AN ABSTRACT OF THE THESIS OF

Mollie A. McKee for the degree of Masters of Arts in Interdisciplinary Studies in Speech Communication, Business, and Sociology presented on May 4, 1990.
Title: Critical Thinking, Dogmatism, and Gender

Redacted for privacy

Abstract approved: _____
Dr. Lloyd Crisp

Many educators are currently revising their curricula to include critical thinking. However, there are factors which apparently allow some students to become better critical thinkers than others. Such factors are the concern of two mentors of this researcher: Ron Manuto and Lloyd Crisp. Both the Manuto and Crisp (1987) and the Crisp and Manuto (1987) studies inquired into possible characteristics relating to critical thinking, as measured by the Watson-Glaser Critical Thinking Test, form A (1980): dogmatism, self-distortion, gender, age, and academic major. The first hypothesis of this study predicted that there was an inverse relationship between dogmatism and critical thinking, a hypothesis supported in the Manuto-Crisp (1987) study. The second hypothesis predicted that males would score higher on the Cornell Critical Thinking Test (1985) than would females. Crisp and Manuto found that males scored significantly higher on the Watson-Glaser Critical Thinking Test than did females. An aim of this study was to

determine whether the use of different critical thinking measures would generate different findings. The final area of investigation of this study was a research question: Do females and males score differently on dogmatism?

The first hypothesis of this study predicted that there would be an inverse relationship between critical thinking and dogmatism and was supported by the findings. The critical thinking and dogmatism findings of this study were very similar to the results of the Manuto-Crisp (1987) study indicating that the two different critical thinking measures apparently do not generate different results when relative to Rokeach's Dogmatism Scale.

The second hypothesis of this study was that males would score higher on the Cornell Critical Thinking Test than would females was not supported by the findings. Males scored higher than females, as predicted, however not significantly higher.

Finally, the findings of this study indicated that males scored significantly higher than females on Rokeach's Dogmatism Scale.

An Empirical Investigation of Critical Thinking, Dogmatism, and Gender

by

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A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Masters of Arts in Interdisciplinary Studies

Completed May 4, 1990

Commencement June 1990

APPROVED:

Redacted for privacy

Professor of Speech Communication in charge of major

Redacted for privacy

Professor of Sociology in charge of co-field

Redacted for privacy

Professor of Marketing in charge of co-field

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Date thesis is presented May 4, 1990

Typed by Mollie A. McKee for Mollie A. McKee

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CHAPTER 1

Introduction

> In America, people are asked to make decisions concerning difficult and complex social issues, and the ability to think critically is often needed to provide the best basis for making such decisions. America's destiny may very well lie in the ability of our teachers and schools to develop students who are able to think critically. (Skinner, 1976, p. 292)

S. Ballou Skinner makes a very important point; critical thinking is a necessary skill in a complex society such as we live in today. It is because of this premise that many educators include the teaching of critical thinking. One such group of educators are the professors of communication. Ron Manuto, in his courses in argumentation at Oregon State University, first caught this author's attention with the issue of critical thinking in his course lectures. It was subsequently learned that Ron Manuto and Lloyd Crisp had researched the effects of dogmatism, self-distortion and gender on critical thinking.

Manuto often talked of critical thinking and how necessary such skills are in everyday-life. It stirred much interest in this author. After observing students in a classroom setting, it seems evident that students are not thinking as effectively as they could. For example, they

tend to write down and absorb some portion of what a professor says or a textbook reports without questioning that source's credibility or intentions. It may be the case that the future of society rests in the hands of people unable to think as critically as they could. However, perhaps it is not simply a question of lack of information, motivation or skills, but some characteristic which causes some students to think critically more effectively than others. Manuto and Crisp (1987) and Crisp and Manuto (1987) suggest the factors dogmatism, self-distortion and gender affect a person's ability to critically think. Perhaps some characteristics affecting critical thinking skills can be identified which can first be approached before attempting to teach critical thinking. If, as Manuto and Crisp report, high dogmatism is a factor inhibiting a student's critical thinking performance, then the characteristic of high dogmatism may have to be "treated" before attempting to teach critical thinking skills (1987, p. 12).

Research Questions

These issues were of great interest to this author after reading Manuto and Crisp's research. It was this interest that motivated a replication of the Manuto and Crisp (1987) and Crisp and Manuto (1987) studies. Robert Sommer and Barbara B. Sommer, authors of A Practical Guide To Behavioral Research, write that the replication of

earlier studies is, "important in increasing the confidence in research results" (1986, p. 287). It is important to know if Manuto and Crisp's findings can be replicated. Following Manuto and Crisp, this study addresses the following research questions: Is there a relationship between dogmatism and critical thinking? Is there a relationship between gender and critical thinking? However, it also appears important to ask the question, do females and males score differently in dogmatism? This question was not approached by Manuto and Crisp. Because dogmatism and gender are being considered with critical thinking in this study, it seems relevant that gender should also be considered with dogmatism.

There have been very few studies which have looked at the relationship between dogmatism and gender. There have been two studies which have found that males score higher on the Rokeach Dogmatism Scale than do females; Martin, Grah, and Harris (1986) and Tobacyk and Milford (1982). However, only Tobacyk and Milford (1982) tested for the significance of the difference in scores and found that they did not differ significantly. The lack of studies in this area and the ambiguity of the few findings available have lead to this study's inquiry into the relationship of dogmatism and gender.

An Additional Factor

Richard Bruce Modjeski's (1982) work suggests that there are two schools of thought for critical thinking researchers and theorists. There are those who rely heavily on logic and judgment and those who rely on the scientific-method and problem solving. This division seemed to be verified after reviewing the work of many authors who investigate critical thinking. It was also discovered that the authors of two leading critical thinking measures each utilize different critical thinking theories and conceptualizations: the authors of the Cornell Critical Thinking Test (CCT) are members of the logic and judgement school of thought, and the authors of the Watson-Glaser Critical Thinking Appraisal (WGCA) are members of the scientific-method and problem solving school of thought. The Crisp-Manuto (1987) and Manuto-Crisp (1987) studies both utilized the WGCA as their measure of critical thinking, whereas this study utilized the CCT. A critical question of this research was, would the results of the Crisp-Manuto (1987) and Manuto-Crisp (1987) studies have been the same had they used another critical thinking measure?

Review of Literature on Critical Thinking

A review of the published work on critical thinking reveals a lack of consensus. However, Modjeski's (1982) analysis tend to narrow the scope to two main groups of critical thinking researchers; the logic and judgment group and the scientific method and problem-solving group.

The multiple definitions and concepts surrounding critical thinking were explored in a list of terms developed by critical thinking researcher Robert E. Pingry (1951). According to Pingry, the list of terms found to be synonymous with the term "critical thinking" were (p. 466):

> clear thinking, straight thinking, reflective thinking, elaborative thinking, scientific thinking, postulational thinking, autonomous thinking, organic thinking, human thinking, subhuman thinking, logical thinking, rational thinking, factual thinking, inventive thinking, productive thinking...

He goes on to point out the lack of consensus about the meaning of critical thinking, "It may be said that critical thinking appears to have a great number of aspects and means different things to different people" (p. 470):

> It is necessary and important that the (term) 'critical thinking' be defined or supplemented by specific outcomes of learning in terms of actual behavior characteristics and skills desired.

In other words, before an attempt is made to analyze or teach critical thinking, defining and supplementing must be done.

Joseph Decaroli (1973, p. 67) also did extensive literature research so as to formulate a single definition of critical thinking, and concluded that several researchers have defined the term differently.

Finally, S. Ballou Skinner (1976, p. 373) reviewed the works of many critical thinking authors and decided that "after reading the various definitions of critical thinking, it becomes clear that agreement upon a single, concise definition of this concept is difficult, if not impossible."

Even though it is difficult, if not impossible, to draw upon a single definition of critical thinking which all can agree upon, Modjeski (1982) has determined that there are two different groups of researchers who agree upon common elements in their definitions and understanding of critical thinking.

The first group, according to Madjeski, relies heavily on logic in their definitions of critical thinking. They rely on the elements of criticizing, evaluating, and judging with the use of formal logic. They believe critical thinking is the act of "judging," not actually "doing." Instead of actively identifying a problem, they judge whether another source has identified the problem. Instead of making observations and collecting data, they decide whether an observational statement is reliable. Finally, instead of developing hypotheses, they judge whether a hypothesis is warranted (p. 14). This group of researchers

are labeled here the "LJ" group, for logic and judgement.

Modjeski states that the second group of researchers believes that critical thinking involves the use of the scientific method and problem-solving techniques. To critically think is to identify problems, make observations and collect data, and develop hypotheses. People with this approach focus more on the "doing" aspect than on the "judging" aspect (p. 14). This group shall be referred to as the "SMPS" group henceforth, in this study to stand for the scientific-method and problem solving group.

LJ Researchers

One of the forerunners of the LJ group is Robert H. Ennis. Ennis and his colleagues define critical thinking as "the process of reasonably deciding what to believe and do" (Ennis, Millman, Tomko, 1985, p. 1). Ennis had previously suggested deleting "the correct assessing of statements" to the definition (Ennis, 1964, p. 612). Again, there is a strong emphasis on judging and criticizing statements with the use of logic. Ennis developed a list of characteristics in which he believes a person must be proficient to be a critical thinker. The list was developed with the second definition as the "root notion" (Ennis, 1964, p. 612). The critical thinker should be proficient in judging whether:

1) A statement follows from the premises.
2) Something is an assumption.
3) An observation statement is reliable.
4) A simple generalization is warranted.
5) A hypothesis is warranted.

6) A theory is warranted.
7) An argument depends on an ambiguity.
8) A statement is overvague or overspecific.
9) An alleged authority is reliable. (pp.599-600)

Initially, this list appeared as 12 items in an earlier work by Ennis entitled "A Concept of Critical Thinking" in the Winter 1962 edition of The Harvard Educational Review. However, Ennis discovered some overlap in the original 12 and cut the list to the nine items above. Unlike the researchers who base critical thinking on the scientific method, Ennis excluded "identifying a problem" (number 9 in the original list of 12) from his list of aspects because he felt it was included in the meanings of various steps listed above.

Along with Ennis' list of nine critical thinking skills, he conceptualized three dimensions of critical thinking. As many as one, two, or all of these dimensions are encompassed in each of the nine skills. The first dimension is entitled the logical dimension. This dimension is the judging of "alleged relationships between meanings of words and statements" (1962, p. 84). The logic dimension includes the traditional rules of logic.

The second dimension is entitled the criteria dimension. It covers the criteria for judging statements. For example, this would be one's knowledge of statistics when determining the validity of a conclusion drawn from statistical evidence.

The final dimension is entitled the pragmatic dimension. This covers the "background purpose of the judgement" and whether the given information is "good" enough for a given situation (p. 85). Questions such as, "What rests on this decision?" and, "Do I have enough evidence in light of the situation?" should be asked under the pragmatic dimension (p. 85).

Ennis, along with two coauthors, Jason Millman and Thomas Tomkin, developed an instrument entitled the Cornell Critical Thinking Test based on the model summarized above. They divided critical thinking into seven aspects, according to Ennis' definitions and the list of nine skills. These include: "induction, deduction, value judgement, observation, credibility, assumptions, and meaning" (Ennis, Millman, and Tomkin, 1985, p.2). The test will be examined further in a section to follow.

Another author who possess a similar view of critical thinking as Ennis is Benjamin J. Novak. He defines critical thinking as (1961, p. 323):

> An approach to thought characterized by caution in drawing conclusions, based upon accurate and adequate evidence. It rejects superstition and authority, accepts cause and effect relationship, and recognizes that conclusions must be modified in the light of added evidence.

James A. Drake accepts Ennis' original list of 12 critical thinking aspects. These aspect are (1962, p. 84):

1) Grasping the meaning of a statement.
2) Judging whether there is ambiguity in a line

of reasoning.
3) Judging whether certain statements contradict each other.
4) Judging whether a conclusion follows necessarily.
5) Judging whether a statement is specific enough.
6) Judging whether a principle establishes a statement alleged to be an application of it.
7) Judging whether an observation statement is reliable.
8) Judging whether an inductive conclusion is warranted.
9) Judging whether the problem has been identified.
10) Judging whether something is an assumption.
11) Judging whether a definition is adequate.
12) Judging whether a statement made by an alleged authority is reliable.

Drake took the 12 aspects of critical thinking and identified the object of the judgment as being either statements, laws, principles and hypotheses, arguments, terms, and/or problems for each (1976, p.34). Drake considers the "identification of problems" (number nine) lastly in his analytical break-down because of its importance. He writes that "the relationship between thought and problems is sufficiently close to have enabled some theorists to equate critical thinking with the ability to solve problems" (p. 45). Drake states further that one aspect of critical thinking "...involves judging whether a problem has in fact been identified" (p. 45). He also believes, along with other LJ researchers, that the critical thinker should not be the actual problem-solver.

Kenneth B. Henderson (1972) notes three characteristics of critical thinking. The first is evaluating by some set

of criteria.

> The term critical thinking implies that criticism is involved. Criticism is closely related to evaluation which is done only in terms of criteria. These criteria may be explicit or implicit. (p. 45)

The second characteristic is (p.46):

> the presence of rating terms such as "good," "well done," "interesting," "beautiful," "right," important, et al., and their opposites.

These terms express the critics preference for or a rejection of the object of the criticism (p. 46).

The third characteristic is "the presence of reasons used to support the evaluation made" (p. 46). Again, Henderson supports the other LJ critical thinking researchers by noting that criticism, judgments and support for the judgments are important elements of critical thinking.

SMPS Researchers

The first of the SMPS researchers was an educator and one of the very first authors on critical thinking, John Dewey. Dewey used the term "reflective thinking" instead of critical thinking in his 1933 book entitled How We Think. Dewey defines reflective thinking as (1933, p. 12):

> (1) a state of doubt, hesitation, perplexity, mental difficulty, in which thinking originates and (2) an act of searching, hunting, inquiring, to find materials that will resolve the doubt, settle and dispose of the perplexity.

Unlike Ennis, Dewey believed in actively developing a hypothesis, testing it and refining it through observable evidence and reason. According to Dewey, a critical thinker develops conclusions carefully so as to avoid any supposed truths or beliefs without first establishing them with evidence and rationality (p. 9).

Along with the necessary critical thinking skills, Dewey professed that it is crucial to possess the necessary attitude for critical thinking. Archambault (1964, p. 227) believed Dewey thought that this attitude consists of "open-mindedness, whole-hearted or absorbed interest, and responsibility in facing consequences." The introduction of these characteristics suggests an active pursuit of a solution to a problem, rather than simply judging a given solution.

Another author who believes in the idea of a necessary attitude in order to critically think is Edward M. Glaser. He and W. Watson developed the Watson-Glaser Critical Thinking Appraisal. They define critical thinking as (Watson and Glaser, 1964, p. 10):

> (1) attitudes of inquiry that involve an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true; (2) knowledge of the nature of valid inferences, abstractions and generalizations in which the weight or accuracy of different kinds of evidence is logically determined; and (3) skills in employing and applying the above attitude and knowledged.

This definition serves as the root notions for the operational definition of critical thinking used in the Watson-Glaser Critical Thinking Appraisal. The test includes five parts: "inferences, interpretations, recognition of assumptions, deduction, and evaluation of arguments" (p. 5). Glaser, himself, defines and discusses critical thinking in this way:

> Critical thinking requires ability to recognize problems, to find workable means for meeting those problems, to gather and marshal pertinent information, to recognize unstated assumptions and values, to comprehend and use language with accuracy, clarity, and discrimination, to interpret data, to appraise evidence and evaluate arguments, to recognize the existence (or non-existence) of logical relationships between propositions, to draw conclusions and generalizations at which one arrives, to reconstruct one's patterns of beliefs on the basis of wider experience, and to render accurate judgments about specific things and qualities in everyday life. (Glaser, 1964, p. 6)

Joseph Decaroli also did an extensive literature review in this area and developed a summary of separate skills used in critical thinking (1973, p. 67):

> Defining: stating the problem; agreeing on the meaning of terms and expressions; clarifying meaning; establishing criteria.
>
> Hypothesizing: "if-then" thinking;seeking alternatives; drawing logical implications; identifying hypothetical thinking; predicting.
>
> Information processing: identifying needed information; gathering information; selecting relevant information; seeking evidence; organizing information.
>
> Interpreting, Generalizing: interpreting facts; comparing; contrasting; generalizing from

evidence; making warranted inference; determining bias.

Reasoning: recognizing errors in logic; justifying opinions (own and others); reaching logical conclusions; recognizing unstated assumptions and values; supporting conclusions; determining cause and effect; determining logical relationships.

Evaluating: evaluating against criteria; rating items, events, ideas; determining validity of arguments; distinguishing fact from opinion; deciding whether statements are true or false; judging reliability of data; evaluating conclusions.

Applying: testing conclusions and deductions; applying generalizations; incorporating judgments into behavior.

S. Ballou Skinner concluded that the steps in critical thinking most frequently listed were (1976, p. 294):

1) Recognize the problem.
2) Formulating a hypothesis.
3) Designing an experience or experiment to test the hypothesis.
4) Gathering pertinent facts or data.
5) Analyzing the facts or data.
6) Rejecting or accepting the hypothesis.
7) Drawing conclusions.

Skinner writes that the seven steps are the "logical sequences of steps or methodology involved in the scientific method" (p. 294).

Skinner also points out that critical thinking involves both a process and certain abilities. The process element includes using the scientific method for problem solving, and an attitude of inquiry (as was included by Dewey and Glaser). The abilities element includes (p. 294):

> ...the knowledge of facts, principles, theories, abstractions, and gentris as well as the knowledge of the nature of valid inferences, assumptions,

> deduction, interpretations, and critical evaluations of arguments.

Skinner, as well as other members of the SMPS group, advocates that critical thinkers should not only know how to use the steps involved in the scientific method, but they should also have some knowledge of logic. This allows them to analyze the validity of their own observations, hypotheses, and conclusions along with those of other sources.

A more recent SMPS critical thinking researcher is Joanne G. Kurfiss. Kurfiss defines critical thinking as (1988, p. 1):

> An investigation whose purpose is to explore a situation, phenomenon, question, or problem to arrive at a hypothesis or conclusion about it that integrates all available information and that can therefore be convincingly justified.

Again, some knowledge of logic is necessary so as to justify or review one's own hypothesis and conclusion. Kurfiss also points out that an inquiry must be conducted free of any preconceived conclusions so as to be bias-free.

In summary, it is evident that a consensus about the definition of critical thinking is very difficult, if not impossible. However, it is evident that there are apparently at least two basic schools of thought; the logicians (LJ) and the scientific method users and problem-solvers (SMPS).

The LJ researchers are very logic oriented in their definitions and characteristics of critical thinking. They

rely on the elements of criticizing, evaluating, and judging with the use of logic. They advocate that critical thinking is the act of judging hypotheses, conclusions and observations, not actively developing them.

The SMPS researchers advocate that critical thinking is problem-solving with the use of the scientific method. Critical thinking involves problem identification, making observations, and collecting data so as to develop hypotheses and conclusions.

There are apparently two distinct schools of thought for critical thinking researchers and theorists, and the CCT and WGCA authors subscribe to different schools. One aim of this study is to determine whether the results generated through the use of the CCT are similar to or differ from those generated by the WGCA used in the Crisp and Manuto studies.

Milton Rokeach's Concept "Dogmatism"

The rationale for predicting the relationship between dogmatism and critical thinking requires dogmatism must first be defined and its characteristics discussed. An understanding of the meaning and factors involved should aid in understanding the reasons for the inverse relationship between dogmatism and critical thinking hypothesized in this study.

Milton Rokeach has done extensive study relative to the concept of dogmatism (1954, p. 194). He was a Social Science Research Council Faculty Research Fellow at Michigan State University in 1954 (1954, p. 194). It was at this time that he wrote a paper entitled, "The Nature and Meaning of Dogmatism" (1954, p. 194). The Open and Closed Mind (1960) is a composite and elaboration of his work in the area of dogmatism. The Dogmatism Scale used in this research was developed by Rokeach and presented in this book (p. 73).

Rokeach begins his definition of dogmatism by clarifying that all cognitive systems are organized into two interdependent parts: "a belief system and a disbelief system" (1954, p. 195). He further divides the belief-disbelief system into "structure and content." The structure and content are interdependent, but they differ: "The total structure of a belief-disbelief system can be described as varying along a continuum from open to closed" (p. 195).

The content element is the formal content of centrally located beliefs in the belief-disbelief system. Centrally located beliefs are those from which all others stem. Other secondary beliefs, or peripheral beliefs, are developed according to one's central beliefs (p. 195). For instance, a central belief may be that of freedom and the right to make one's own decisions. A peripheral belief stemming from

this central belief may be the belief in abortion as a pro-choice issue.

Rokeach lists the following as characteristics of dogmatism (p. 195):

> (a) A relatively closed cognitive organization of beliefs and disbeliefs about reality (b) organized around a central set of beliefs about absolute authority with, in turn, (c) provides a framework for patterns of intolerance and qualified tolerance toward others.

A dogmatic person has a closed set of beliefs and disbeliefs. These beliefs and disbeliefs are directly adopted from a central belief in authority outside oneself. If others agree with these beliefs passed down by the authority figure, then they are accepted by the dogmatic person. If not, they are rejected (p. 195).

Rokeach defines a closed system as being characterized by (p. 195):

> (a) isolation of parts within the belief system and between belief and disbelief systems, (b) a discrepancy in the degree of differentiation between belief and disbelief systems, (c) de-differentiation within the disbelief system, (d) a high degree of interdependence between central and peripheral beliefs, (e) a low degree of interdependence among peripheral beliefs and (f) a narrowing of the time perspective.

Rokeach believes the first characteristic of a closed cognitive system is the isolation of parts within and between the belief and disbelief systems. This is the case because a closed system tends to accentuate the differences between beliefs and disbeliefs. For instance, a Catholic

may see the Protestant religion as completely different (p. 197). The more closed the system, the more exaggerated the differences. Furthermore, the greater the dogmatism the greater will arguments pointing to similarities between the belief system and disbelief system be perceived as irrelevant. Along these same lines, a dogmatic system will strongly deny events contradicting or threatening one's belief system (p. 197).

Along with the isolation of the belief and disbelief systems, there is an isolation of subparts of the belief and disbelief systems (p. 197). This means that the more dogmatic a person, the more there exists contradictions within that person's beliefs or disbeliefs because of the isolation of subparts. For instance, a person may believe that killing another human is intolerable, yet at the same time support the death penalty (p. 197).

The second characteristic of a closed system is the relative degrees of differentiation of the belief and disbelief systems. Rokeach writes that, "we have assumed that the greater the dogmatism the more differentiated the belief system will be as compared with the disbelief system" (p. 198). One reason for the difference in differentiation is that a dogmatic person tends to know more facts, events, and ideas about beliefs than disbeliefs. A dogmatic person does not want to learn more about a disbelief for fear it may create a discrepancy in a belief (p. 198).

The third characteristic, "dedifferentiation" within the disbelief system, refers to the concept that dogmatic people see subsystems within the disbelief system as being relatively the same. This may also be attributed to the lack of knowledge of a disbelief. For instance, a person believing in a democratic system may see communism and socialism as being the same (p. 199).

The fourth characteristic is the high degree of interdependence between central and peripheral beliefs. A dogmatic person is highly authoritarian. To be authoritarian is to have "absolute beliefs in or about authority" (p. 196). This absolute belief in or about an authority becomes the central beliefs of a dogmatic person. There is an interdependence between central and peripheral beliefs of a dogmatic person because the ideas of an authority figure dramatically effect the peripheral beliefs and disbeliefs of the dogmatic person (p. 199).

The fifth characteristic is that the greater the dogmatism, the easier it is for a person to simply drop a peripheral belief if it is preceded by a corresponding change by the authority (p. 199).

The final characteristic of a closed system, or dogmatism, is the need to be future or past-oriented without a balance in past-present-future. With regard to future-orientation, Rokeach writes (p. 200):

> With an increase in dogmatism there will be the following variations: an increasing confidence in

> the accuracy of one's understanding of the future, a generally greater readiness to make predictions, and a decreasing confidence in the predictions of the future made by those adhering to disbelief systems.

In summary, the characteristics of a closed-minded person are the isolation of parts within and between the belief and disbelief systems, an isolation of subparts of the belief and disbelief system, the relative degrees of "dedifferentiation" of the belief and disbelief systems, "dedifferentiation" within the disbelief system, the high degree of interdependence between central and peripheral beliefs, the ease in changing or dropping a belief that contradicts a belief of an accepted authority figure, and the need to be future or past-oriented (p. 200).

In a later source, Rokeach states that the belief-disbelief systems "serve two powerful and conflicting sets of motives at the same time" (1960, p. 67). First, there is the need to know and understand. Second, there is the need to avoid threat to one's beliefs by avoiding threatening aspects of reality. The open system is characterized by the need to know with an absence of the need to ward off threat. The closed system is characterized by the avoidance of knowledge and the need to ward off threat by avoiding threatening aspects of reality. Again, if reality does not support the beliefs set down by a central authority figure, then reality is avoided by a dogmatic person.

It is clear from the factors and dynamics involved that

a dogmatic person should demonstrate traits quite opposite of those generally regarded as effective critical thinking.

Related Studies in the Area of Critical Thinking and Dogmatism

There have been few studies done on the relationship of critical thinking and dogmatism. Robert Ennis, Jason Millman, and Thomas Tomko, authors of the CCT, reported on two studies correlating dogmatism and critical thinking using the Rokeach Dogmatism Scale and the CCT (1985, p. 21). Both studies found a significant, negative correlation. Also, a study conducted by Alcock and Otis (1980) compared critical thinking using the Watson-Glaser Critical Thinking Appraisal (1964), belief in the paranormal, and dogmatism using the Trodahla and Powell Dogmatism Scale (1965). They discovered that skeptics scored higher in critical thinking than did believers. Furthermore, they found skeptics to be significantly less dogmatic than believers. Another study comparing dogmatism and critical thinking scores was performed by Innes (1978) with 48 engineering students as subjects who had expressed negative attitudes about the liberal studies course requirement. Innes found that students who scored high on the Rokeach Dogmatism Scale were significantly less willing to read material that challenged their beliefs than were those who scored low on the scale. Tobacyk and Milford (1982) found a significant correlation

between an 11-item Irrational Belief Scale (Newmark, Frerking, Cook and Newmark, 1979) and the Rokeach Dogmatism Scale Form E. They also found a significant correlation between irrational beliefs and scores on the Uncritical Inference Test (Haney, 1954).

Kemp (1960) hypothesized that those who were open-minded or low in dogmatism would solve correctly more critical thinking problems than those who were high in dogmatism. He used the Rokeach Dogmatism Scale Form E and developed a 50-item critical thinking measure by choosing items from Taxonomy of Education Objectives, A Test of Problem-Solving, High School Edition, Form A, and A Test of Critical Thinking, Form G. Kemp's hypothesis was supported when he found a significant difference in the critical thinking scores of those who scored high on the Dogmatism Scale and those who scored low. Finally, a study conducted by Manuto and Crisp (1987) found a significant negative correlation between scores on the Dogmatism Scale Form F (revised) and scores on the WGCA, however the relationship was not linear: the high dogmatists, first, and the middle dogmatists, second, were responsible for the relationship. "There is no evidence of a relationship between low dogmatists and critical thinking" (p. 8). However, a highly significant difference was found when comparing critical thinking scores of high and low dogmatism groups, with low dogmatists scoring significantly higher critical thinking

scores than the high dogmatist group (MD = 5.915, P < .000).

Related Studies in the Area of Critical Thinking and Gender

Ennis, Millman and Tomko (1985) reported no significant relationship between gender and critical thinking in one study. Watson and Glaser, in the manual of their critical thinking appraisal, also report that the possibility of a gender difference in critical thinking scores had been examined. They asserted that there was no significant difference based on preliminary results of the early forms of their test, YM and ZM (1964, p. 5). A study conducted by Simon and Ward (1974) did not find a significant difference in the total scores of males and females on the WGCA, forms YM and ZM. However, males did score significantly higher on two of the subtests, Inference and Evaluations of Arguments. Another study with 190 Dutch psychology students by Hoogstraten and Christiaans (1975) also found no significant difference between males and females in performance on the WGCA, forms YM and ZM. Although there was not a significant difference in gender scores of the previous two studies, males did score higher. A study which did find a significant gender difference in the score on the WGCA, form A, was conducted by Crisp and Manuto (1987). The research was conducted with 433 students.

Related Studies in the Area of Dogmatism and Gender

There have also been researchers which have looked at the relationship of dogmatism and gender. Martin, Grah, and Harris (1986) found that men scored higher on the Rokeach Dogmatism Scale than did women. However, the significance of the difference in scores was not tested. Tobacyk and Milford (1982) also compared the Dogmatism Scale scores of males and females and discovered a trend that males scored higher, but not significantly ($P < .06$).

Hypotheses

This study is a replication of the Manuto-Crisp (1987) and Crisp-Manuto (1987) studies. Their studies are being replicated to determine whether their results can be generated a second time. However, this study is utilizing a different critical thinking measure, the CCT, than the Manuto-Crisp (1987) and Crisp-Manuto (1987) studies--which utilized the WGCA. It will be interesting to determine if the use of different critical thinking measures generate different results.

The first hypothesis of this study is, there is an inverse relationship between critical thinking and dogmatism.

The second hypothesis of this study is that men will score higher on the Cornell Critical Thinking Test than will

females. Crisp and Manuto (1987) researched this question in their study and found that males scored significantly higher on the WGCA than did females. If the findings of this study using the CCT support those of Crisp and Manuto, then the gender differences in critical thinking will be further supported.

Research Question

The third area of this study is a research question: Do females and males score differently in dogmatism? This is not an area explored by Manuto and Crisp, but it is an area relevant to this research. Only a few studies have been done comparing dogmatism and gender, and they have found that men scored higher, but not significantly (Tobacyk and Milford, 1982, and Martin, Grah, and Harris, 1986).

CHAPTER 2

Methodology

The measure of critical thinking is central to this study. Critical thinking is measured and related to both dogmatism and gender. This study also explores the possible differences in dogmatism between males and females.

The research sample for this study consisted of 178 Oregon State University Students. Each student was given both the Cornell Critical Thinking Test (1985) and Rokeach's Dogmatism Scale (1960) to complete within a given time period. Test scores were tabulated and the data were treated statistically using a PC statistical package.

Instruments

The Cornell Critical Thinking Test

Ennis, Millman and Tomko, authors of the Cornell Critical Thinking Test (1985), have developed Level Z to be used with advanced and gifted high school students, college students, and other adults. The test was written by Robert H. Ennis, Jason Millman, and Thomas N. Tomko in 1985. The test was standardized on the basis of a 50 minute time limit. An optical scanning form is used as an answer sheet with a, b, and c as possible answers for 52 items.

The manual for the CCT provides normative data for both level X and Z. The average score on level Z for undergraduate students is approximately 30 out of 52 possible (p. 12).

The authors established internal consistency by correlating odd-numbered items with even-numbered items. This established the reliability for half of the test which was then corrected for the whole test by the Spearman-Brown Formula. The tests provided reliability estimates which range from .55 to .75, indicating the test is moderately to strongly reliable. The "Kuder-Richardson" method was also used to determine the internal consistency of the test, which determined an average intercorrelation of the items with each other. The internal consistency estimates using this method range from .50 to .77 (p. 13).

The test consists of seven sections. Each section tests for a different aspect of critical thinking, according to Ennis' definitions of critical thinking and his list of nine skills.

Section I (number 1 through 10) tests for a student's deduction skills. It tests for the ability to determine whether a statement follows from premises. The items contain a "strong value-laden context" (p. 27).

Section II (numbers 11 and 12) is the semantics section. This section is concerned with the language used in an argument or the verbal aspects of arguments.

Section III (number 22 through 25) is the credibility section. It is concerned with the reliability of observation and authenticity of sources.

Section IV (number 26 through 38) tests for induction skills as they apply to judging conclusions. "Best-explained criteria apply to judging these induction items" (p. 28). This section touches on the generalizations and hypothesis aspects of critical thinking.

Section V (number 39 through 42) also tests for induction, but it deals with the planning of experiments. This section deals with experimental control groups, results which conflict with the hypothesis, and the ability to be specific.

Section VI (number 43 through 46) deals with the identification of assumptions. The test taker is asked to determine the best definition which expresses a person's usage of a term.

Section VII (number 47 through 52) also tests for the identification of assumptions, however, assumptions made in arguments. On page four of the test the directions read, "there is one and only one gab-filler to the argument given." The person being tested is to find it among three choices.

Figure 1 is given in the manual to summarize the aspects of critical thinking relevant to the items of Level Z.

Figure 1

THE TOPICS OF LEVEL Z QUESTIONS OF THE CCT

Aspects of Critical Thinking	Items of Level Z
Induction	17, 26-42
Deduction	1-10, 39-52
Observation	22-25
Credibility	22-25
Assumptions	43-52
Meaning	11-21, 43-46

Rokeach's Dogmatism Scale

The second instrument used was Rokeach's Dogmatism Scale, Form E (see Appendix B). Rokeach reports it required five revisions of his original test to develop this 40-item scale (1960, p. 73). However standards about sexist language which existed in the 1960's have changed considerably. Therefore, Dr. Crisp revised the Dogmatism Scale, Form E, by replacing the male "his" with the plural "their" and other such changes.

The instrument calls for agreement or disagreement with each item on the scale ranging from "strongly agree" to "strongly disagree," with no neutral choice. The test was scored by adding or subtracting responses to a constant of 4: assigning a +3 for "strongly agree," +2 for "moderately agree," +1 for "slightly agree"; and a -3 for "strongly disagree," -2 for "slightly disagree," and -1 for "slightly disagree." The possible range of scores is from 40 to 280.

The test-retest reliability of the Dogmatism Scale was tested at Michigan State University, Ohio State University, and a VA domiciliary. The reliability statistics ranged from .68 to .93 (Rokeach, 1960, p.89).

Subjects

The data for this study were collected from one three-hundred level speech communication course on intercultural communication and eight sections of a fundamentals of communication course during the Spring academic term of 1989. The fundamentals of communication courses are optional areas for fulfilling university requirements in communication skills. Therefore, a variety of academic majors were present in the course. All students were required to complete the tests in class. The fundamentals of communication students were given extra credit for the completion of the tests while the intercultural students had to complete the tests as a non-graded course requirement. However, the students were assured of complete anonymity; that people would not be connected with their scores. All students were asked to first complete the critical thinking test and then the dogmatism scale. They were also asked to indicate their sex, age, and School, College or program.

This study's research sample was not a randomly selected. However, the critical thinking scores for each academic major group were compared to be sure that one group

did not score in the extreme. An extreme group score could have effected the total mean score. For instance, engineers, because of the nature of their academic work, are sometimes thought to be more analytically inclined and, therefore, "better" critical thinkers. If this were to be the case in this study, then a group of engineering students could effect the total mean score for the sample. However, the scores of each group fell within one standard deviation of the total mean. Therefore, there was no need to control for any particular group (see Appendix C).

The population originally consisted of about 200 students. However, due to incomplete information, 22 scores had to be dropped from the analysis. The final group consisted of 178 students, 91 males and 87 females. There were 47 freshmen, 31 sophomores, 51 juniors, 46 seniors, and 3 graduate students.

Treatment of the Data

Finally, a PC statistical package entitled Jenny (1987) was used to tabulate test scores and correlate the results with the use of t-tests, Chi square comparisons, and the Pearson Product Moment Coefficient of Correlation.

CHAPTER 3

Results

Univariate Description

Table 1 shows the total sample mean critical thinking and dogmatism scores along with their corresponding standard deviations. The Dogmatism Scale scores ranged from 53 to 222, with a mean of 147.66 and a standard deviation of 25.70. Through Rokeach's test-retest reliability work with the Dogmatism Scale, he had a range of means from 126.9 to 219.1 with an average mean score of 154.6 (1960, p. 90). The dogmatism scores of this study are comparable to those in Rokeach's studies.

The critical thinking scores ranged from 12 to 45, out of 52 possible. The mean for the critical thinking scores was 26.90, with a standard deviation of 5.85. The mean scores found by Ennis, Millman, and Tomko on the CCT ranged from 25.6 to 39.2 when given to undergraduate students.

Table 1

Dogmatism and Critical Thinking
Mean Scores and Standard Deviations

Variable (N=178)	Range	Mean	Std Dev	S.E. Mean
Dogmatism	53-222	147.66	25.70	1.93
Critical Thinking	12-45	26.90	5.85	0.438

Hypothesis I

The first hypothesis, predicting an inverse relationship between dogmatism and critical thinking, was supported by the data. This hypothesis was tested in three different ways. The correlation of dogmatism and critical thinking (N = 178) was found to be r = -0.3033, which is significant beyond the 0.05 level. This indicates a moderate and significant inverse relationship between critical thinking and dogmatism, supporting the first hypothesis of this study.

An additional test was done to further explore the relationship between dogmatism and critical thinking. This test also supports Hypothesis I. Table 2 reports on the subjects who scored one standard deviation above and below the mean for dogmatism. This method of determining the high and low dogmatism groups was consistent with the method used in the Manuto and Crisp study (1987, p. 8). This method meant the N was small in this study, but the findings are consistent with the other methods of testing this hypothesis. The mean for those scoring in the low dogmatism range was 106.00 and the mean for those scoring in the high dogmatism range was 189.38. The mean critical thinking score for those scoring in the low dogmatism range was 30.05, and 23.91 for those in the high dogmatism range.

The t-test was used to compare the difference in

critical thinking scores of those scoring high in dogmatism and those scoring low in dogmatism. Table 2 also shows the results of the t-test for low dogmatism and high dogmatism with their corresponding critical thinking score. The t-value was found to be 2.068 with a significance $P < .003$, showing the mean critical thinking scores for those in the low and high dogmatism range differ significantly from one another. This test also supports the first hypothesis.

Table 2

t-Test Comparison of Low Dogmatism and High Dogmatism Groups and Critical Thinking Scores

Group	N	Mean Score	S.D.	D	$S.E._{MD}$	t	P
Low	23	30.05	4.08	6.14	2.97	2.068	>.003
High	24	23.91	8.60				

Table 3 provides an association measure, Chi square, for low and high dogmatism and high and low critical thinking. This is yet another way of testing the first hypothesis. The high and low critical thinking scores were determined to be one standard deviation above and below the critical thinking overall mean score. Although the N's are small the table reports the frequency with which low dogmatism occurs with high critical thinking scores, and high dogmatism scores occur with low critical thinking scores.

This means that those who scored within the mean critical thinking and dogmatism range were omitted from this comparison. Of those scoring within the low dogmatism range, 86% (N=6) scored within the high critical thinking score range, and only 14% (N=1) scored within the low critical thinking score range. Of those scoring within the high dogmatism range, 75% (N=9) scored within the low critical thinking range and only 25% (N=3) scored within the high critical thinking score range. The Chi Square value based on these data was found to be 14.96, $P < .0048$. The results indicate a significant association between dogmatism and levels of critical thinking. This test also supports the inverse relationship of critical thinking and dogmatism predicted in the first hypothesis.

Table 3

Chi Square Analysis of Numbers for Those Scoring High or Low in Dogmatism and High or Low in Critical Thinking

	Low Dogmatism	High Dogmatism
Low Critical Thinking	N=1	N=9
High Critical Thinking	N=6	N=3

Chi Square = 14.96, df = 4, $P < .0048$

Hypothesis II

The second hypothesis of this study predicted that males would score higher on the CCT than would females. The

findings did not support this hypothesis. The critical thinking scores of males and females did not differ reliably. Table 4 reports the data of a t-Test comparison of female and male mean scores on the CCT. The mean score for 87 females was 26.63, with a standard deviation of 6.41. The mean score for 91 males was 27.15, with a standard deviation of 5.85. While males scored .56 mean points higher than females on total critical thinking scores, it was not a significant difference.

Table 4

t-Test Comparison of Critical Thinking Mean Scores For Males and Females

Group	N	Mean Score	S.D.	D	$S.E._{MD}$	t	P
Males	91	27.15	5.85	.52	1.47	.353	None
Females	87	26.63	6.14				

Research Question

Do females and males score differently in dogmatism? The findings of this research show that there is a difference. There was a significant difference between the scores of males and females of Rokeach's Dogmatism Scale with males scoring higher than females. Table 5 contains the data relative to a t-Test comparison of females with males on mean Dogmatism Scale scores. The mean score for 87 females was 143.91 with a standard deviation of 27.21. The mean

score for 91 males was 151.24 with a standard deviation of 23.76. Males scored significantly higher on the Dogmatism Scale than did females.

The significance of the difference in dogmatism scores for females and males was determined using a t-test which has also been reported on in table 5. The t-value was found to be 3.68, which is highly significant at the $P < .0005$ level.

Table 5

t-Test Comparison of Dogmatism
Mean Scores For Males and Females

Group	N	Mean Score	S.D.	D	$S.E._{MD}$	t	P
Males	91	151.24	23.76	7.33	1.99	3.68	<.0005
Females	87	143.91	27.21				

Discussion

This study is essentially a replication of the Manuto-Crisp (1987) and Crisp-Manuto (1987) studies. The first and second hypotheses of this study were also hypotheses of their studies: There is an inverse relationship between critical thinking and dogmatism; and, males will score higher in critical thinking than will females. Both of these hypotheses were supported in the Manuto-Crisp (1987) and Crisp-Manuto (1987) studies using the WGCA; however, only the first of these hypotheses were supported in this

study with the use of the CCT. However, this study utilizes a different standardized test for measuring critical thinking, CCT, than the Manuto-Crisp (1987) and Crisp-Manuto (1987) studies--which used the WGCA. One aim of this study is to see if the results differ from the Manuto and Crisp studies because of the different critical thinking tests used.

An exploratory area of this study, which was not investigated by Manuto and Crisp, is whether females and males would differ in dogmatism. The findings of this study indicate that there is a difference; males scored significantly higher than females on Rokeach's Dogmatism Scale.

Hypothesis I

The first hypothesis was that there is an inverse relationship between critical thinking and dogmatism, from high critical thinking/low dogmatism to low critical thinking/high dogmatism. The results were supportive of the first hypothesis. The Pearson Product Moment Coefficient of Correlation for dogmatism and critical thinking was -.3033 with significance beyond the .05 level. Manuto and Crisp (1987), using the Watson-Glaser Critical Thinking Appraisal and Rokeach's Dogmatism Scale, found the Pearson Product Moment Coefficient of Correlation for this relationship to be -.2488 with significance beyond the .001 level. The

relationship found in both studies, therefore, is quite consistent. Consequently, it appears the Watson-Glaser Critical Thinking Appraisal and the Cornell Critical Thinking Test measure dimensions of critical thinking similarly as related to dogmatism, measured by the Rokeach Dogmatism Scale.

The critical thinking scores for high and low dogmatism were also compared, as they were in the Manuto-Crisp (1987) study. Those who scored in the high dogmatism group also much lower on the critical thinking test than did those in the low dogmatic group. The difference was significant at the .003 level, supporting the prediction that the mean critical thinking scores of those in the low and high dogmatism range differ significantly from one another.

Finally, the Chi Square value of 14.96, significant of $P < .0048$ level, indicates an association which did not occur by chance between high dogmatism/low critical thinking and low dogmatism/high critical thinking. These data argue for a systematic difference between these groups, and further support the hypothesis that there is an inverse relationship between dogmatism and critical thinking.

An important result of these findings is the reliability of the findings of the Manuto-Crisp (1987) study. The replication of a strong, inverse relationship between dogmatism and critical thinking adds to the reliability of such findings. However, future replications of

this study are necessary using a different sample. Both this study and the Manuto-Crisp study used Oregon State University students.

It is evident from the lack of difference in results between this study and the Manuto-Crisp (1987) study that both the CCT and the WGCA generate the same results when looking at the relationship of critical thinking and dogmatism. It appears that dogmatism is an inhibiting factor for critical thinking derived from two different critical thinking philosophies; the LJ group and the SMPS group. In either case, there is a connection between an "irrational" structural characteristic of personality and the ability to be rational and critically think, no matter if one subscribes to the LJ or SMPS approach to critical thinking. It is therefore important not to expect to teach critical thinking alone without also dealing with dogmatism. Critical thinking goes against the highly dogmatic person's fear of questioning authority and dealing with anything that threatens the reliability of information from that authority figure (Rokeach, 1960, p. 54). Some sort of training should be developed to help the highly dogmatic person overcome this fear of questioning in order to be trained in critical thinking.

Hypothesis II

The second hypothesis of this study predicted that males would score higher on the CCT than females. This hypothesis was not supported by the study's findings. There was not a significant difference in the critical thinking scores of males and females. There have only been a few studies done on this relationship, but most have found no significant difference in the critical thinking scores of males and females. The Crisp and Manuto (1987) study was one which did find a significant difference in the critical thinking scores of males and females using the WGCA.

The results of this research do not support the stereotype of males being more analytically inclined. Males did score slightly higher on the CCT, but the difference in their mean score was not significantly different from the female's mean score.

The fact that the results of this study were not consistent with those of the Crisp-Manuto (1987) study could be attributed to a major difference in the critical thinking tests; perhaps the WGCA is male-biased--Crisp and Manuto pointed out quite a few examples of male-biased subjects contained within the questions (1987, p. 3):

> U.S. Armed Forces and "military men," Mr. Brown and his pool hall, the President of a chamber of commerce on the civic responsibility of labor unions, and should young men go to college?

Research Question

This study also explored the relationship of dogmatism and gender. The findings indicate that there is a relationship. There was a significant difference in the dogmatism scores of males and females with males scoring higher on Rokeach's Dogmatism Scale than females. Only two studies have been done to test this relationship. Both Martin, Grah and Harris (1986) and Tobacyk and Milford (1982) found that males scored higher than females on the Dogmatism Scale. However, only Tobacyk and Milford tested for the significance of the difference in scores and found the difference was not significant.

The findings of this study indicate that there is a significant difference in the dogmatism scores of males and females, with males scoring higher than females. The t-value was found to be 3.68, which is significant beyond the .05 level.

Conclusions

In conclusion, the data supported one of the two hypotheses of this study. Also, The Cornell Critical Thinking Test (CCT) seemed to generate correlation results that are comparable to those generated by the Watson-Glaser Critical Thinking Appraisal (WGCA) ($r = -0.3033$ and $r = -0.2488$, respectively). However, it is possible that the use of the CCT was a factor in the contradictory results reached

by this study and the Crisp-Manuto (1987) study in the area of critical thinking and gender. Perhaps the use of the WGCA by Crisp and Manuto created a significant difference in the scores of females and males because of its tendency to be male-biased, unlike the CCT used in this study.

Since it was determined that there is an inverse relationship between critical thinking and dogmatism and it was found that males score significantly higher than females on the Dogmatism Scale, why was it that females did not score significantly higher on the critical thinking test? It seems that it is due to the type of critical thinking test that was used. The CCT and the WGCA, the two leading critical thinking measures used by researchers, measure linear thinking. Perhaps because of socially learned characteristics, males tend to think more linearly than do females. Females tend to be more intuitive in their thinking, and they tend to do well in the recognition of assumptions, a one of the subtests of critical thinking. However, the critical thinking tests used by researchers are very linear and, interestingly enough, they are all written by males. Perhaps a future study should be done to develop a less linear form of testing for critical thinking.

The results of this replication of the Manuto-Crisp (1987) and Crisp-Manuto (1987) study have generated other important questions. Do the WGCA and the CCT really measure different dimensions of critical thinking abilities, as

Modjeski (1982) suggest? If so, then does dogmatism effect a person's ability to critical think no matter how critical thinking is defined? Perhaps one philosophy of critical thinking is more easily applied to "real life" situations and, therefore, more easily learned by students. Finally, does the educator first approach dogmatism in hopes of lowering the levels of dogmatism in students before teaching critical thinking skills? Or will the teaching of critical thinking automatically lower the level of dogmatism? It seems possible that if the highly dogmatic students are first trained to be more open-minded, then they will be more willing to question the validity and reliability of an authority figure, such as an educator. However, these are important questions which should be addressed in future studies. With the increase in the number of educators who are including the teaching of critical thinking in their curricula, it is vital that these questions are answered through research. Educators should know if one of the critical thinking philosophies is more inhibited than another by dogmatism or if they are both inhibited equally. It would also be important to if one causes the other; does dogmatism effect critical thinking skills, or visa versa, or are both the result of some factor or combination of factors?

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APPENDICES

Appendix A
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due to copyright.

APPENDIX A

The Cornell Critical Thinking Test

APPENDIX B

Dogmatism Scale - Form E (Revised)

1. The United States and Russia have just about nothing in common.

2. The highest form of government is a democracy and the highest form of a democracy is a government run by those who are most intelligent.

3. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

4. The worst crime a person could commit is to attack publicly the people who believe in the same thing he or she does.

5. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's camp than by those in the opposing camp.

6. A group which tolerates too much difference of opinion among its own members cannot exist for long.

7. It is only natural that people would have a much better acquaintance with the ideas they believe in than with ideas they oppose.

8. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.

9. It is often desirable to reserve judgment about what's going on until one has had a chance to hear the opinions of those on respects.

10. In the long run the best way to live is to pick friends and associates whose tastes and beliefs are the same as one's own.

11. The present is all too often full of unhappiness. It is only the future that counts.

12. If people are to accomplish their mission in life it is sometimes necessary to gamble "all or nothing at all."

13. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on.

14. Most people just don't know what's good for them.

15. In the history of mankind there have probably been just a handful of really great thinkers.

16. There are a number of people I hate because of the things they stand for.

17. A man or woman who does not believe in some great cause has not really lived.

18. It is only when people devote themselves to an idea or cause that life becomes meaningful.

19. Of all the different philosophies which exist in this world there is probably only one that is correct.

20. A person who gets enthusiastic about too many causes is likely to be a pretty "wishy-washy" sort of person.

21. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.

22. When it comes to differences of opinion in religion, we must be careful not to compromise with those who believe differently from the way we do.

23. In times like these, people must be pretty selfish if they consider primarily their own happiness.

24. There are two kinds of people in this world; those who are for the truth and those who are against the truth.

25. My blood boils whenever a person stubbornly refuses to admit he or she is wrong.

26. A person who thinks primarily of her or his own happiness is beneath contempt.

27. Most of the ideas which get printed nowadays aren't worth the paper they are printed on.

28. Man/woman on her/his own is a helpless and miserable creature.

29. Fundamentally, the world we live in is a pretty lonesome place.

30. Most people just don't give a "damn" for others.

31. I'd like it if I could find someone who would tell me how to solve my personal problems.

32. It is only natural for a person to be rather fearful of the future.

33. There is so much to be done and so little time to do it.

34. Once I get wound up in a heated discussion, I just can't stop.

35. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.

36. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying.

37. It is better to be a dead hero than to be a live coward.

38. While I don't like to admit this even to myself, my secret ambition is to become a great person, like Einstein, or Madam Curie, Beethoven, or Joan of Arc, or Shakespeare.

39. The main thing in life is for a person to want to do something important.

40. If given the chance I would do something of great benefit to the world.

ANSWER SHEET FOR THE DOGMATISM SCALE

For each of the 40 items, make two decisions: First, determine whether or not you AGREE or DISAGREE. Then determine the DEGREE of agreement or disagreement--STRONG, MODERATE, or SLIGHT for the three Agreement columns, and SLIGHT, MODERATE, or STRONG for Disagreement.

	AGREEMENT				DISAGREEMENT		
	strong	moderate	slight		slight	moderate	strong
1.	___	___	___	. .	___	___	___
2.	___	___	___	. .	___	___	___
3.	___	___	___	. .	___	___	___
4.	___	___	___	. .	___	___	___
5.	___	___	___	. .	___	___	___
6.	___	___	___	. .	___	___	___
7.	___	___	___	. .	___	___	___
8.	___	___	___	. .	___	___	___
9.	___	___	___	. .	___	___	___
10.	___	___	___	. .	___	___	___
11.	___	___	___	. .	___	___	___
12.	___	___	___	. .	___	___	___
13.	___	___	___	. .	___	___	___
14.	___	___	___	. .	___	___	___
15.	___	___	___	. .	___	___	___
16.	___	___	___	. .	___	___	___
17.	___	___	___	. .	___	___	___
18.	___	___	___	. .	___	___	___
19.	___	___	___	. .	___	___	___
20.	___	___	___	. .	___	___	___
21.	___	___	___	. .	___	___	___
22.	___	___	___	. .	___	___	___
23.	___	___	___	. .	___	___	___
24.	___	___	___	. .	___	___	___
25.	___	___	___	. .	___	___	___
26.	___	___	___	. .	___	___	___
27.	___	___	___	. .	___	___	___
28.	___	___	___	. .	___	___	___
29.	___	___	___	. .	___	___	___
30.	___	___	___	. .	___	___	___
31.	___	___	___	. .	___	___	___
32.	___	___	___	. .	___	___	___
33.	___	___	___	. .	___	___	___
34.	___	___	___	. .	___	___	___
35.	___	___	___	. .	___	___	___
36.	___	___	___	. .	___	___	___
37.	___	___	___	. .	___	___	___
38.	___	___	___	. .	___	___	___
39.	___	___	___	. .	___	___	___
40.	___	___	___	. .	___	___	___

APPENDIX C

Academic Major Control

Mean Critical Thinking Scores
for Each Academic Major Group

	Mean	Std Dev	S.E.Mean
Agriculture (N=4)	27.25	7.14	3.57
Business (N=48)	28.31	5.66	0.817
Pre-Engineering (N=6)	26.33	9.75	3.98
Engineering (N=5)	28.40	4.56	2.04
Forestry (N=4)	27.50	7.59	3.80
Home Economics (N=3)	31.00	2.00	1.15
Health and PE (N=3)	25.00	8.89	5.13
Liberal Arts (N=88)	25.97	5.67	0.604
Education (N=4)	25.00	9.59	4.80
Science (N=10)	26.50	3.47	1.10
University Exploratory Studies Program (N=2)	29.50	0.707	0.50

Total Critical Thinking Mean=26.90, Std Dev=5.85