking? To investigate Research Question Three, SPSS statistical software was used to perform correlation analyses to determine whether or not total and subscale CCTDI scores for all subjects ($N = 141$) correlated significantly with GPA.

GPA Correlations

The statistical analysis for correlation showed that there is a statistically significant positive correlation between total CCTDI scores and GPA for the entire subject group, at $r = .214$ (see Table 17).

In evaluating the entire group of scores ($N = 141$), there was also a statistically significant positive correlation between GPA and scores on two of the subscales: maturity and systematicity (see Table 18). GPA and maturity correlate at $r = .330$; GPA and systematicity correlate at $r = .194$.

Table 17—Correlation between Total CCTDI and GPA

Correlations

		TOTAL	GPA
TOTAL	Pearson Correlation	1	.214*
	Sig. (2-tailed)	.	.011
	N	141	141
GPA	Pearson Correlation	.214*	1
	Sig. (2-tailed)	.011	.
	N	141	141

*. Correlation is significant at the 0.05 level (2-tailed).

Table 18—Correlation between GPA and subscale CCTDI scores

Correlations

		GPA	INQUIZ	CONFID	SYSTEM	OPENMIND	ANALYT	TRUTH	MATURE
GPA	Pearson Correlation	1	.095	-.023	.194*	.093	.103	.135	.330**
	Sig. (2-tailed)	.	.261	.791	.021	.274	.223	.111	.000
	N	141	141	141	141	141	141	141	141
INQUIZ	Pearson Correlation	.095	1	.499**	.270**	.395**	.267**	.262**	.269**
	Sig. (2-tailed)	.261	.	.000	.001	.000	.001	.002	.001
	N	141	141	141	141	141	141	141	141
CONFID	Pearson Correlation	-.023	.499**	1	.256**	.257**	.455**	.082	.046
	Sig. (2-tailed)	.791	.000	.	.002	.002	.000	.331	.587
	N	141	141	141	141	141	141	141	141
SYSTEM	Pearson Correlation	.194*	.270**	.256**	1	-.002	.534**	.256**	.251**
	Sig. (2-tailed)	.021	.001	.002	.	.982	.000	.002	.003
	N	141	141	141	141	141	141	141	141
OPENMIND	Pearson Correlation	.093	.395**	.257**	-.002	1	.059	.310**	.278**
	Sig. (2-tailed)	.274	.000	.002	.982	.	.489	.000	.001
	N	141	141	141	141	141	141	141	141
ANALYT	Pearson Correlation	.103	.267**	.455**	.534**	.059	1	.149	.212*
	Sig. (2-tailed)	.223	.001	.000	.000	.489	.	.078	.012
	N	141	141	141	141	141	141	141	141
TRUTH	Pearson Correlation	.135	.262**	.082	.256**	.310**	.149	1	.588**
	Sig. (2-tailed)	.111	.002	.331	.002	.000	.078	.	.000
	N	141	141	141	141	141	141	141	141
MATURE	Pearson Correlation	.330**	.269**	.046	.251**	.278**	.212*	.588**	1
	Sig. (2-tailed)	.000	.001	.587	.003	.001	.012	.000	.
	N	141	141	141	141	141	141	141	141

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Research Question 3 Findings

GPA does correlate significantly with critical thinking dispositions. It correlates positively with overall CCTDI scores, as well as with two of the subscale scores: maturity and systematicity.

Conclusion

This chapter reported the results of the quantitative data collected to compare the critical thinking dispositions of undergraduates, and answered the three research questions posed in this study. The data presented show that junior/senior arts students have a significantly higher disposition toward critical thinking than freshmen non-arts students; and GPA does correlate positively with the disposition toward critical thinking.

The next and final chapter summarizes the results of the CCTDI score comparisons and presents a discussion of the findings as well as the implications of the results.

CHAPTER 5: SUMMARY AND DISCUSSION OF FINDINGS

Introduction

Critical thinking is generally considered a desirable outcome of higher education, but there is not a large body of research on which instructional techniques influence gains in critical thinking (Halpern, 1993; Tsui, 1998, 2002). In the small amount of research which is available on the pedagogy of critical thinking, very little mention is made of findings on the impact of arts instruction on higher order reasoning (Simon & Ward, 1974; Astin, 1993b).

Because so little investigation into the relationship between university level fine arts instruction and critical thinking has been conducted, further study was suggested on whether or not a relationship exists between the disposition toward critical thinking and the undergraduate study of fine arts. To determine if such a relationship exists, this study utilized the California Critical Thinking Disposition Inventory (CCTDI), a survey instrument, to collect critical thinking dispositions data from a sample of 141 undergraduates at a large, urban, public university on the east coast. The sample consisted of four groups: freshmen non-arts students, freshmen arts students, junior and senior non-arts students, and junior and senior arts students.

Of the four groups which were compared, the junior and senior arts subjects showed the highest mean total score on the CCTDI. This mean was significantly higher than that of freshmen non-arts students. Also, junior and senior arts students scored significantly higher than other groups on several of the CCTDI subscales. Freshmen arts students scored significantly lower than all juniors/seniors in the study on one of the seven CCTDI subscales: systematicity.

This chapter summarizes the results of all of the CCTDI score comparisons and presents a discussion of the findings and implications of the results.

Summary of Findings

Total CCTDI Score Comparisons

The statistical analysis performed on the CCTDI scores shows that a statistically significant difference exists between the mean total CCTDI score of freshmen and that of juniors/seniors. Further analysis shows that the significant main effect difference (effect when the four groups are merged into two groups) between the two class rank groups is due to significant differences in the simple effect between two of the four groups in the study. The simple effect analysis (comparison of all four groups) shows that of the groups compared—freshmen non-arts students, freshmen arts students, junior/senior non-arts students, and junior/senior arts students—a significant difference exists between non-arts freshmen and junior/senior arts students. The junior/senior arts students' total mean CCTDI score was significantly higher than that of the freshmen non-art students, at $p = .014$.

Subscale CCTDI Score Comparisons

Subscale comparisons showed no significant differences between any of the four groups on three of the subscales: open-mindedness, analyticity, and critical thinking confidence. There were significant differences between groups on the four remaining subscales: truth-seeking, inquisitiveness, maturity, and systematicity.

Juniors/senior arts students scored significantly higher than freshmen non-arts students on truth-seeking, at $p = .005$, and inquisitiveness, at $p = .037$.

On the maturity subscale arts junior/senior arts students scored significantly higher than *all* non-arts students. On this subscale, arts juniors/seniors scored significantly higher than non-arts freshmen, at $p = .004$, and they scored significantly higher than non-arts juniors/seniors, at $p = .032$.

The systematicity subscale was the only subscale where the pattern of findings shifted. Freshmen arts students scored significantly lower than *all* juniors/seniors on this subscale. Arts juniors/seniors scored significantly higher than arts freshmen on systematicity, at $p = .022$. Non-arts juniors/seniors scored significantly higher than arts freshmen on systematicity, at $p = .006$. There was not a significant difference between non-arts freshmen and non-arts junior/seniors on this subscale, or between arts juniors/seniors and non-arts juniors/seniors.

Correlations

The statistical analysis for correlation showed that there is a statistically significant positive correlation between total CCTDI scores and GPA for the entire subject group. There was also a statistically significant positive correlation between GPA and scores on two of the subscales: maturity and systematicity. It is likely that the two subscales correlations impacted the correlation between GPA and total scores.

Discussion of Findings

The findings of this study may indicate that exposure to undergraduate visual arts curriculum and instruction significantly increases the disposition to think critically. This was not a longitudinal study, however, the cross sectional sampling produced results showing a statistically significant difference between the freshmen who had no

exposure to arts curriculum and instruction and the juniors/seniors who did have such exposure. This suggests that visual arts curriculum and instruction may produce significant gains in the critical thinking dispositions of undergraduates.

Causality was not an aspect of this study, but existing research on critical thinking and on creative arts curriculum and instruction may offer indications as to how arts curriculum and instruction may enhance the disposition to think critically. Prior research has clearly shown that critical thinking is enhanced by an emphasis on classroom discussion, independent inquiry, problem-solving and analysis (Astin, 1993; Ewell, 1994; Giancarlo & Facione, 2001; King, 1994; Tsui, 2002). These pedagogical techniques are commonly used in K-12 and higher education art classrooms (Amabile, 1993; Burton et al., 2000; Cole et al., 1999; Cromwell, 1994; Dorn, 1999; Eisner, 1998; Geahigan, 1997; Stout, 1999).

For example, in studio critiques a key component of an art student's experience is discussion of the strengths, weaknesses, successes and failures of their own work, as well as the work of fellow students' and that of artists outside the classroom. It is notable that the very root of the word critique is the same root in the term critical thinking. Visual arts students think critically when discussing each other's work, other artist's work, and when solving the problems of how to visually depict forms and concepts. No road maps are available to students approaching empty space which must be filled with effective visual communication, or when interpreting other artists' visual messages. These processes include all of the elements which research has shown impact critical thinking: independent inquiry, problem-solving, classroom

discussion and analysis. Art students continually think heuristically rather than algorithmically when practicing their discipline (Amabile, 1993).

The findings of this study seem to indicate that immersion in a discipline which requires constant heuristic problem solving, inquiry, discussion and analysis may condition the mind to approach the world with a disposition for accepting that there are many possible solutions to complex problems—in other words, such a discipline may condition the mind to think critically.

The findings on the CCTDI subscale scores weigh heavily in favor of suggesting that arts curriculum and instruction impacted the results in this study. The three subscales on which the arts students in this study scored significantly higher are described by N. Facione et al. (1994) as follows:

> The *inquisitiveness* subscale on the CCTDI measures one's intellectual curiosity and one's desire for learning, even when the application of the knowledge is not readily apparent.
>
> The *truth-seeking* subscale targets the disposition of being eager to seek the best knowledge in a given context, courageous about asking questions, and honest and objective about pursuing inquiry even if the findings do not support one's self-interests or one's preconceived opinions.
>
> The *maturity* subscale targets the disposition to be judicious in one's decision making. The CT-mature person can be characterized as one who approaches problems, inquiry, and decision making with a sense that some problems are necessarily ill-structured, some situations admit of more than one plausible option, and many times judgments must be made based on standards, contexts, and evidence that preclude certainty (N. Facione et al., 1994, pp. 345-347).

The descriptions of exactly what these subscales measure are highly aligned with

what research and theory on arts instruction describe as the main components of arts curriculum and instruction: creative exploration and analysis of ill-structured problems which have more than one possible solution. Except for the systematicity subscale, the arts students scored neither higher or lower than non-arts students on the other subscales of the inventory. This is a strong indication that the significant differences that exist between arts and non-arts undergraduates in this study can be attributed to the above three subscales.

The systematicity subscale findings, which show a significant difference between arts freshmen and *all* juniors/seniors, indicate that arts freshmen start college with a weaker disposition in this area than non-arts freshmen, but that they do realize significant gains in systematicity by their junior/senior years.

Although this study measured critical thinking dispositions rather than critical thinking skills, Facione et al. (1995) explained that "preliminary empirical studies using the CCTDI and its companion skills test, the CCTST are beginning to suggest that perhaps truth-seeking is the most crucial dispositional attribute in predicting CT skills" (pp. 11-12). Notably, truth-seeking is one of the three subscales on which arts students scored significantly higher than non-arts students.

Implications for Practice

The findings of this study, when considered in relation to findings from existing research on critical thinking skills and dispositions, may suggest that for non-arts undergraduates to realize significant gains in critical thinking, it may require they receive more exposure to heuristic-based curriculum and instruction than they

currently receive in many institutions (Astin, 1993; Burton, Horowitz & Abeles, 1999; Ewell, 1994; Giancarlo & Facione, 2001; King, 1994; Tsui, 2002). Also, although this study did not compare the classroom climate and culture that arts and non-arts subjects in the study experienced, research indicates that creative thinking, and an enthusiasm for inquiry and divergent thinking with heuristic-based problems is impacted by instructor attitudes and classroom climate (Amabile, 1993; Cole et al., 1999; Cromwell, 1994). Hand in hand with exposing non-arts students to more heuristics and classroom discussion akin to the age-old 'Socratic Method,' it may be necessary for college teachers in non-arts settings to adopt a less authoritative approach and to be more receptive to divergent thinking in order to foster a greater spirit of inquiry and inquisitiveness in non-arts students.

Limitation and Future Research Suggested

As this is one of the only studies to compare the critical thinking dispositions of undergraduate arts and non-arts students, a great deal of future research is necessary to determine if the findings of this study will be sustained in replications with larger and better defined samples. A large scale longitudinal study which compares large samples across multiple institutions might provide further insight on the impact of visual arts curriculum and instruction on critical thinking. Because this study tested freshmen art students in the spring, after one semester of exposure to arts curriculum and instruction, a longitudinal study which tests all subjects upon entry to the institution and then tracks changes in their critical thinking dispositions along the way would offer further illumination of these findings. Such a study, if it tested freshmen

upon entry, would more clearly indicate if arts freshmen begin college with differences from other majors in critical thinking dispositions which might be attributed to arts learning at the secondary level.

A large scale study might also correlate results from several instruments used as measures, including the CCTDI, a critical thinking skills test, creativity tests, as well as qualitative measures, such as classroom observations, student and faculty interviews, and curriculum content analysis.

Also, the study reported here may not be generalizable beyond the setting in which it occurred because art students in this study were from a highly regarded art school and were compared with non-arts students from a very large public university not known to have a high humanities orientation. The large institution where this study was conducted is very different than Perry's Harvard of the 1950s, which likely had a strong humanities orientation, an orientation which research shows impacts critical thinking (Astin, 1993; Ewell, 1994; Tsui, 2002). Future research might be done to determine if findings similar to those in this study are obtained in studies which compare non-arts students from an institution with a strong humanities orientation with arts students from the same institution. Further study might also be done to compare art and non-arts students across and within multiple types of institutions.

A mixed methods study which compares the impact of various types of art and non-art curricula and instruction, and which also examines the impact of varying kinds of classroom culture on critical thinking, is also suggested by these findings. Such as study might compare curriculum and instruction across various majors

through course content analysis, observations, focus groups, interviews, and surveys and might also utilize pretests and posttests with instruments which measure creativity, critical thinking skills, and critical thinking dispositions.

Additionally, an experimental study design might be considered, using two groups of non-arts students: an experimental group which receives inquiry-based arts instruction and a control group which does not. Pretests and posttests of these groups could be compared to determine if arts instruction influenced posttest outcomes.

Any of the above suggested studies on undergraduate education might be extended to include secondary students to test whether or not high school arts and non-arts instruction impacts critical thinking skills and dispositions in any ways that may be related to postsecondary findings.

In regard to the correlational findings in this study, since critical thinking has previously been correlated with GPA (Gadzella et al. 2004; Weast, 1996; Williams & Worth, 2001), these findings support existing research. Future research might investigate how this correlation may be a covariant with academic discipline and classroom culture. And, future research might investigate why only two of the subscales in this study showed a significant correlation with GPA—the maturity and systematicity subscales.

Conclusion

Although this study was limited in scope and range by the setting, the non-experimental, cross-sectional design, and the small sample size, the findings are important to educational practice because they provide some empirical support for the

theory that arts curriculum and instruction enhance the disposition to think critically over time in college. It has long been believed that learning in the arts requires critical analysis and fosters an understanding of multiple perspectives. The subscale results of this study show a clear strength in these abilities in arts students and offer initial evidence that the arts do indeed enhance the disposition to think critically.

APPENDICES

Appendix A

Research Subject Information and Consent Form

RESEARCH SUBJECT INFORMATION AND CONSENT FORM

You do not have to participate in this study. If you choose to participate you may stop at any time without any penalty. You may also choose not to answer particular questions that are asked in the study. Be informed that data collected from the survey will be linked with your academic records. Personal data gathered in connection with this study will be maintained in a manner consistent with federal and state laws and regulations. Once data is collected, names will be deleted and replaced with numbers to prevent personal identification. To indicate your consent to participate in this study please sign and date this statement and return it to the investigator before completing the survey.

_____

Subject Name, printed

_____ _____

Subject Signature Date

Appendix B

Fine Arts Degree Requirements

Degree Requirements in Sculpture	
Studios	Credits
Foundation Program	14
Sculpture Studio	36
Studio Courses from any department other than Sculpture	14
General Education	
Art History	15
English 101, 200	6
Literature	6
Approved electives to include:	
Social Sciences	3
Math (or recognized competency)	3
Ethics	3
Lab Science	4
Open Electives	20
TOTAL	124

Department of Art Education - BFA Degree in Art Education
Curriculum Checklist Minimum Credits: 123 (46 upper level credits)

	Art Education Courses - 20 credits	
	ARTE 250 - Computer Technology in Art Education	3
	ARTE 310 - Foundations of Art in Education	3
	ARTE 311 - Art Education Curriculum and Instructional Procedures	3
	ARTE 401 - Art Education Elementary Materials and Practicum*	4
	ARTE 402 - Art Education Secondary Materials and Practicum*	4
	Special Education elective (ARTE 450 or TEDU 330)	3
	Student Teaching - 13 credits	
	TEDU 485 - Directed Student Teaching: Art - Elementary*	6
	TEDU 486 - Directed Student Teaching: Art - Secondary*	6
	ARTE 404 - Student Teaching Seminar*	1
	*Prerequisite: 2.5 GPA and passing scores on PRAXIS I examination	
	General Studies - 31 credits	
	ENGL 101 - The Craft of Writing	3
	ENGL 200 - The Craft of Writing and Research	3
	EDUS 201 - Human Development and Learning	3
	Literature elective	3
	Quantitative Reasoning elective**	3
	History elective	3
	Laboratory Science elective (lecture and lab)	4
	Humanities elective	3
	Social Science elective	3
	General Studies elective	3
	Art History - 15 credits	
	ARTH 102 - Contemporary Issues in Art and Design	3
	ARTH 103 - Survey of Western Art	3
	ARTH 104 - Survey of Western Art	3
	Contemporary Art, Aesthetics or Art Criticism elective	3
	Upper level (300-400) Art History elective	3
	Studio - Art Foundation - 14 credits	
	ARTF 151 - Foundation Studio	4
	ARTF 152 - Foundation Studio	4
	ARTF 161 - Figure Drawing I	1
	ARTF 162 - Perspective and Three-Dimensional Drawing	1
	ARTF 163 - Two-Dimensional Design Methods	1
	ARTF 164 - Color Research Laboratory	1
	ARTF 1 - Technical Laboratory elective	1
	ARTF 1 - Technical Laboratory elective	1
	Studio Electives - 21 credits	
	Painting (PAPR 235)	4
	Sculpture (SCPT 211 or 212)	4
	Photography (PHTO 243 or 245)	3
	Crafts (CRAF 241 or 242)	4
	Two-Dimensional Studio elective (PAPR 209 recommended)	3
	Three-Dimensional Studio elective (CRAF, SCPT)	3
	Electives - 9 credits	
	Elective	3
	Elective	3
	Elective	3
	Total Credits Required	123

REFERENCES

Amabile, T. (1983). *The social psychology of creativity.* New York: Springer-Verlag.

Amabile, T. (1996). *Creativity in context.* Boulder, CO: Westview Press.

Amabile, T., Hadley, C., & Kramer, S. (2002). Creativity under the gun. *Harvard Business Review. 80* (8), 52-61.

Astin, A. (1993a). *Assessment for excellence: The philosophy and practice of assessment and evaluation in higher education.* Phoenix, AZ: Oryx Press.

Astin, A. (1993b). *What matters in college? Four critical years revisited.* San Francisco: Jossey-Bass.

Bleedorn, B. (1993). Toward an integration of creative and critical thinking. *American Behavioral Scientist, 37*(1), 10-21.

Bloom, B. S. (Ed). (1956). *Taxonomy of educational objectives: The classification of educational goals. Handbook I. Cognitive domain.* New York: Longman.

Brandt, R. (1986). On creativity and thinking skills: A conversation with David Perkins. *Educational Leadership, 43*(8), 12-18.

Brookfield, S. (2003). Critical thinking in adulthood. In D. Fasko, Jr. (Ed.) *Critical thinking and reasoning: Current research, theory, and practice.* (pp. 143-161). Cresskill, NJ: Hampton Press, Inc.

Burton, J., Horowitz, R., & Abeles, H. (2000). Learning in and through the arts: The question of transfer. *Studies in Art Education, 41*(3), 228-257.

Burton, J., Horowitz, R., & Abeles, H. (1999). Learning in and through the arts: Curriculum implications. In E. Fiske (Ed.) *Champions of change: The impact of the arts of learning.* (pp. 35-46). Washington, DC: Arts Education Partnership.

Callahan, C. (1995). The California critical thinking dispositions inventory. In J. Conoley & J. Impara (Eds.). *The twelfth mental measurements yearbook.* Lincoln, NE: Buros Institute of Mental Measurements. Retrieved July 11, 2004 from http://buros.unl.edu/buros/jsp/search.jsp

Cole, D., Sugioka, H., & Yamagata-Lynch, L. (1999). Supportive classroom environments for creativity in higher education. *Journal of Creative Behavior, 33*(4), 277-293.

Cromwell, R. (1994). Creativity enhances learning in college classes: The importance of artists and poets. In R. Kelder (Ed.) *Theories of learning: Teaching for understanding and creativity.* (pp. 217-225). New Paltz: State University of New York.

Dorn, C. M. (1999). *Mind in art: Cognitive foundations in art education.* Mahwah, NJ: Lawrence Erlbaum Associates.

Downs-Lombardi, J. (1996). *Society's child: A mini-workshop in critical and creative thinking.* (ERIC Document Reproduction Service No. ED400726).

Eisner, E. (1998). Does experience in the arts boost academic achievement? *Journal of Art & Design Education, 17*(1), 51-60.

Ennis, R. (2002). A *super streamlined conception of critical thinking.* Retrieved December 29, 2004 from http://faculty.ed.uiuc.edu/rhennis/SSConcCTApr3.html

Erwin, T. & Wise, S. (2002). A scholar-practitioner model for assessment. In T. Banta & Associates (Eds.) *Building a scholarship of assessment.* (pp. 67-81). San Francisco: Jossey-Bass Publishers.

Evans, N., Forney, D., & Guido-DiBrito, F. (1998). *Student development in college: Theory, research, and practice.* (pp. 130-145). San Francisco: Jossey-Bass.

Ewell, P. (1994). *A preliminary study of the feasibility and utility for national policy of instructional "good practice" indicators in undergraduate education.* (ERIC Document Reproduction Service No. ED372718).

Facione, P. (1990a). *The California critical thinking skills test: Forms A and B: and the CCTST test manual.* Millbrae, CA: California Academic Press.

Facione, P. (1990b). Critical thinking: A statement of expert consensus for purposes of educational assessment and instruction. *The Delphi report executive summary.* Millbrae, CA: California Academic Press.

Facione, P., & Facione, N. (1992). *The California critical thinking disposition inventory.* Millbrae, CA: California Academic Press.

Facione, N., Facione, P., & Sanchez, C. (1994). Critical thinking disposition as a measure of competent clinical judgment: The development of the California Critical Thinking Disposition Inventory. *Journal of Nursing Education, 33*(8), 345-350.

Facione, P., Giancarlo, C., Facione, N., & Gainen, J. (1995). The disposition toward critical thinking. *Journal of General Education, 44*(1), 1-25.

Feldhusen, J., & Eng Goh, B. (1995). Assessing and accessing creativity: A integrative review of theory, research, and development. *Creativity Research Journal, 8*(3), 231-247.

Gadzella, B., Stephens, R., & Stacks, J. (2004) *Assessment of critical thinking scores in relation with educational psychology and GPA for education majors.* Poster session presented at the Texas A&M University Assessment Conference, College Station, TX. Retrieved June 16, 2005 from http://www.tamu.edu/qep/Presentations/CRITGPA_poster_Gadzella.pdf

Gall, M., Borg, W., & Gall, J. (1996). *Educational research: An introduction.* White Plains, NY: Longman.

Gardner, H. (1993). *Creating minds.* New York: Basic Books.

Geahigan, G. (1997). Art criticism: From theory to practice. In Wolff, T. and G. Geahigan. *Art criticism and education.* (pp. 125-278). Urbana: University of Illinois Press.

Geiger, R. (1986). *To advance knowledge: The growth of American research universities, 1900-1940.* New York: Oxford University Press.

Giancarlo, C., & Facione, P. (2001). A look across four years at the disposition toward critical thinking among undergraduate students. *The Journal of General Education, 50*(1), 29-55.

Halpern, D. (1993). Assessing the effectiveness of critical thinking instruction. *The Journal of General Education, 42*(4), 238-254.

Hetland, L. & Winner, E. (2004). Cognitive transfer from arts education to nonarts outcomes: Research evidence and policy implications. In E. Eisner & M. Day (Eds.), *Handbook of research and policy in art education* (pp. 135-161). Mahwah, NJ: Erlbaum.

Hofer, B., & Pintrich, P. (1997). The development of epistemological theories: Beliefs about knowledge and knowing and their relation to learning. *Review of Educational Research, 67*(1), 1-34.

Hooker, R. (1996). *The European enlightenment.* Retrieved October 26, 2003, from http://www.wsu.edu/~dee/ENLIGHT/ENLIGHT.HTM

Insight Assessment (2005). *CCTDI score interpretation document.* Millbrae, CA: Insight Assessment.

Isaksen, S. & Murdock, M. (1993). The emergence of a discipline: Issues and approaches to the study of creativity. In S. Isaksen, M. Murdock, R. Firestien & D. Treffinger (Eds.), *Understanding and recognizing creativity: The emergence of a discipline* (pp. 13-47). Norwood, NJ: Alex Publishing Corporation.

Jones, E., Hoffman, F., Moore, L., Ratcliff, G., Tibbits, S., & Click, B. (1995). *National assessment of college student learning: Identifying college graduates' essential skills in writing, speech and listening, and critical thinking.* Washington, DC: National Center for Education Statistics.

Kardash, C. & Sinatra, G. (2003). *Epistemological beliefs and dispositions: Are we measuring the same construct?* (ERIC Document Reproduction Service No. ED479164).

Keiss, H. (2002). *Statistical concepts for the behavioral sciences.* Boston: Allyn & Bacon.

King, A. (1990). Enhancing peer interaction and learning in the classroom through reciprocal questioning. *American Educational Research Journal, 27*(4), 664-687.

King, A. (1992). Comparison of self-questioning, summarizing, and notetaking-review as strategies for learning from lectures. *American Educational Research Journal, 29*(2), 303-323.

King, A. (1994). Inquiry as a tool in critical thinking. In Halpern, D. F. and Associates (Eds.) *Changing college classrooms: New teaching and learning strategies for an increasingly complex world.* (pp. 13-38). San Francisco: Jossey-Bass Publishers.

King, A. (1995). Designing the instructional process to enhance critical thinking across the curriculum: Inquiring minds really do want to know: Using questioning to teach critical thinking. *Teaching of Psychology, 22*(1), 13-17.

King, A., Staffieri, A., & Adelgais, A. (1998). Mutual peer tutoring: Effects of structuring tutorial interaction to scaffold peer learning. *Journal of Educational Psychology, 90(*1), 134-152.

Knefelkamp, L. (1999). Introduction. In W. Perry, *Forms of ethical and intellectual development in the college years: A scheme.* (pp. xxi-xxiii). San Francisco: Jossey-Bass.

Marzano, R. J. (1993). How classroom teachers approach the teaching of thinking. *Theory Into Practice, 32*(3), 154-160.

McMillan, J. (1987). Enhancing college students' critical thinking: A review of studies. *Research in Higher Education, 26*(1), 3-29.

Morison, S. E. (1936). *Three centuries of Harvard 1636-1936.* (pp. 3-36). Cambridge, MA: University Press.

Nosich, G., M. (2005). *Learning to think things through: A guide to critical thinking across the curriculum.* Upper Saddle River, New Jersey: Pearson Prentice Hall.

Olson, I. (2000). *The arts and critical thinking in American education.* Westport, Connecticut: Bergin & Garvey.

Pascarella, E., Bohr, L., Nora, A., & Terenzini, P. (1996). *Is differential exposure to college linked to the development of critical thinking?* (ERIC Document Reproduction Service No. ED374729).

Paul, R., & Elder, L. (2004). *The miniature guide to critical thinking concepts & tools.* Dillon Beach, CA: The Foundation for Critical Thinking.

Paul, R., Elder, L., & Bartell, T. (1997). *California teacher preparation for instruction in critical thinking: Research findings and policy recommendations.* Sacramento, CA: California Commission on Teacher Credentialing.

Perkins, D., Jay, E., & Tishman, S. (1993). Beyond abilities: A dispositional theory of thinking. *Merrill-Palmer Quarterly, 39*(1), 1-21.

Perkins, D. (1994). *The intelligent eye: Learning to think by looking at art.* Los Angeles: Getty Publications.

Perry, W. (1999). *Forms of ethical and intellectual development in the college years: A scheme.* San Francisco: Jossey-Bass Publishers.

Pilcher, V. (1994). *Early science and the first century of physics at Union College, 1795-1895.* Schenectady, NY: Union College.

President and Fellows of Harvard College (2003). *Project zero.* Retrieved October 30, 2004 from http://www.pz.harvard.edu/

Ramey, C. T., & Piper, V. (1974). Creativity in open and traditional classrooms. *Child Development, 45*(2), 557-560.

Rudolph, F. (1990). *The American college and university: A history.* Athens and London: The University of Georgia Press.

Simon, A., & Ward, L., (1974). The performance on the Watson-Glaser critical thinking appraisal of university students classified according to sex, type of course pursued and personality score category. *Educational and Psychological Measurement, 34,* 957-960.

Snow, L. (1907). *The college curriculum.* New York: Teacher's College, Columbia University.

Stout, C. J. (1999). Artists as writers: Enriching perspectives in art appreciation. *Studies in Art Education, 40*(3), 226-241.

Terenzini, P., Springer, L., Pascarella, E. & Nora, A. (1995). Influences affecting the development of students' critical thinking skills. *Research in Higher Education, 36*(1) 23-39.

Thomson, R. P. (1970). Colleges in the revolutionary south: The shaping of a tradition. *History of Education Quarterly,* Winter, 399-413.

Torrance, E. P. (1969). *Creativity.* Belmont, CA: Dimensions Publishing Co.

Tsui, L. (1998). *A review of research on critical thinking.* Paper presented at the annual meeting of the Association for the Study of Higher Education, November 1998. (ERIC Document Reproduction Service No. ED 427572).

Tsui, L. (1999). Courses and instruction affecting critical thinking. *Research in Higher Education, 40*(2), 185-200.

Tsui, L. (2002). Fostering critical thinking through effective pedagogy. *The Journal of Higher Education, 73*(6), 740-763.

Turner, J. & Bernard, P. (2000). The German model and the graduate school. In R. Geiger (Ed.), *The American college in the nineteenth century.* (pp. 221-241). Nashville: Vanderbilt University Press.

U.S. News.com. (2003). *America's best graduate schools 2004: Fine arts programs.* Retrieved June 6, 2003 from http://www.usnews.com/usnews/edu/grad/rankings/arts/premium/art.php

U.S. News.com. (2004a). *Unranked specialty schools.* Retrieved July 11, 2004 from http://www.usnews.com/usnews/edu/college/rankings/rankunranked_brief.php

U.S. News.com. (2004b). *National universities-doctoral: Tier 3.* Retrieved July 11, 2004 from http://www.usnews.com/usnews/edu/college/rankings/brief/natudoc/tier3/t3natudoc_brief.php

VanTassel-Baska, J. (1998). Creativity and the gifted. In J. VanTassel-Baska, C. Persson Benbow & J. Feldhusen (Eds.) *Excellence in educating gifted and talented learners.* (pp. 143-148). Denver: Love Publishing Co.

Veysey, L. (1965). *The emergence of the American university.* Chicago: University of Chicago Press.

Weast, D. (1996). Alternative teaching strategies: The case for critical thinking. *Teaching Sociology, 24*(2), 189-194.

Widick, C., Knefelkamp, L. & Parker, C. (1975). The counselor as a developmental instructor. *Counselor Education and Supervision, June*(1975), 286-296.

Williams, R. L. & Worth, S. L. (2001). The relationship of critical thinking to success in college. *Inquiry: Critical Thinking Across the Disciplines, 21*(1), 5-16.

Winner, E., & Hetland, L. (2001). Research in arts education: Directions for the future. In E. Winner & L. Hetland (Eds.) *Conference proceedings from beyond the soundbite: What the research actually shows about arts education and academic outcomes.* (pp. 143-148). Los Angeles: The J. Paul Getty Trust.

Winterer, C. (1998). The humanist revolution in America, 1820-1860: Classical antiquity in the colleges. *History of Higher Education Annual, 18,* 111-129.