AN INVESTIGATION OF DOGMATISM AND EFFECTIVE THINKING

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PREFACE

Inquiry offers the opportunity to develop effective thinking skills; however, there is little evidence that such skills currently are being developed to their maximum potential in the classroom. Perhaps one variable which may be important in the development of effective thinking skills is personality. This study is designed as an investigation of one personality variable, dogmatism, and its relationship to the expression of effective thinking skills.

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CHAPTER I

NATURE OF THE PROBLEM

Introduction

Effective Thinking

Effective thinking has been espoused by curriculum experts and classroom teachers as a primary goal of education. (28:1) In reference to this goal of education, Guilford stated that "teaching children to think (critically and creatively) is a current concern." (44:152) Few educators would deny that effective thinking should be a major instructional objective; however, questions arise concerning the most efficient and promising means of achieving this end.

Actually there are several reasons why educators have been less than successful in promoting effective thinking in the schools. (48:5) For one reason, only vague ideas about the nature of thinking have been expressed, for description of thinking has been largely inferential. (44:85,121) In addition, there has been widespread disagreement on the processes underlying the act of thinking. (35:243) Also there have been problems when conducting research on the psychology of thought. It has not been easy to build an acceptable theory of the phenomena of thought, and it has been difficult to witness the impact of the theory on perceived reality. (51:10) Furthermore, lack of agreement regarding the meaning of effective thinking has complicated the schools' problems

of implementing this goal, especially since each public seems to equate "good thinking" with holding the particular ideas which they endorse. (48:18) Thus, there have been several reasons why effective thinking, a goal of many educators, has not been fully realized.

Since problems of terminology have caused confusion in the past, it is important to consider what is meant by effective thinking in this study. A search of the literature revealed that effective thinking has been defined in a variety of ways. Some people have limited the concept to critical thinking; however, others have felt that such a definition is too narrow. Kurfman stated that "two aspects of effective thinking are identifiable, a creative component and a critical component."(24: 235) In Bloom's terms, the creative aspect would correspond to the ability to synthesize while the critical aspect would call for the ability to analyze. (8) Inquiry requires generating new ideas, and it entails novel ways of interpreting and ordering data. Henle stressed the idea that "a question, a problem, is often a condition of creative thinking." (24:44) Creative as well as critical thinking abilities are essential aspects of effective thinking, and inquiry entails forming and testing hypotheses, requiring creative as well as analytical processes. Effective thinking involves questioning as well as the logical steps of problem solving. Therefore, effective thinking encompasses creative and critical thinking, those thought processes needed to function in inquiry situations.

To further delineate what is meant by effective thinking, its components are defined in the following way. In this study, creative thinking is used to refer to those thought processes which rely primarily upon divergent thinking and which show an awareness of problems,

a capacity for the generation of ideas and hypotheses, and the ability to see novel approaches to data and generalizations. The term critical thinking refers to analytical thought processes which are more likely to be convergent rather than divergent in nature and which enable the person to view data critically and to evaluate the results. Therefore, by combining these two definitions, it can be seen that creative and critical thinking comprise the two essential elements of effective thinking.

Inquiry

Among the tools which will assist individuals in the development of effective thinking are the skills of inquiry. Examination of the literature showed that inquiry and inquiry skills are terms which are given a variety of meanings. Since a basic technique of inquiry, questioning, was used by Socrates, it is obvious that inquiry is not new; yet the passage of time has provided no consensus as to the meaning of inquiry. One reason for the confusion is that there are many different stages of guided inquiry which extend from expository teaching to non-directed discovery. (20:531) Each stage can be labeled inquiry, yet each one differs from the next in the degree of autonomy allowed the learner. However, all stages have a common intent in that they endeavor to encourage the student to anchor his beliefs in reason, inference, data, and generalization. (64:1) According to Massialas and Zevin, "inquiry is behavior which is characterized by a careful exploration of alternatives in seeking a solution to a problem." (64:6) Crabtree described the methods of inquiry, saying that they:

> ...involve processes of search and critical reflective thinking. They require skill in defining problems, categorizing data, hunching and hypothesizing; of specific criteria and of testing, validating and synthesizing evidence. These processes transcend any particular decision. They are means to intelligent decision making in the society, as well. (21:407)

However, others have stressed that inquiry is more than a synonym for problem solving. Suchman emphasized that "inquiry is an attitude toward learning and a philosophy of education. The central values are the open mind and the autonomous probing of the learner."(88:290) In essence, inquiry is reflective thinking. Dewey defined reflective thought as the "active, persistent, and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusions to which it tends." (22:9) According to Dewey, there are five phases of reflective thought which may be distinguished as suggestion, intellectualization, hypothesis, reasoning, and testing the hypothesis. (22:106-118) Hullfish and Smith considered the meaning of reflective thought and stated that it "differs from other looser kinds of thought primarily by the virtue of being directed or controlled by a purpose - the solution of a problem." (48:36) For purposes of this study, reflective thinking and inquiry will be used interchangeably. (64:266)

A pertinent question to ask is what characteristics of an inquiry-oriented classroom distinguish it from other situations in which the teaching is primarily expository. First, the student assumes an active rather than a passive role in the learning process, taking part as an investigator. (64:252) The student role changes from that of a consumer of knowledge to that of creator of knowledge. Second, the method

is heuristic; and it encourages the student to generate hypotheses and to order data into relationships which are more meaningful. (21:411) Third, the method of inquiry implies a curriculum "that is organized around key concepts and problems rather than discrete items of information put together on the basis of vague criteria." (64:261) Dealing with problems and concepts has been considered a central theme in the inquiry process. (19:62,64) Fourth, the inquiry-oriented classroom is characterized by the use of higher mental processes, including convergent thinking, divergent thinking, and evaluation. (42:10) Since much factual information is soon forgotten, the development of higher mental processes is important. (70:478) Finally, the inquiry approach requires a change in the role of the teacher, a change from a didactic to a dialectical role in the sense that it is assumed that a person learns more when he is allowed to participate in discovering ideas and relationships on his own. (64:25-26) Of course, it must be remembered that there is no perfectly delineated set of dimensions for inquiry which are agreed upon by all educators; but the characteristics which are mentioned above are basic to inquiry-oriented instruction. In summarizing the inquiry approach, Carpenter said:

> The inquiry approach views the learner as an active thinker - seeking, probing, processing data from his environment toward a variety of destinations along paths best suited to his own mental characteristics. It rejects passiveness as an ingredient of effective learning and the concept of the mind as a reservoir for the storage of knowledge presented through expository instruction directed toward a predetermined, closed end. The inquiry method seeks to avoid the dangers of rote memorization and verbalization as well as the hazards of fostering dependency in citizens as learners and thinkers. (13:220)

Inquiry has become a very popular word among educators, yet there are some people who have found weaknesses in this type of instruction. First, it has been pointed out that inquiry approaches have been the object of few experimental studies.(20:523) Empirical research has not been sufficient to support firmly the widespread enthusiasm for inquiry methods; however, Crabtree suggested that there was enough evidence at least to indicate probable outcomes. (21:408) Another criticism has been that the inquiry-oriented approach requires that the teacher provide much of the curricular material to be used. (56:412) Although there is a firm philosophical argument to defend inquiry, there is little evidence of inquiry in the classroom. (45:538) Perhaps this situation is due to the lack of teacher preparation for inquiry. Emphasizing the need for reflective thinking, Griffin stated that the teacher who has acquired content reflectively can best use it that way. (66:963) Another block to the usage of the inquiry mode of instruction is that teachers are afraid to use it for fear of arousing doubts concerning dominant community beliefs and, therefore, possibly creating misunderstandings. (66:963) A further problem encompasses the danger of building weak academic backgrounds in situations involving totally self-directed inquiry. In addition, a question has arisen concerning the amenability of some disciplines or parts of disciplines to the inquiry approach. (50:162) Finally, it has been suggested that all students may not be suited to the inquiry approach. (45:537) In light of the above statements, it can be seen that there are several vulnerable points and pertinent questions about the inquiry-oriented approach to learning.

Recent curriculum studies in the social studies as well as the physical and biological sciences have focused much attention upon inquiry. (49)(63)(64)(85) They have exhibited an awareness of the important interrelationship of content and process. (21:407)(4:3) In the face of the increasing volume of knowledge, learning all of the known information in any one discipline is no longer feasible, making increasingly complex the problem of selecting material to be used in the classroom. (85:11) It is also of vital concern to educators that knowledge not be viewed as absolute, and it is important to realize that much of what a student knows at the conclusion of his college career will be obsolete at the end of the next decade. (29:7) Furthermore, it is impossible to predict the problems which will be paramount in the future. (52:314) Bloom stressed that, in a closed society, it may be possible to anticipate problems which the student will face; however, twentieth century Western culture is not closed. (8:40) In light of the above facts, the recent emphasis upon inquiry is justified since inquiry or effective thinking skills can provide ways of attacking problems and dealing with data which can be used in a variety of undetermined situations. (8:40)

In a discussion of inquiry, it must be noted that there are certain goals which are associated with this mode of instruction. Bruner has suggested that the ideal in education is to develop an interest in what is being learned but at the same time to develop an appropriate set of values and attitudes about intellectual activity in general. (10:73) As Goodlad has said, the schools should encourage self-sustaining inquiry rather than mere recall of facts and rote memorization. (40:60) Self-sustaining inquiry implies that the student is

capable of independent learning. In an effort to achieve this goal of self-sustaining inquiry, process as well as content is important. Becker emphasized the importance of process, the process of seeking knowledge, when he said that "a reliance on process rather than upon static knowledge seems to be the only sensible goal in the modern world." (32:66) Bloom expressed concern for the development of autonomous learners when he stated that "unless the individual can do his own problem solving he cannot maintain his integrity as an independent personality." (8:41) Bloom stressed the need for autonomous learning and continuing evaluation when he said that it is suspected:

> ...that no specific learning material or process is indispensable. The presence of a great variety of instructional materials and procedures and specific suggestions as to which ones to use can help the student learn that if he cannot learn one way, alternatives are available to him. (7:no page)

From the above statements, it can be seen that there is one overriding goal for inquiry: that the individual will be able to continue inquiry on his own in later life as well as in the classroom.

With this goal in mind, it is important to consider the advantages of the inquiry approach to learning. Crabtree stated that inquiry will yield "benefits in long-term recall, transfer, and a command for continuing inquiry and growth." (21:408) Bloom stressed the permanence of inquiry skills, for they can be generalized and applied to a variety of situations. (8:41) Another advantage is that inquiry can create a positive attitude toward learning because there is personal involvement. (45:536) Inquiry also helps to develop important thinking operations, such as observing, interpreting, and criticizing. (45:537) Commenting with reference to inquiry, Suchman said:

> It is clear from the research on teaching strategies that the more active and autonomous the learner becomes in a learning process and the more he takes the responsibility for decisions regarding the collection and interpretation of information, the more meaningful the learning becomes and the more motivated the learner becomes. (88:289)

Thus, some of the benefits to accrue from inquiry strategies are heighted motivation, long-term retention, transfer, improved inquiry skills, and increased autonomy in learning situations.

In spite of the many general statements which can be made about inquiry, it is important to realize that inquiry is not the same for every person and is not useful in every situation. The steps of inquiry or reflective thinking, as they are outlined by Dewey or any other educator, are not set; and they are not intended as a pattern into which to force thinking. (48:219) Instead of being a definitive model, Dewey's five phases of reflective thought were included as one possible model of the act of thinking. Other models have also been developed and serve the same purpose. (48:43-44) (4:14-19)(39:32) The teacher who wishes to promote the development of inquiry skills must realize that, because inquiry involves autonomous probing on the part of the learner, it will be approached in a variety of ways by individual students. Therefore, the teacher who desires to encourage inquiry must provide the student with opportunities to delve into problems, offer him an environment in which he can hypothesize and test his theories, and assist him, whenever necessary, in the development of more productive strategies to use in the process of investigation.

Dogmatism

Since inquiry or reflective thinking processes are not the same

for all persons and in all situations, it follows that individualization is necessary in order for each person to develop his inquiry or effective thinking skills to his maximum potential. However, the present state of research does not allow the teacher to provide such optimal conditions for individualization. To gain a better understanding of the factors which influence the development of effective thinking skills, there is a need to delve into the question of how to encourage effective thinking and also to consider variables which may influence the learning process. There is a need to investigate the interaction between conditions and methods of instruction and the nature of the learner. (89:153) Massialas and Zevin suggested that there is a need to investigate the relationship between personality variables and response to the inquiry approach. (64:6,263) With these ideas in view, it becomes apparent that further research is warranted, research that focuses upon variables which may influence the effectiveness of various learning situations.

Crabtree posed the question as to the possibility that all children may not learn equally well from inquiry, saying that it is likely that they do not. (20:531) She stated that "reflective thinking assumes the learner has withheld action until all data are in; and has examined thoughtfully a range of alternatives for action before determining his choice." (20:531) Since the dogmatic individual tends to seek closure before all data are considered and before all alternatives have been examined (52)(58), it is possible that dogmatic and nondogmatic individuals may respond in different ways to inquiry-oriented situations. Considering this possibility, it seems appropriate to investigate the relationship between cognitive factors and one aspect

of personality, dogmatism, in learning situations.

Personality, as defined by Guilford, is a person's "unique patterns of traits."(44:77) One such pattern is the organization of a person's beliefs. Rokeach's model of open and closed belief-disbelief systems offers "the trait of dogmatism as an underlying dimension in the development of personality, ideology, and cognitive functioning."(67:365) In order to examine the beliefs of an individual, Rokeach conceived of all cognitive systems as being organized into a belief-disbelief system. (77:35) This system includes all propositions which the person holds to be true or false.

Rokeach developed the idea that the two interdependent parts, a belief system and a disbelief system, can be seen as varying in terms of structure and content. In terms of structure, Rokeach described the belief-disbelief system as varying along a continuum from open to closed. (76:195) The basic characteristic which determines the degree of openness or closedness of a belief-disbelief system is the capacity to receive and objectively evaluate information without distortion and consequently to respond to the data on the basis of its own intrinsic values; thus, the response is unimpeded by extraneous factors which arise from within the person or from the environment. (77:61) In this conceptualization, the more closed the system is, the more difficult it should be to distinguish between information received about the event and about the source of information. Conversely, the more open the system is, the easier it should be to receive and analyze information and to respond to it independently and on its own merits. In reference to content, the belief-disbelief system can be described by speaking of the content of the centrally located beliefs, especially beliefs about

authority and people in general.(76:195)

Rokeach emphasized that the belief-disbelief system serves two powerful and conflicting motives at the same time, for it compensates for the need for a cognitive framework to know and understand and for the need to ward off threatening aspects of reality.(77:67) If the cognitive need predominates, an open system should result; but, if the need to ward off threats is dominant, the result will be a more closed system.

If dogmatism influences how a person believes, a consideration of dogmatism may shed light upon the effectiveness of various learning situations. Two characteristics of dogmatism have been noted as relevant by educators who are interested in dogmatism as a factor influencing the learning situation. One of these characteristics concerns "cognitive isolation," which implies that the closed-minded person tends to isolate cognitive beliefs and ideas in his mental structure; as a result, there is little communication between different parts of his system. (77:73) The second of these characteristics is that the closed-minded individual tends to have a high degree of reliance on authority and direction.(77:62) These two dimensions of dogmatism have been identified by Mouw as significant in examining an individual's cognitive functioning.(67:365)

In consideration of the relationship between personality and cognitive variables in a learning situation, Rokeach said that "we should be able to predict, from a knowledge of a person's ideological orientation, his conceptual behavior when solving intellectual problems." (77:7) Still there remain questions concerning the relationship of dogmatism and cognitive functioning. Should individualized

instruction be preceded by an investigation of an individual's belief-disbelief structure in order to provide appropriate learning experiences? Do open- and closed-minded students respond differently to various instructional strategies? Is it possible that open- and closed-minded individuals differ in their abilities to inquire, either in their development of critical or creative thinking abilities? Answers to these questions are essential to effective inquiry-based instruction.

Statement of the Problem

The purpose of this study is to determine if there is a relationship between dogmatism as measured by Rokeach's Dogmatism Scale, Form E, and a person's ability to think effectively as measured by the Watson-Glaser Critical Thinking Appraisal and the Torrance Test of Creative Thinking.

Based upon the rationale developed above, the degree of open- or closed-mindedness is one variable which may have an effect upon one's ability to think effectively, a term encompassing both the creative and the critical aspects of thinking.

Clarification of Terminology

The basic definitions of the principal terms in this study are presented below. The meaning of these and other important terms will be amplified in the selected review of the literature.

1. Dogmatism: For purposes of this study, dogmatism was measured by Rokeach's Dogmatism Scale, Form E. Rokeach stated that dogmatism is

> ...a relatively closed cognitive organization of beliefs and disbeliefs about reality, organized around a central set of beliefs about authority which, in turn, provides a framework for patterns of intolerance and qualified tolerance toward others.(76:195)

Individuals who are high in dogmatism are presumed to have closed belief-disbelief systems, and those who are low in dogmatism are presumed to have open belief-disbelief systems. Thus, a person scoring high on the Dogmatism Scale, Form E, is placed at the top of the continuum and is considered to be closed-minded while a low score indicates an open-minded individual. There are no absolute levels of open- or closed-mindedness; most individuals are relatively open-minded or relatively closed-minded. Dogmatism is concerned with the structure rather than the content of beliefs, enabling the concept to cut across specific content.(77:6)

2. Effective Thinking: This term represents the combination of two components, creative and critical thinking. In this study, the effective thinking score represents the combined (summed) t-scores for an individual on the Torrance Test of Creative Thinking and the Watson-Glaser Critical Thinking Appraisal. Thus, there are pre-test and post-test effective thinking scores; and the combination of the two scores is called the overall effective thinking score.

3. Creative Thinking: As defined by Torrance, creative thinking is:

> ...a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.(96:6)

Since this definition is in accord with the one cited earlier in this

study, the instrument used to obtain a measure of creative thinking was the Torrance Test of Creative Thinking.

4. Critical Thinking: In this study critical thinking is considered to involve analytical thought processes. As defined by Watson and Glaser, critical thinking is composed of five analytical processes, including inference, recognition of assumptions, deduction, interpretation of data, and evaluation of arguments. (98:1) An individual's critical thinking score was obtained using the Watson-Glaser Critical Thinking Appraisal.

Significance of the Study

If open-minded individuals do respond more favorably to situations designed to develop or utilize inquiry skills to cultivate effective thinking than do closed-minded individuals, there should be important educational implications from this exploratory research.

Any effort to train teachers to use inquiry as a major instructional strategy must be undertaken with the realization that dogmatism may influence the degree to which a teacher can utilize effectively a dominant inquiry motif in his or her classroom. While the dogmatism of the teacher is an important factor to consider, the dogmatism of the students, in the final analysis, may determine the effectiveness of inquiry in a classroom. This statement is based on the fact that a student's belief-disbelief system may determine, in large part, his capabilities as an effective thinker and self-directed learner by restricting his method for dealing with new information.

If open- and closed-minded individuals respond differently to various learning situations, this finding would have important

implications for the classroom teacher. Situations which enhance the development of effective thinking skills should be provided for all students, and it is possible that open-mindedness and closed-mindedness may provide meaningful criteria to use in order to individualize instruction.

CHAPTER II

REVIEW OF SELECTED LITERATURE

Introduction

The review of selected literature is divided into four main sections. The first major division deals with dogmatism and the implications of this variable for learning. The second one is concerned with effective thinking and considers the importance of this term as a major goal of education. The third section examines creative thinking and the creative individual's response to learning situations. Finally, the last part of the review of selected literature concentrates upon critical thinking and the possibilities of developing critical thinking skills.

These four concepts were chosen for examination because they are the crucial terms under consideration in this study. The purpose of this research is to examine the relationship of dogmatism, a personality variable, and effective thinking, a cognitive variable, encompassing both creative thinking and critical thinking.

Dogmatism

Dogmatism has meaning for how one believes, how he arrives at his beliefs, and how open the beliefs are to examination or change.(77:6,9) Dogmatic thinking involves the total configuration of an individual's

beliefs organized into a relatively closed system. The entire structure of a belief-disbelief system can be described as varying along a continuum from open to closed. The extent to which a person's system is open is:

> ...the extent to which the person can receive, evaluate, and act on relevant information from the outside on its own intrinsic merits unencumbered by irrelevant factors in the situation, arising from within the person or from the outside. (77:57)

As a result, open-mindedness is a factor highly related to a person's receptiveness to new ideas and alternatives. Since dogmatism has been conceptualized in terms of the degree to which a belief-disbelief system is open or closed, the term closed-minded refers to an individual scoring relatively high on the Dogmatism Scale, Form E; and open-minded refers to one scoring relatively low on this instrument. Rokeach said that persons who score very high on the Dogmatism Scale are shown to differ consistently in the ability to form new belief systems from those who score low on this measure.(77:397) Differences between persons with open and closed belief systems are not dependent upon intelligence, as Rokeach and Ehrlich have established that dogmatism is independent of academic aptitude.(24:149)(77:407)

In order to understand the implications of dogmatism for acquiring effective thinking skills, it is first necessary to review the pertinent research in this area. A relationship between cognitive and personality variables was established by the research done by Frenkel-Brunswik.(33). She found degrees of variation in the ability of young people to tolerate ambiguities, and this emotional and social ambivalence was evidenced in the cognitive spheres, including thinking,

memory, and perception. Frenkel-Brunswik linked tolerance of cognitive ambiguity to early parent-child relationships.(33:140-141) The importance of this research in this review is the finding that emotional and social ambivalence reveals itself in the cognitive domain.

The interaction between affective and cognitive spheres suggests differences in performance on thinking tasks. Rokeach and his associates constructed several tasks as a means for comparing the operation of analysis and the operation of synthesis among individuals with relatively open and relatively closed belief systems. The correct solution of each of the tasks required subjects to cope with new conceptual systems contradictory to those in everyday life. This research revealed a close tie between affective and cognitive operations, and it was found that open- and closed-minded persons differed in their abilities to synthesize but not to analyze.(77:286) Although high and low scorers on the Dogmatism Scale did not differ in respect to the analysis or breakdown of individual beliefs, they did differ significantly in respect to synthesizing or integrating beliefs into a novel system, one contradicting their personal system of beliefs. The studies by Rokeach and his associates revealed that closed-minded people took longer to synthesize material because they were prone to reject situations necessitating new modes of thought.(77:197) The more closed-minded subjects displayed a tendency to want to change the task or to reject it altogether, and Rokeach and Vidulich commented that such behavior hardly seems conducive to the formation of a new belief system.(77:197) However, Rokeach noted that open- and closed-minded individuals did equally well at synthesizing when the task was familiar; but, when the situation is unfamiliar, closed-minded persons

apparently are hesitant to form new systems, making it evident that past experience determines whether a system is psychologically new or not.(77:223) When hints were given by an authority figure, the closed-minded individuals were not held back in the process of synthesis; apparently they relied upon the authority, taking away the need to consider the hints. (51:14) From these studies two points become evident. First, open- and closed-minded persons differ in their abilities to deal with cognitive tasks involving the processing of new information. The findings indicate that individuals differ in their basic attitudes toward new systems.(77:223) Secondly, they may be very similar in their abilities to perform familiar cognitive tasks. Emphasizing the critical nature of nonintellectual determinants of cognition, Rokeach suggested that "important aspects of mental functioning are attributable to personality rather than to intellectual ability as such."(77:288)

Rokeach and Vidulich said that, "if new beliefs are not really accepted, then they will not be remembered, and if they are not remembered there is nothing to synthesize or integrate."(77:197) With this idea in mind, Kleck and Wheaton (54) investigated the ability of open- and closed-minded subjects to recall opinion-consistent and opinion-inconsistent information. In this study open-minded persons were able to recall more information which was inconsistent with their opinions than were the closed-minded individuals.(54:251) The authors concluded that the findings were in line with Rokeach's belief that closed-minded people are less able to integrate new beliefs into their cognitive systems because it is impossible to integrate information

which cannot be recalled.(54:251) The results of this study suggest that the ability to recall may be a prerequisite for successful integration of ideas into a belief-disbelief system.

A study by Fillenbaum and Jackman demonstrated that closed-minded subjects performed less well in problem solving, as measured by the Denny Doodlebug Problem, than did the open-minded subjects.(30:214) Perhaps this finding, which confirms Rokeach's earlier findings, can be related to Rokeach's statement that "the greater the dogmatism the more the avoidance of contact with stimuli - people, events, etc. - which threaten the validity of the belief system or which proselyte for competing belief systems." (76:199-200) Rokeach stated that "a relatively efficient solution of the Doodlebug Problem is not so much a function of efficiency in analytic thinking as in integrative thinking."(77:207) Closed-minded students were more defensive when they were confronted with beliefs which contradicted their existing beliefs, (77:211) and problem-solving situations undoubtedly involve new and potentially threatening stimuli.

Decision making of open- and closed-minded subjects was the focus of attention in a study by Long and Ziller (58). They found a negative relationship between dogmatism and predecisional information search. (58:377) Open-minded persons tended to delay decision making until they had engaged in a predecisional search, and they were inclined to reply that they did not know in situations in which there were insufficient data. In similar situations, closed-minded subjects showed a predisposition to avoid involved predecisional search and to reach closure. Long and Ziller postulated that these results are evidence of a defense mechanism which allows closed-minded people to maintain their

belief-disbelief systems; in this sense, the dogmatic individual is less open to new information than is the more open-minded individual. (58:376) They suggested that the premature closure of the more closed-minded person may be instrumental in situations necessitating immediate decisions; however, in situations requiring creative responses, the nondogmatic individual who searches for additional information may have an advantage. (58:378)

Kemp postulated that dogmatism was a hypothetical construct which could influence a person's ability to think critically, assuming "a dynamic relationship between the personality and the way the person thinks."(52:10) He stated that a person "thinks as he does because of the kind of person he has become. Thinking per se is not the focus but a means of studying the whole person in action."(52:10) Then, he conducted studies, using students at Michigan State University, to see if students who were high and low in dogmatism would differ in their critical thinking abilities as indicated by problem solving. He found that students scoring low on the Dogmatism Scale were superior in their critical thinking abilities to individuals scoring high on this instrument and that the more closed-minded subjects had a higher percentage of errors in problems necessitating the consideration of several factors and deferring making a conclusion until all aspects were evaluated. (52:317) He concluded that "apparently the high dogmatic has difficulty in tolerating ambiguities and is thus impelled toward 'closure' before full consideration is given to each piece of contributing evidence."(52:318) This situation may result in a perceptual distortion and a conclusion which does not weigh all facets of a problem. Kemp also noted that "the more open-minded perceptively

examine all aspects of the experience, try to clarify the ambiguity, and strive to see the relationship among parts."(52:315) These findings may have important implications concerning the relationship between dogmatism and cognitive functioning.

Considering Rokeach's observation that closed-minded learners tend to rely heavily upon authority and direction, Mouw (67) conducted a study to investigate the effect of dogmatism on the five cognitive processes described by Bloom in his Taxonomy of Educational Objectives: Cognitive Domain. The study yielded the information that the mean performance of open-minded college students tended to increase as the task became more complex and autonomous; but, when faced with similar tasks, closed-minded subjects decreased in mean performance.(67:365) Thus, Mouw found a relationship between dogmatism and cognitive functioning.

Also concerned with authority, Powell (71) undertook a study to determine whether open- and closed-minded persons differ in their abilities to differentiate between and evaluate independently messages and the sources in the context of communication. He found that closed-minded individuals tended to judge the worth of the communication on the basis of the source; however, open-minded people tended to judge it more on their own intrinsic merits.(71:63) This study indicates that the influence of source credibility may operate differently for open-minded and closed-minded individuals.

Another study relating to the independence of the individual was done by Blankenship and Hoy (5). They found that there was a significant difference between open- and closed-minded subjects in their "capacity for independent thought and action" as measured by The

California Personality Inventory. Subjects who were more open-minded scored significantly higher on the aspects of this instrument which were combined to measure "capacity for independent thought and action." (5:70) The characteristics of the "capacity for independent thought and action" are intellectual independence, an emphasis upon intellectuality, and broad interests and perspectives.(5:69)

Ehrlich (24) conducted a study of college students to investigate the relationship between the degree of learning in an introductory sociology course and dogmatism. His findings indicated that dogmatism is significantly and inversely related to learning.(24:149) Students who were low in dogmatism began the semester with a higher level of learning, learned more during the semester, and retained more of the information than did their more dogmatic colleagues.(24:149) This study gives support to Rokeach's idea that the relatively closed cognitive system of closed-minded individuals inhibits them when confronted with new belief systems.(77:196-197)

Costin (15) and Christensen (14) also did studies of the same nature as the research by Ehrlich except their subjects were college students enrolled in psychology courses. Their results failed to confirm Ehrlich's finding that dogmatism was significantly related to course achievement. These results may not negate the role of personality factors in the learning situation, indicating that the type of information considered may interact in a significant way with personality characteristics. (15:187) In order to reconcile the contradictory findings, Costin (16) conducted another study to see if dogmatism would be positively correlated with the retention of specific

false beliefs about human behavior but not related to the acquisition of basic psychological principles. Using students in an introductory psychology course at the University of Illinois, Costin found that open- and closed-minded students learned general principles equally well; however, the more closed-minded people showed a greater resistance to changing specific false beliefs about human behavior.(16:533) Thus, the relationship which may be crucial is not between dogmatism and learning in general but rather between dogmatism and particular types of learning tasks.

Research by Riley and Ammlin (73) revealed that dogmatism was inversely related to the Consistency-Flexibility score on a pre-test but that it was not related to the same score on a post-test. The high dogmatic group increased their scores over time; but the low dogmatic group showed a mean loss in scores, suggesting that dogmatism is accompanied by rigidity on a perceptual motor task. (73:914)

Shulman (84) reported differences in the habitual patterns of seeking and inquiry strategies. He defined a seeking style as "a consistent mode of initiating, conducting, and terminating an inquiry that is characteristic of individuals or groups of individuals,"(84:259) and he explained that seeking styles are conceptualized as varying along a continuum from dialectical to didactic. The findings of the study indicated that individuals have consistent seeking-style tendencies, and Shulman suggested that personality as well as intellectual differences account for the results. (84:265-266).

Solomon (86) conducted a study in the use of the scientific method among college students. He reported that the more open-minded students manifest a greater ability to give up preconceived ideas and to

integrate and incorporate new data if they were scientifically demonstrated.(86:854) The reason given for this finding was that the open-minded students had fewer defenses.(86:854) This conclusion is in line with Rokeach's conclusion that the more closed-minded subjects were more threatened by new belief systems which contradicted their old ones than were the more open-minded people.(77:211)

After administering the Dogmatism Scale to a group of college students who planned to become social studies teachers, McCollum (65) concluded that the high means on the instrument developed by Rokeach indicated that they would encounter problems when they used the reflective method in teaching. Specifically, he said that they would find it more difficult when hypothesizing, testing data, conceptualizing, and generalizing.(65:762A)

In a discussion of problem solving skills, Bloom (8) offered several ideas concerning some of the deterrents to improvement in these skills. He said that there is a tendency to avoid problem solving, to be satisfied with partial solutions, to use only a limited stock of techniques when solving problems, to change the problem entirely, and to escape from the situation.(8:42-43) This analysis of some of the problems encountered when inquiry is used suggests that there may be personality as well as cognitive factors which influence a person's effectiveness in an inquiry-oriented situation.

Massialas and Cox stated that the relationship between personality and the way one reasons seems to show that dogmatic individuals have definite mind sets which have adverse effects on the learning process in cases when the problem involves a number of alternatives, is abstract, or necessitates the generation of hypotheses.(63:80) Related to this idea is the

is the statement by Massialas and Cox that "authoritarianism, rigidity, and dogmatism are generally negatively related to achievement and to abstract thinking."(63:42) These statements and the studies discussed above emphasize the important influence of the personality variable, dogmatism, on an individual's ability to function in learning situations. The interaction of cognitive and personality variables influences how receptive students are to alternative ideas and to ones which conflict with ideas which they hold to be true. Mouw suggested that research of this nature points to the need for further individualization of instruction and stated that:

> The implication is that, depending on the student's degree of dogmatism, he may not be able to perform the kinds of tasks called for in the contemporary curriculum series, where the emphasis is on more abstract reasoning and self-directed learning, as well as his less dogmatic peers.(67:369)

Effective Thinking

Effective thinking, as it is defined in this study, comprises creative thinking and critical thinking components. Crabtree stated that reflective thinking processes, which involve effective thinking skills, might be considered:

> ...both critical and creative - critical in the sense they enable students to analyze, verify, and organize knowledge, and creative in the sense they produce reconstruction of knowledge, as they engage students in the quest for new organization, idea relationships, or problems resolution.(28:87)

Kurfman suggested that the two phases of effective thinking interact continuously, and he defined the creative aspect as the stage requiring curiosity and the forming of hypotheses while the critical aspect is characterized by the clarifying of questions and the testing of ideas.(28:235) As a result, both creative and critical thinking

abilities are essential factors in inquiry, a teaching strategy which endeavors to develop effective thinking skills.

The problem-solving process has been described as involving two major phases, one entailing analysis and the other requiring synthesis. (6:193) Consideration of the analytical aspect of problem solving reveals the necessity for critical thinking skills while synthesis requires creative thinking abilities. Creative thinking skills are essential for hypothesizing and generalizing, and the processes of critical thinking are requisite for experimenting with variables and for testing data.(20:525) Effective thinking involves autonomy; at least, the development of effective thinking skills should result in the learner becoming increasingly autonomous. Benne warned that too much reliance upon authority in problem solving will prevent the development of novel approaches to problems and decrease the satisfaction derived from making a discovery.(28:4)

Effective thinking skills are those skills which are essential for inquiry or reflective thinking. Bayles described reflective thinking saying that it is "a process of solving a problem. If a problem is not recognized, no reflection can occur."(3:108) Thus, an awareness of the problem is an essential aspect of effective thinking. Concerning the problem itself, Getzels stated that there is a big difference between solving a problem which is presented and finding a problem that needs to be solved, and he said that much creative thought is of the latter type.(35:247) This statement points to the importance of creative thinking in inquiry.

Getzels suggested that there is a paradoxical situation in teaching to encourage creative thinking:

> On the one hand, solving problems seems to require conscious effort, the possession of established facts, and rationality of attack - all aspects of secondary-process thought. On the other hand, creative thinking seems to entail at least a degree of regressive playfulness, impulse acceptance, and arationality - all aspects of primary-process thought.(35:265)

This paradox, as described by Getzels, suggests the dual aspects of effective thinking and the possibility that the analytical and creative aspects of inquiry are quite different; yet there is no indication that analytical and creative skills are mutually exclusive.

Many research studies have been concerned with creative thinking and critical thinking; however, a search of the literature revealed little empirical data on effective thinking, a combination of the creative and critical aspects of thinking. Only one study seemed appropriate to report in this section on effective thinking. It is a study conducted by Good, Farley, and Fenton (39) to see if high school students involved in a social science curriculum designed with inquiry skill objectives and knowledge objectives would differ from students in the control group which followed a traditional curriculum. The results of the study showed that the students in the experimental group did significantly better on The Carnegie Test of Social Studies Inquiry Skills than did those students in the control group.(39:34) This study indicates that curriculum designs which focus upon inquiry can have a significant effect on the development of inquiry or effective thinking skills.

Concerning the relationship of dogmatism to effective thinking, Bruner made the observation that:

> The open mind, the suspension of motive and directedness are essential for stimulating the flow of hypothesis and metaphor, but for recognizing the fitness or adequacy of a particular hypothesis, the appropriately closed mind is required.(11:52)

Perhaps there is a degree of openness or closedness which is most conducive to effective thinking. Creativity demands divergent thinking while critical thinking is more likely to call for convergent thought processes, yet creative and critical thinking are believed to be complementary rather than antithetical. Since creative thinking skills are considered to be important in hypothesis formation and critical thinking skills are deemed essential for hypothesis analysis, if individuals differ in their abilities to hypothesize and analyze, the expression of these two identified aspects of effective thinking may be related to the open- or closed-mindedness of the individual.

Creative Thinking

Creative thinking and creativity are words which have been quite popular in educational circles in the past decade, yet limited research has been done on creative thinking.(35:257-258) Not only has scant research been carried out but it is difficult to assess the relevant details which the research does report.(35:263,265) Generally the study of creativity has been neglected by psychologists, and Guilford offered the following three reasons to account for this fact.(44:78-80) First, it has been a widely held belief that creativity is a function of intelligence. Second, problems of definition have plagued researchers. Third, it is hard to measure creativity using stereotyped tests. Anderson stated that one of the problems which has confronted those people who have tried to measure creativity is the fact that the process is "often obscure, unknown, unperceived, unverbalized by the person himself, and therefore uncommunicated."(1:243) Thus, it can be seen that research in the area of creative thinking and creativity has

been limited.

One of the problems which has been delimited above is that of definition. Creativity has been defined as a process, a product, an aspect of personality, and an environmental condition.(92:3) Guilford suggested that the most narrow definition of creativity is that it "refers to the abilities that are most characteristic of creative people."(43:444) However, such a definition does not specify observable and measurable behavior. Torrance defined creative thinking as "the process of sensing problems or gaps of information, forming ideas or hypotheses, testing and modifying these hypotheses, and communicating the results."(92:4) By defining creative thinking in this way, Torrance defined a process; and he chose this definition of creative thinking because it allows the operational definition of the "kinds of abilities, mental functioning, and personality characteristics that facilitate and inhibit the process.(95:664)

Guilford surveyed the literature on creative thinking and problem solving and concluded that creative thinking and problem solving involve essentially the same processes.(44:122)(42:9) Then he clarified his idea by saying that, although all problem solving is creative, it is not certain that all creative thinking is problem solving.(42:10) He stated that "to the extent that problem solving includes something new or novel it remains creative thinking."(44:122) Torrance observed that generally creative thinking has been considered as one special type of problem solving, for creative thinking operates in the processes involving formulating hypotheses, synthesizing ideas, and looking at data in new lights.(95:666) In regard to creative thinking, Guilford hypothesized that creative thinking and problem solving

require higher mental processes, especially divergent thinking.(1:157) In fact, Guilford said that it would be possible to define creative thinking as divergent thinking except for the fact that divergent thinking does not account for all of the intellectual parts of creative production.(1:157) He also added that it is certain that traits of fluency, flexibility, and originality fall under the general heading of divergent thinking.(1:157)

Torrance stated that creative learning and creative thinking involve questioning, inquiring, experimenting, manipulating, and playing with ideas and materials.(93:46) Torrance cited evidence to show that creative thinking is not a unitary ability but rather it involves a number of abilities.(91:7) He stated that such abilities include sensitivity to problems, fluency, flexibility, originality, elaboration, and redefinition.(91:7-8) Previously Guilford identified these six traits of creative thinking.(1:145-149)

Being sensitive to problems is the first of the traits which Torrance and Guilford cite. It is important to remember that detecting the problem is just as crucial as actually producing an answer.(1:171) Fluency is the second trait to be identified as an important aspect of creative thinking. Fluency indicates the ability to produce a large number of ideas.(91:8) Guilford said that ideational fluency is important for problem solving since many problems require novel solutions; and, if it is crucial to problem solving, fluency is also important to creative thinking.(1:147) Flexibility is the third trait mentioned, and it is concerned with the ability to produce a variety of ideas and to use various approaches.(91:8) Flexibility involves a change in thought or a change of set.(43:452) Hilgard stated that a person

loses flexibility when a chart of action is plotted and when he no longer looks around for ideas.(1:168) Originality is a fourth dimension of creative thinking. One of the standard criteria for creativity is novelty; and originality is dependent upon the unusualness, the cleverness, and the remoteness of responses.(44:99) Taba observed that hypothesizing requires divergence and creativity, but she stated that less originality is needed when the problem has stiff boundaries.(28:42) A fifth trait of creative thinking which has been identified is elaboration. This aspect of creative thinking is concerned with the ability to add details to ideas.(91:8) The final trait listed by Torrance and Guilford is redefinition. This ability requires perceiving and defining in ways which differ from the conventional ones.(91:8) Together these six traits comprise important aspects of creative thinking.

Creative thinking, like dogmatism and critical thinking abilities, must be measured in degrees; and Guilford emphasized this point by saying that "whatever the nature of creative talent may be, those persons who are recognized as creative merely have more of what all of us have." (43:446) Therefore, there is variety in degree and kind of creativity, and it is important to note that creative people differ considerably from one time to another.(44:79)

Henle stressed the importance of freedom to creative thinking, and he said that "such thinking consists in breaking out of our conceptual system, our system of assumptions and meanings and knowledge when it no longer does justice to given material."(41:37) To emphasize this same point, McCleod said, in describing creative thinking:

> When we think creatively we shake ourselves loose from our old assumptions, we see the problem as imposing new requirements, we see old instruments as capable of new functions - the rigid structure of the field is broken down so as to permit new configurations.(41:188)

Both Henle and McCleod suggested that creative thinking requires an openness to ideas and a willingness to consider new aspects of a problem.

Virtually all accounts of the creative process are in agreement that there must be openness to impulses from within the person and to stimuli in the environment.(35:259) Rogers commented that the creative person must be open to new experiences in the following three ways. (1:75) He must have permeable boundaries in his beliefs, perceptions, and ideas. He must display tolerance in the face of ambiguity. Also, he must be capable of receiving conflicting stimuli without reaching premature closure. Emphasizing the importance of openness, Getzels said that any premature censorship can be an inhibiting factor on creative thinking and problem solving; furthermore, he said that such censorship of ideas can come from the teacher or authority figure or from within the individual.(35:253)

A study by Rutherford (80) was concerned with personality correlates of creativity. She identified the creative individual as one who approaches new situations in the following three ways.(80:4434) First, he shows an ability to differentiate the different parts of a situation and to integrate them into a meaningful whole. Second, the system is open, enabling new ideas to be assimilated and to allow for changes in old relationships when the need arises. Last, he is realistic in his perceptions of and reactions to new situations. A description of this nature shows a resemblance between the creative person

and the open-minded person as described by Rokeach.

Creative thinking involves questioning; but the new idea must find a place in the belief system, frequently entailing the revision of other ideas in light of the new one.(41:43) Stein and Meer cited evidence that creative individuals are more capable of integrating percepts and are more free in suggesting hypotheses for poorly structured stimuli than are their less creative counterparts.(87:42-43) Taylor designated a devotion to independence and autonomy and a tolerance for complexity and the capacity to defer closure as cardinal traits of the creative scientist.(90:101) Guilford stated that "the original person tends to be more confident and tolerant of ambiguity and to like reflective and divergent thinking and aesthetic expression," but he added that "the unoriginal person is inclined to be meticulous and to feel the need for discipline."(1:152) In light of of these statements, questions arise concerning the relationship between creative thought and personality variables such as dogmatism.

Creative learning calls for divergent thinking and evaluation rather than for convergent thought processes. To be creative involves unpredictability, and what is unpredictable makes some students uneasy. (93:11) A highly creative individual enjoys learning situations which encourage autonomous probing. Perhaps the self-directed person works well only in courses which interest him; if so, this information could explain why grades are not a good indication of creativity.(60:378) Getzels and Jackson (36) and Torrance (91) reported that teachers tend to prefer students with high intelligence and to not prefer students who are more creative and, therefore, exhibit more highly developed divergent thought processes. Attitudes and motivating factors must be

considered if learning is to be most efficient for students with all levels of creative thinking abilities.

Conformity pressures, the pressures to be accepted by the group, are greatest among individuals with certain personality traits; however, these pressures are not conducive to creative thinking.(41:121) When conformity pressures are high, "the solution of the problem itself becomes of secondary relevance."(41:125) In such a situation, obtaining approval from the group becomes the item of utmost concern. Crutchfield cited conformity pressure as an inhibiting influence upon an individual's ability to face reality and said that losing touch with reality is the death knell for creative thinking.(41:120) Those people who can be labeled conformists have "tendencies toward rigidity of cognitive processes and poverty of ideas," and they have "a more rigid and authoritarian outlook."(41:132) Such statements indicate that conformist tendencies can be detrimental to creative thought.

Getzels and Jackson recognized that some individuals, being more imaginative and nonconventional, are more perceptive than others to intuitive interpretations; but they said that this difference is not a measure of intelligence.(36:31-33) Guilford emphasized that an understanding of the domain of creativity must penetrate beyond the limits of intelligence as measured by standard I.Q. tests.(43:445) Likewise, Getzels and Jackson (36), Torrance (92), and Massialas and Zevin (64) emphasized the idea that intelligence and creativity are not synonymous. Torrance stated that "the learning procedures of highly creative children are quite different from those with high I.Q.'s and without high creative thinking ability."(93:7)

Yamamoto (101) conducted a study with high school students in order to measure the effect of creative thinking and intelligence upon high school achievement. The findings supported earlier studies by Getzels and Jackson (36) and Torrance (93). The study revealed no correlation between intelligence measurements and creativity; and, even though there was a twenty-point difference in the scores of the high intelligence and the high creativity groups on the instrument measuring I.Q., there were no significant differences in the achievement scores.(101:783,788) This study and earlier ones indicate that creative individuals are not handicapped in achievement, but they also show that creative students may prefer to learn in more creative ways. (91:12)

A study conducted by Torrance revealed that students with high creativity achieved as well as students with high I.Q.'s; and the more creative ones learned by asking questions, exploring, and inquiring. (93:92) Another study by Torrance reported that graduate students who scored high on tests of creative thinking "develop original ideas in the content area of the course and make more creative applications of knowledge than do their less creative peers."(95:673) These studies by Torrance suggest that creative individuals may have preferences for learning styles and that their preferred ways of learning may call for different types of situations from those found in the average classroom.

MacDonald and Raths (59) constructed a series of curriculum tasks varying in frustration and openness of structure. They found that the children who were more creative, as measured by the Torrance Test of Creative Thinking, were also more productive with the frustrating tasks; and the less creative children reacted more favorably to closed tasks.

This study showed that students with varying degrees of creativity react in a different manner to various tasks and, therefore, may be taught best by a variety of procedures.(59:140-141)

Long and Henderson (57) undertook a study to see if highly creative children would be better able to withstand uncertainty and to resist premature closure. The results yielded the information that the more creative youngsters were better able to withhold opinions when the data were inadequate, to withstand the state of indecision and to resist premature closure.

In a study comparing a group of children high in intelligence with a group high in creativity, Getzels and Jackson (36) found the following to be true. The high creative individuals were less stimulus-bound than were those pupils in the high intelligence group.(36:50) They also found that creative students demonstrated more willingness to take intellectual risks without fearing the social consequences. (36:50-52) An additional finding was that the more creative children tended to favor divergent modes of thought but that the high I.Q. students showed a tendency to favor convergent modes of thought.(43:51) These results point to the differences which can be seen in the reactions of individuals to various learning situations. Studies of the nature of creative thought and the learning process indicate that persons scoring high on creativity measures can learn effectively; however, there appear to be differences in the way that people learn, suggesting that some individuals may learn more economically and effectively from an authority figure while others may respond best to methods which encourage creative thinking.

At the present time, the problems and possibilities of nurturing creative thinking in education are very difficult and obscure since much is still unknown in this area.(100:14) Rogers expressed concern that the schools are graduating conformists "whose education is 'completed,' rather than freely creative and original thinkers."(1:69) He stressed the idea that to foster creative thinking in the classroom there must be both psychological safety and psychological freedom. (1:78-80) In order to encourage creative thinking, Williams stated that the teacher must provide a variety of experiences which will allow the student to gain intellectual persistence in the manipulation of ideas and to prepare him to resist premature closure in decision making as well as in making generalizations and in solving problems.(100:15) Opportunities must be provided in which students can use the higher mental processes.(100:15) Whether creative thinking can be taught is still a debatable topic due to the limited research; however, the above suggestions were offered by educators who are desirous of seeing that creative thinking is not squelched in the public schools.(1:178)

Benne stressed the idea that the conditions conducive to releasing and enhancing creative capabilities are of utmost importance to teachers who want to encourage creative thinking.(28:19) Keeping in mind that much of the creative phase of effective thinking is attitudinal, Kurfman stated that relevant attitudes should be appraised in light of the total learning experience.(28:240-241) Torrance offered the idea that varying procedures could be used effectively in learning situations because different curriculum tasks vary in their appeal to students with varying levels of creativity.(95:678) Commenting further on individual differences, Torrance observed that:

> Whenever teachers change their ways of teaching in significant ways, a different group of learners become the stars or high achievers. This advance has far-reaching implications for educating a larger number of people to a higher level and for achieving a higher level of dignity and mental health in our society.(95:678)

Pupils learn best when opportunities are provided which are well suited to their motivation and abilities.

Evidence indicates that man can learn creatively; in fact, Torrance has stated that "man fundamentally prefers to learn in creative ways - by exploring, manipulating, questioning, experimenting, risking, testing, and modifying ideas."(91:12) The principal reason Torrance gave for his interest in developing creative thinking measures is that such instruments offer promise for finding a means of providing a basis for individualized instruction.(95:667) He added that "since abilities constitute, at least to some extent, the basis of needs and motivations, knowledge about a person's creative thinking abilities frequently provides clues about differential preferences for ways of learning."(95:667) Knowledge concerning an individual's creative thinking abilities can offer valuable information concerning personal preferences for ways of learning, allowing instruction to be individualized in meaningful ways. If, indeed, the creative individual is more open-minded, there are important implications for individualizing instruction.

Critical Thinking

Critical thinking, one component of effective thinking, is an educational goal which is widely accepted among educators; yet many questions remain concerning the development of critical thinking

skills.(31:335) There is apparent agreement among social scientists that the ability to think critically about political, social, economic, and ethical issues is a desirable educational goal (70:476); however, there is limited evidence that students are developing critical thinking skills in the classroom.(31:335)

There are several reasons why young people are not taught to think critically. Foremost among the reasons is the fact that there is little agreement upon the term critical thinking; therefore, there is no concensus concerning how to teach critical thinking.(38:329) The term itself is vague, and this vagueness raises the question as to the compatibility of critical thinking and citizenship.(38:329) Selakovich offered the following five reasons why the schools have encountered difficulties in efforts to teach critical thinking.(81:268-272) They are the tradition-bound curriculum, tradition-bound teachers, an atmosphere of fear and repression, a lifetime of drill on nonfunctional knowledge, and the lack of adequate materials. These factors make it difficult for teachers to implement the objective of teaching students to think critically. A study by Fox revealed that 9.3 percent of the teachers in the sample reported that they had insufficient time to teach students to analyze, interpret, and evaluate information.(31:335) Another major reason why success in the teaching of critical thinking has been limited is the fact that research has been scarce and the findings have been inconclusive.(83:13) There are several factors which account for the scant research, and they include the scarcity of trained research personnel to work in this area and a lack of time and money resources for such research.(82:154) A further complicating factor is the value dilemma, which is crucial to the selection of

content to be used in any experiment designed to delve into the question of critical thinking.(82:156-163) Another factor to be considered is that the measuring devices for critical thinking have not been adequate.(82:154) It is questionable if the paper and pencil tests actually measure reactions in real situations, for they do not resemble actual conditions in decision making.(68:184) Considering all of the above factors, it can be seen that there have been several obstacles in the path of classroom teachers and research personnel interested in the development of critical thinking abilities.

One of the difficulties has been that there is great divergence in what is meant by critical thinking.(52:314) Some educators have used the term critical thinking interchangeably with inquiry skills, reflective thinking, or problem solving.(29:11)(81:262) Also critical thinking has been equated with logical analysis.(38:329) Others have said that critical thinking involves taking a critical and analytical approach toward issues.(97:529) Selakovich defined critical thinking as "the ability to comprehend something in a way that is useful."(82:145) Ennis has said that basically critical thinking is "the correct assessing of statements."(26:83) Kemp described critical thinking as involving five abilities; and they are the abilities to define a problem, to select pertinent information, to recognize unstated assumptions, to formulate and select relevant and promising hypotheses, and to draw valid conclusions and to judge the validity of inference.(53:321) The importance of critical thinking skills in inquiry lies in testing the soundness of generalizations, explanations, and predictions; thus, they are not restricted to the stage of hypothesis

testing, for there is need to question the clarity and the relevance of hypotheses.(28:237) The numerous definitions of critical thinking complicate the task of the teacher and researcher, but they do not negate the importance of critical thinking skills. As Kemp has said, in the rapidly changing society of the twentieth century, "improvement in critical thinking is an urgent necessity."(53:321)

Shaver, after reviewing the available research on critical thinking, concluded that teachers who want to foster critical thinking in the classroom cannot expect these skills to develop as an indirect result of studying the usual content; and he said that it is essential to use materials designed specifically to develop critical thinking skills.(83:14) He stated that research offers little solid evidence as to the relative effectiveness of different methods of teaching those skills, and he suggested that teachers should determine the concepts and skills which they deem to be most important and teach them explicitly.(83:16)

Research by Herber (47), Rothstein (78), Kemp (53), Eisele (25), Massialas (62), and Henderson (46) revealed that critical thinking skills can be sharpened; but improvement will occur only if a concentrated effort is made to encourage the development of critical thinking skills. Eisele commented that there is greater change in critical thinking skills when the teacher has formulated critical thinking objectives.(25:2726A)

Rothstein (78), using two groups of eleventh grade students in American history classes, conducted a study over a thirty-five week period to see if there would be any significant differences between the experimental group which had concentrated emphasis upon critical

thinking and the control group which used a more conventional curriculum. He found that the experimental group gained significantly on critical thinking, but the control group did not show significant improvement.(78:1141) The study also revealed that both groups acquired the same amount of information, but there was no correlation between critical thinking ability and the information test.(78:1141) The implication of this study is that, if the student is directed and encouraged, he can make gains in his ability to think critically.

Although there has been wide-spread endorsement of critical thinking objectives, there has been doubt expressed concerning the level of achievement of classes when critical thinking or inquiry skills are emphasized. A study by Massialas indicated that students engaged in reflective inquiry learned as much information as students taught by the traditional method while at the same time increasing their critical thinking skills.(62:32) Cox reported that achievement was significantly greater for students engaged in a problem-solving approach to controversial issues than for students using the traditional approach. (18:137) Such research has offered evidence that critical thinking skills can be developed without sacrificing achievement in the conventional subject matter.(46:281-282)

Lee (55) conducted a study with junior high students to see if those who were engaging in problem solving would differ from those in traditional classes. She concluded that there was no loss of factual information when problem solving skills were stressed, but she noted that students without instruction did not show gains in problem solving skills.(55:3367A)

Henderson (46) conducted a two-year study with high school students. The first year was devoted to the development of materials, and during the second year experimental classes used the new materials and control classes used a more traditional approach. The results stated that there was no significant difference on achievement tests designed to measure conventional subject matter.(46:282) However, with regard to critical thinking, the findings were mixed. The experimental group scored significantly above the control group on the Watson-Glaser Critical Thinking Appraisal, but the difference in the scores on the American Council on Education Test of Critical Thinking was not significant.(46:281-282) On a free response test constructed by the researchers, the experimental group had scores that were significantly higher than those for the control group.(46:282) The final conclusion was that it is possible to be effective in the teaching of critical thinking.

Research by Oliver and Shaver (68) was concerned with comparing socratic and recitation methods as possible vehicles for the teaching of critical thinking. Using standardized tests, the results yielded no significant differences.(68:301) However, they did find significant differences on tests designed for the project with the students in the experimental classes making the higher scores.(68:301)

Related to the above research is a study by Wallen, Haubrich, and Reid (97). They reported mixed evidence that revisions in the curriculum which were designed to foster critical thinking actually accomplished that goal.(97:535)

Interest has been expressed in the change in critical thinking skills at various levels of the educational scale, including changes

which are possible once a student is in college. From a study at Michigan State University, Dressel and Lehmann reported that changes in critical thinking skills were evidenced each year of college with the greatest changes occurring during the freshman year.(23:254)

Gilbert (37) did a study which looked at the relationships between creativity, critical thinking, and performance in the social studies classroom. She found a significant correlation between the total creativity score and the critical thinking score.(37:1906) In addition, the study revealed that there was a significantly greater relationship between creativity and achievement than between creativity and teacher grades.(37:1906) This research suggests that, when intelligence is held constant, individuals who score high on creativity measures may also obtain high scores on instruments designed to measure critical thinking.

Since critical thinking is considered to be a goal of education, concern has been expressed concerning factors which may inhibit or enhance the development of critical thinking skills. In a consideration of the relationship between the cognitive and affective domains, Ennis hypothesized that there is probably a negative correlation "between the degree to which a personality is authoritarian and the logical dimension."(26:108)

In order to assess the relationship between open- and closed-minded individuals and their abilities to think critically, Quinn (72) conducted a study of secondary students in public and Catholic schools. He found that the rank of the students on open-mindedness, as measured by Rokeach's Dogmatism Scale, was in the following order: Protestants, Jews, public school Catholics, and parochial school Catholics. Using

the Watson-Glaser Critical Thinking Appraisal, the students ranked from high to low in critical thinking in the following order: Protestants, Jews, parochial school Catholics, and public school Catholics.(72:2789) This study indicates a relationship between the degree of dogmatism and the ability to think critically.

Using a sample of five hundred college freshmen, Kemp(52) investigated the relationship between open- and closed-minded students and their abilities to think critically. His research revealed that closed-minded subjects were less successful on a test of critical thinking than were the more open-minded ones.(52:317) Later Kemp (53) did a study to see if there was any improvement in critical thinking for those high as opposed to those who were low in dogmatism. This study was done with eighty college freshmen who were divided into experimental and control groups. The result was that open-minded students in the experimental section showed more marked improvement in critical thinking than did those with more closed minds, and no one in the control group showed significant improvement in critical thinking. Kemp drew the following three conclusions from this study.(53:322) First, it is not likely that critical thinking will improve in the usual classroom situation. Secondly, when conditions were favorable, open-minded students improved more than did the closed-minded students. Last, Kemp said that working in permissive small groups and providing intensive practice would be conducive to the development of critical thinking skills. Small group situations minimize any threats to the individuals involved in new or different learning experiences. Kemp stated that his research "assumes a dynamic relationship between the personality and the way the person thinks."(51:10) A consideration of

this statement points to the influence of affective factors upon critical thinking.

Research which has been done on critical thinking reveals mixed results, yet there are certain trends. In general, the research has indicated that a definite emphasis upon critical thinking can develop the requisite skills and still maintain the same level of achievement in relation to traditional content. Also there is some evidence that there may be a relationship between the degree of dogmatism and a person's ability to think critically. In regard to this possible relationship, Massialas and Cox examined studies by Rokeach and Kemp and made the following statement:

> These studies appear to indicate that some mental attitudes of the learner, which he can, perhaps, control but little and his teacher not at all, are simultaneously crucial to learning and impervious to methodological strategies. The implications of these findings are most destructive when social studies is seen as emphasizing analysis, synthesis, and critical thinking. Kemp's conclusion that low-threat, small-group situations may offer ways to deal with these factors is at least hopeful. (63:81)

Theoretical Framework

The review of the literature has shown that critical thinking requires analytical skills, including deduction and interpretation of evidence. In regard to creative thinking, it was suggested that important aspects of this ability are flexibility, fluency, and originality. The literature further indicated that open- and closed-minded individuals are distinctly different in the critical and creative thinking skills which they exhibit in various learning situations.

Kurfman stressed that critical thinking and creative thinking are the two identifiable aspects of effective thinking. Based upon Kurfman's statement, it would be feasible to obtain a functional measure of effective thinking by using two instruments, each with subscales appropriate for assessing critical thinking and creative thinking abilities. A search of the literature revealed that instruments designed by Watson and Glaser and Torrance would be the most appropriate ones available. Therefore, a combination of creative thinking and critical thinking scores would comprise a functional measure of effective thinking.

Since there are relationships between dogmatism and critical thinking and between dogmatism and creative thinking, then it follows that there should be a relationship between dogmatism and effective thinking. By using a composite score for effective thinking, one consisting of creative and critical components, one should find it possible to examine the relationship between dogmatism and effective thinking.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

This study was planned as exploratory research into the relationship between dogmatism, a personality variable, and effective thinking, a cognitive variable which encompasses both creative and critical thinking. The design of the study called for the expression of creative and critical thinking skills at two different times with a four-month interval between the administration of the tests. The pre-test and post-test situations were provided in order to determine if there would be a difference in the effective thinking skills exhibited by open- and closed-minded individuals on two separate occasions. The particular class used was not a critical factor in the study since it should be possible to study the relationship between dogmatism and effective thinking in any group in which there is a range of scores indicating open- and closed-mindedness.

Hypotheses

Based upon the search of the literature and the rationale developed in the preceding chapters, the following null hypotheses are presented.

H. I. Open- and closed-minded individuals do not differ significantly in their effective thinking scores.

H. $I._1$ Open- and closed-minded individuals do not differ significantly in their critical thinking scores.

H. $I._2$ Open- and closed-minded individuals do not differ significantly in their deductive reasoning scores.

H. $I._3$ Open- and closed-minded individuals do not differ significantly in their interpretation of data scores.

H. $I._4$ Open- and closed-minded individuals do not differ significantly in their creative thinking scores.

H. $I._5$ Open- and closed-minded individuals do not differ significantly in their fluency scores.

H. $I._6$ Open- and closed-minded individuals do not differ significantly in their flexibility scores.

H. $I._7$ Open- and closed-minded individuals do not differ significantly in their originality scores.

H. II. There is no significant difference between the pre-test and post-test scores on effective thinking.

H. $II._1$ There is no significant difference between the pre-test and post-test scores on critical thinking.

H. $II._2$ There is no significant difference between the pre-test and post-test scores on deductive reasoning.

H. $II._3$ There is no significant difference between the pre-test and post-test scores on interpretation of data.

H. $II._4$ There is no significant difference between the pre-test and post-test scores on creative thinking.

H. $II._5$ There is no significant difference between the pre-test and post-test scores on fluency.

H. $II._6$ There is no significant difference between the pre-test and post-test scores on flexibility.

H. $II._7$ There is no significant difference between the pre-test and post-test scores on originality.

H. III. The results of the effective thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_1$ The results of the critical thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_2$ The results of the deductive reasoning scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_3$ The results of the interpretation of data scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_4$ The results of the creative thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_5$ The results of the fluency scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_6$ The results of the flexibility scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

H. III.$_7$ The results of the originality scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

Description of the Sample

The subjects in this study included all of the undergraduates enrolled in History 4183-1 at Oklahoma State University during the fall semester of 1969. The course, offered by the history department and

taught by Dr. Charles Dollar, was entitled U. S. Since World War I - the Contemporary Scene. Three graduate students were enrolled in the course, but they were eliminated from the study because their course requirements differed from those of the undergraduates. The sample included twenty-five male and twelve female students. Twenty-three of the subjects were seniors, thirteen were juniors, and one was a sophomore. A complete listing of all demographic data collected on the students is presented in Appendix A.

Methodology

Instrumentation

The Dogmatism Scale, Form E, is one of three instruments used in this study. The Dogmatism Scale is a general measure of the degree to which a person's "total mind is an open or closed one," for this instrument was designed to measure the degree of open-mindedness and closed-mindedness.(77:397) It has been developed to identify open and closed belief systems. This scale consists of forty Likert-type items. It focuses upon the structure rather than upon the content of the belief system, emphasizing how people believe rather than what they believe. The range of possible scores on this scale extends from forty to two hundred and eight. The higher the score is, the more closed-minded the individual is.

The Dogmatism Scale, Form E, which has been standardized for adults, was revised five times.(77:73) These revisions were made in an effort to increase the reliability of the instrument. The reliability coefficients on the revised measure were obtained using a test-

retest situation with five to six months between testing, and they have ranged from .68 to .93.(77:89) Costin found that there was no significant change in mean score on the Dogmatism Scale when the test was given at two different times.(15:186) Item analysis has shown that there is a consistent and statistical difference between high and low dogmatic individuals on a majority of the items.(77:90)

Peabody has criticized the Dogmatism Scale and other authoritarian measures on several counts.(69:11) These instruments score every item in the same direction, allowing agreement bias to be shown over the scale as a whole. Such a response tendency, according to Peabody, is apt to be revealed when the subject is uncertain of a response. In addition, Peabody charged that ambiguous items are deliberately used to make agreement bias likely on the separate items; however, the writer gave no examples of this purported ambiguity. Furthermore, Peabody said that authoritarian scales measure simple-mindedness more than they do authoritarian ideologies.

In response to Peabody's charges, Rokeach said that it is hard to imagine that so many theoretically generated hypotheses as have been tested using the Dogmatism Scale could have been supported merely within the framework of such a response bias.(75:354) He further cited numerous studies which revealed differences in the various measures of authoritarianism; and he stated that the response bias interpretation of authoritarian measures cannot be reconciled with substantive findings, especially studies showing that the Dogmatism Scale is a measure of general authoritarianism while the F Scale is a measure of right-authoritarianism.(75:354) Rokeach also emphasized that three years had been spent trying to make the items unambiguous; and, if they are

still ambiguous, it is despite efforts to make them otherwise.(75:350) Furthermore, Rokeach said that Peabody gave no independent evidence of ambiguity on the Dogmatism Scale.(75:350)

A second instrument used in this study is the Torrance Test of Creative Thinking. This instrument, developed by Torrance and his associates at the University of Minnesota, was designed to measure creative thinking abilities; and, defined by Torrance, creative thinking is:

> ...a process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on: searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.(96:6)

Thus, Torrance's definition of creative thinking is a description of "a natural human process."(96:6) Such a definition enables the researcher to begin to define abilities, mental functioning, and personality characteristics in operational terms.(96:7)

The format of the instrument consists of seven tasks or activities, each of which is presented in a form which allows for the formation of an open-ended answer. In this way there is an opportunity for each individual to create his own responses. The tests are constructed in such a way that they can be used with students in kindergarten through graduate school. The seven tasks are entitled: "asking," "guessing causes," "guessing consequences," "product improvement," "unusual uses," "unusual questions," and "just suppose." Torrance stated that asking and guessing are activities which are the very essence of creative thinking.(96:10) The person has an opportunity to sense problems or gaps in information and to respond accordingly. Furthermore, "guessing

causes" and "guessing consequences" allow for hypothesizing concerning cause and effect as these activities entail supplying possible causes for the problems they sense. With the "unusual uses" and the "unusual questions" activities, the person has to overcome mental sets in order to produce responses. The "just suppose" activities requires the individual to elicit spontaneous responses. Individual parts of the test are timed with forty-five minutes being allowed for taking the entire test; and each of the tasks is based on a rationale developed from research results concerning the nature of the creative process, the creative personality, or the requisite conditions for creative achievement.(95:670)

Each of the tasks is designed to assess the products in the terms of Guilford's divergent thinking factors which include fluency, flexibility, originality, and elaboration.(96:9) Fluency scores are obtained by counting the number of relevant responses to the various tasks. A flexibility score is a measure of the number of shifts in thinking and the number of different approaches used. Originality, a third trait of creative thinking, is scored according to the novelty and unusualness of the response. The fourth trait is elaboration, but Torrance did not recommend using this score for research purposes. (96:72) Therefore, fluency, flexibility, and originality are the three subscales which have been used for statistical analysis in this study.

Reports are given of several test-retest validity studies using the Torrance Test of Creative Thinking, only two of which involved college students. Sommers obtained reliability coefficients of .97 and .80 for two different samples while Yamamoto found a .83

correlation for fluency in one of his studies.(96:21-22) In an attempt to insure content validity, Torrance emphasized that a definite effort had been made to keep the tests free of technical or subject matter content.(96:24) Also a deliberate effort was made by Torrance and his associates to see that the test tasks, instructions, and scoring procedures are in accord with the theory and research which are available; in this way Torrance endeavored to maintain content validity.(96:24)

There have been some questions raised as to the very nature of Torrance's definition of creative thinking. Ausubel voiced objections to the definition because it does not distinguish between creativity and a host of generalized intellectual abilities, personality characteristics, and problem-solving traits.(95:664) Others have upheld the idea that creativity is a term which should be reserved for artists, writers, and musicians.(95:665)

Torrance has countered both of these criticisms, saying that creative thinking is a broad term which encompasses all types of creative activities, certainly including art, music, and literature.(96:8) He also stressed that precedent has been established by others who have referred to creativity as generalized intellectual abilities, personality characteristics, and problem-solving traits.(96:7) Such a definition is useful for Torrance's purposes, for he maintains an active interest in finding a basis for differentiating instruction for different students.(96:9)

Barron has reported criticisms of tests of creativity, and they are based on the following three points.(2:362) First, they are superficial; therefore, they do not bring out true creativity as actual

creative tasks do. Second, they measure only fragments of creativity. Third, the fact that such tests are timed is not in keeping with the very nature of creativity. These three criticisms apply to other instruments designed to measure creative thinking as well as to the Torrance Test of Creative Thinking.

The third instrument utilized in this study is the Watson-Glaser Critical Thinking Appraisal. The purpose of this instrument is to provide situations and problems which elicit the application of abilities required in critical thinking. Watson and Glaser defined critical thinking as an ability which includes an attitude of wanting evidence to support ideas, knowledge of the methods of logical inquiry, and skill in using this attitude and knowledge.(98:8) Such a definition of critical thinking does not put it into opposition to creative thinking; in fact, the two aspects of thinking are viewed by Watson and Glaser as complementary.(98:8-9)

The test of critical thinking was originally published by Watson and Glaser in 1942, and it was known as the Watson-Glaser Test of Critical Thinking. In 1956 this instrument was revised; the revised measure includes ninety-nine items distributed over five subtests, all of which are designed to measure specific analytical thinking skills. The five subtests measure abilities to infer, to recognize assumptions, to reason deductively, to interpret data, and to evaluate arguments. Only subtests three and four, deductive reasoning and the interpretation of data, have sufficiently high reliability coefficients to warrant their separate use as subscales of the test.(98:5) As a result, the only subtests in this study which were treated individually in the statistical analysis were subtests three and four.

Reliability for the Watson-Glaser Critical Thinking Appraisal was determined using both the split-half and the inter-form methods for several different groups. For adults the reliability coefficients which were reported were .93 and .95, and for college sophomores they were .84 and .91.(98:9)

The Watson-Glaser Critical Thinking Appraisal has been criticized primarily on two counts. Ennis said that the test gives too high a score to the pathological or chronic doubter.(27:158) A second criticism was made by Rust who stated that this test is highly loaded with a general reasoning factor.(79:180) She suggested that the subtests are measuring general reasoning rather than the skills which they are purported to measure.(79:181) Rust concluded that critical thinking abilities may involve many unique abilities and items of knowledge; and, on the basis of the evidence, it is difficult to say that the Watson-Glaser Critical Thinking Appraisal and other critical thinking tests are good or poor.(79:181)

Method of Procedure

During the first week of the fall semester, Rokeach's Dogmatism Scale, Form E, and the pre-test battery of the Torrance Test of Creative Thinking and the Watson-Glaser Critical Thinking Appraisal were administered to the subjects in this study. Since the Dogmatism Scale is not published commercially, a copy of this instrument was included as Appendix B. At the close of the semester, post-tests consisting of equivalent forms of the Torrance Test of Creative Thinking and the Watson-Glaser Critical Thinking Appraisal were given to the

subjects. The Dogmatism Scale and both forms of the Watson-Glaser Critical Thinking Appraisal were hand scored by the author. In order to obtain greater scoring reliability, both forms of the Torrance Test of Creative Thinking were sent to the publisher, Personnel Press, Inc., to have them scored by a trained personnel. A summary of all the test scores can be found in Appendix C.

Although the particular course is not crucial to the design of the study, the course in which all of the subjects were enrolled is described in order to furnish information about the classroom experiences which were common to all the subjects during the semester. The organizational structure of the course included both lecture sessions and discussion groups. In order to facilitate discussion, the class was divided into three sections which met separately with the professor on the average of once a week. The two remaining hours each week were spent with the entire class meeting for lectures. It should be noted that the schedule was flexible with discussion hours being called when they seemed appropriate.

The small-group sessions gave an opportunity to discuss inquiry and to provide the background for computer-assisted inquiry activities. In this study, computer-assisted inquiry was a mode of instruction which utilized the computer for rapid data retrieval. Although students did not have direct access to the computer via a console, they did benefit from the speed of the computer in data retrieval, for they were freed of the time-consuming task of securing their own data to test their hypotheses.

At the beginning of the semester attention in the discussion groups was focused upon the method of inquiry. Students were given a

list of student expectations or objectives. (See Appendix D.) The formulating and testing of hypotheses were discussed as well as were the identification of significant variables and the interpretation of data. Steps of inquiry were presented to provide an overall framework for the inquiry activities but not as a rigid structure to follow.

The students participated in three major inquiry activities during the semester. The first project dealt with immigration in the 1920's and the 1930's. Voting records, party platforms, and demographic data provided springboards for hypothesizing. The second activity concerned the New Deal coalition and the realignment of the political parties in the 1920's and the 1930's. Roll call, election, and demographic data were provided for the states of Michigan, New York, and Nebraska. The last inquiry project centered around data from the Survey Research Center at the University of Michigan. These current data provided the bases for hypothesizing on current political, social, and economic issues.

Inquiry was not completely open nor was it totally directed, for the students had the opportunity to develop any problems and to engage in inquiry activities within the limits of the data available. The purpose of providing the data was to enable the student to engage in several inquiry activities during the semester, and the computer printout allowed the student to skip the time-consuming task of gathering data to test the hypotheses he generated. The data provided for each of the three inquiry activities offered numerous possibilities for hypothesizing, and the student was free to set up his own problem. The individual could use as many variables as he felt were relevant to his hypothesis. Therefore, the student was able to work in an

inquiry-oriented situation with the only limits being set by the data available to test his hypotheses.

Method of Statistical Analysis

Analysis of variance was employed to consider all of the hypotheses in this study. A two-factor mixed design appropriate for repeated measures on one factor was used. Three basic questions were investigated using analysis of variance. Was there a significant difference between the overall effective thinking scores for open- and closed-minded individuals? Was there a significant difference in the pre-test and the post-test scores in effective thinking? Was there a significant interaction between the particular test (pre-test or post-test) and the type of individual (open-minded or closed-minded)? These same three questions were considered for creative thinking and critical thinking as well as for the subscores. In each case, the analysis of variance was the statistical tool used.

When it was deemed appropriate, an independent t-test was run to test for significant difference between the open-minded and closed-minded individuals on effective thinking scores as well as for each of the scores and subscores considered in this study. Also when it was considered appropriate, a t-test for correlated scores was employed to test for significant differences between the pre-test and the post-test scores for open-minded and for closed-minded individuals.

In order to establish the open-minded and the closed-minded groups, the students were ranked in the order of their scores on the Dogmatism Scale. The median score was taken out of the study, leaving eighteen individuals in each group. The eighteen subjects with the highest

dogmatism scores were labeled closed-minded and the eighteen with the lowest dogmatism scores were called open-minded.

Limitations of the Study

Whenever the design of a study calls for a pre-test and a post-test using the same instrument, there is a danger that the initial exposure to the instrument will influence the responses obtained on the post-test.(12:179) While there is a possibility of sensitization to the instruments used, the semester interval between the initial and the final administration of the tests should be a sufficient period of time to reduce the significance of instrument sensitization in this study.

A second limitation is related to the fact that this was a pilot study. As a result, inference will be limited by the size and the nature of the population. The study is exploratory research into the relationship of dogmatism and effective thinking, and it is not intended as an investigation of the influence of these variables upon any given methodology.

A third limitation is related to the type of testing. Certain limitations are imposed upon the study by the very nature of using verbal tests to measure creative thinking and critical thinking abilities. This problem was considered in the discussion of the instruments.

Furthermore, the size of the population prohibited using the more extreme scores on the Dogmatism Scale as a means of dichotomizing the group into open-minded and closed-minded individuals.

CHAPTER IV

RESULTS OF THE STUDY

This study is an exploratory investigation of the relationship of dogmatism and effective thinking. The results of the statistical analysis of the three main hypotheses and the twenty-one subhypotheses are reported in this chapter. The principal statistical tool used was the analysis of variance. When it was deemed appropriate, an independent t-test or a t-test for correlated scores was used.

For convenience of the reader, the tables and figures are placed close to the text to which they refer most directly, making it necessary only occasionally to refer to another portion of the explanation. The F tables are shown with the analysis of the first hypothesis, the mean tables are interspersed with the text amplifying the second hypothesis, and the interaction figures are placed with the explanation of the third hypothesis.

H. I. Open- and closed-minded individuals do not differ significantly in their effective thinking scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall effective thinking scores between subjects classified as open-minded and those classified as closed-minded ($F < 1$ with 1 and 34 df).

TABLE I

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST EFFECTIVE THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	14,165.22	71			
Between Subjects	11,875.42	35			
Dogmatism	33.88	1	33.88	0.10	N.S.
Error	11,841.54	34	348.28		
Within Subjects	2,289.82	36			
Test	2.10	1	2.10	0.04	N.S.
Dogmatism x Test	588.99	1	588.99	11.79	$p < .005$
Error	1,698.72	34	49.96		

The F value for significance at the .005 level with 1 and 34 degrees of freedom is 9.05.

$H. I._1$ Open- and closed-minded individuals do not differ significantly in their critical thinking scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall critical thinking scores between subjects classified as open-minded and those classified as closed-minded ($F < 1$).

TABLE II

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST CRITICAL THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	7,567.20	71			
Between Subjects	6,571.28	35			
Dogmatism	150.22	1	150.22	0.80	N.S.
Error	6,421.05	34	188.85		
Within Subjects	995.93	36			
Test	180.50	1	180.50	7.74	$p < .01$
Dogmatism x Test	22.22	1	22.22	0.95	N.S.
Error	793.21	34	23.33		

The F value for significance at the .01 level with 1 and 34 degrees of freedom is 7.44.

$H. I._2$ Open- and closed-minded individuals do not differ significantly in their deductive reasoning scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall deductive reasoning scores between subjects classified as open-minded and those classified as closed-minded ($F = 1.16$).

TABLE III

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST DEDUCTIVE REASONING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	746.31	71			
Between Subjects	641.82	35			
Dogmatism	21.13	1	21.13	1.16	N.S.
Error	620.69	34	18.26		
Within Subjects	104.50	36			
Test	5.01	1	5.01	1.72	N.S.
Dogmatism x Test	0.13	1	0.13	0.04	N.S.
Error	99.36	34	2.92		

$H. I._3$ Open- and closed-minded individuals do not differ significantly in their interpretation of data scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall interpretation of data scores between subjects classified as open-minded and those classified as closed-minded ($p < 1$).

TABLE IV

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST INTERPRETATION OF DATA SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	842.87	71			
Between Subjects	571.38	35			
Dogmatism	1.13	1	1.13	0.07	N.S.
Error	570.25	34	16.77		
Within Subjects	271.49	36			
Test	51.68	1	51.68	8.11	$p < .01$
Dogmatism x Test	3.13	1	3.13	0.49	N.S.
Error	216.69	34	6.37		

The F value for significance at the .01 level with 1 and 34 degrees of freedom is 7.44.

$H. I._4$ Open- and closed-minded individuals do not differ significantly in their creative thinking scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall creative thinking scores between subjects classified as open-minded and those classified as closed-minded ($F = 1.97$).

TABLE V

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST CREATIVE THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	159,114.69	71			
Between Subjects	121,908.86	35			
Dogmatism	703.12	1	703.12	1.97	N.S.
Error	121,205.74	34	3,564.87		
Within Subjects	37,206.05	36			
Test	1,540.11	1	1,540.11	1.90	N.S.
Dogmatism x Test	8,043.33	1	8,043.33	9.90	$p < .005$
Error	27,622.62	34	812.43		

The F value for significance at the .01 level with 1 and 34 degrees of freedom is 7.44.

$H_0 E_5$ Open- and closed-minded individuals do not differ significantly in their fluency scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall fluency scores between subjects classified as open-minded and those classified as closed-minded ($F < 1$).

TABLE VI

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST FLUENCY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	35,004.85	71			
Between Subjects	28,392.48	35			
Dogmatism	378.12	1	378.12	0.46	N.S.
Error	28,014.36	34	823.95		
Within Subjects	6,612.38	36			
Test	4.01	1	4.01	0.02	N.S.
Dogmatism x Test	728.35	1	728.35	4.21	$p < .05$
Error	5,880.02	34	172.94		

The F value for significance at the .05 level with 1 and 34 degrees of freedom is 4.13.

$H. I._6$ Open- and closed-minded individuals do not differ significantly in their flexibility scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall flexibility scores between subjects classified as open-minded and those classified as closed-minded ($F < 1$).

TABLE VII

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST FLEXIBILITY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	8,774.55	71			
Between Subjects	6,977.61	35			
Dogmatism	128.00	1	128.00	0.64	N.S.
Error	6,849.61	34	201.46		
Within Subjects	1,796.94	36			
Test	193.39	1	193.39	4.25	$p < .05$
Dogmatism x Test	56.89	1	56.89	1.25	N.S.
Error	1,546.67	34	45.49		

The F value for significance at the .05 level with 1 and 34 degrees of freedom is 4.13.

$H_{0}I._{7}$ Open- and closed-minded individuals do not differ significantly in their originality scores.

The obtained F value for this hypothesis was found to be an insignificant statistic. There was no significant difference in the overall originality scores between subjects classified as open-minded and those classified as closed-minded ($F < 1$).

However, when only post-test scores were considered, a t-test revealed that the closed-minded subjects achieved significantly higher originality scores than did the open-minded individuals ($p < .05$). This may be seen more clearly in Table XVI.

TABLE VIII

THE ANALYSIS OF VARIANCE OF PRE-TEST AND POST-TEST ORIGINALITY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

Source of Variation	Sum of Squares	df	Mean Squares	F	Significance Level
Total	29,241.82	71			
Between Subjects	15,104.94	35			
Dogmatism	22.22	1	22.22	0.05	N.S.
Error	15,082.72	34	443.61		
Within Subjects	14,136.89	36			
Test	2,664.49	1	2,664.49	10.68	$p < .005$
Dogmatism x Test	2,990.23	1	2,990.23	11.99	$p < .005$
Error	8,482.17	34	249.48		

The F value for significance at the .005 level with 1 and 34 degrees of freedom is 9.05.

H. II. There is no significant difference between the pre-test and post-test scores on effective thinking.

The null hypothesis was accepted, for analysis of variance yielded an insignificant F value. There was no significant difference in the overall effective thinking scores on the pre-test and the post-test ($F < 1$).

When a t-test for correlated scores was employed, it was revealed that the open-minded individuals dropped significantly in effective thinking scores from the pre-test to the post-test ($p < .05$). (See Table IX.)

When closed-minded subjects were considered, a t-test for correlated scores showed that they raised their effective thinking scores significantly on the post-test ($p < .05$). (See Table IX.)

TABLE IX

MEAN EFFECTIVE THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	103.26	96.17	99.71
Post-Test	97.20	101.54	99.37
Combined	100.23	98.86	99.54

H. $II._1$ There is no significant difference between the pre-test and post-test scores on critical thinking.

The null hypothesis was rejected, for analysis of variance yielded a significant F value of 7.74, $p < .01$. There was a significant difference in the overall critical thinking scores from the pre-test to the post-test with scores going down on the final test. (See Table II.)

When a t-test for correlated scores was employed, it was revealed that the open-minded individuals dropped significantly in critical thinking scores from the pre-test to the post-test ($p < .05$). (See Table X.)

TABLE X

MEAN CRITICAL THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	72.39	68.39	70.39
Post-Test	68.11	66.33	67.22
Combined	70.25	67.36	68.81

H. $II._2$ There is no significant difference between the pre-test and post-test scores on deductive reasoning.

The null hypothesis was accepted, for analysis of variance yielded an insignificant F value. There was no significant difference in the overall deductive reasoning scores on the pre-test and the post-test ($F = 1.72$).

TABLE XI

MEAN DEDUCTIVE REASONING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	18.94	17.78	18.36
Post-Test	18.33	17.33	17.83
Combined	18.64	17.56	18.10

H. II.$_3$ There is no significant difference between the pre-test and post-test scores on interpretation of data.

The null hypothesis was rejected, for analysis of variance yielded a significant F value of 8.11, $p < .01$. There was a significant difference in the overall interpretation of data scores from the pre-test to the post-test with scores going up on the final test. (See Table IV.)

When a t-test for correlated scores was employed, it was revealed that the more closed-minded individuals increased their interpretation of data scores significantly from the pre-test to the post-test ($p < .05$). (See Table XII.)

TABLE XII

MEAN INTERPRETATION OF DATA SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	16.44	15.78	16.11
Post-Test	17.72	17.89	17.81
Combined	17.08	16.83	16.96

H. II.$_4$ There is no significant difference between the pre-test and post-test scores on creative thinking.

The null hypothesis was accepted, for analysis of variance yielded an insignificant F value. There was no significant difference in the

overall creative thinking scores from the pre-test to the post-test ($F = 1.90$).

When a t-test for correlated scores was employed, it was revealed that the open-minded individuals showed a significant drop in creative thinking scores from the pre-test to the post-test ($p < .02$). (See Table XIII.)

TABLE XIII

MEAN CREATIVE THINKING SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	159.72	144.83	152.22
Post-Test	129.33	156.72	143.02
Combined	144.53	150.78	147.65

H. $II._5$ There is no significant difference between the pre-test and post-test scores on fluency.

The null hypothesis was accepted, for analysis of variance yielded an insignificant F value. There was no significant difference in the overall fluency scores from the pre-test to the post-test ($F < 1$).

TABLE XIV

MEAN FLUENCY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	67.89	66.11	67.00
Post-Test	61.06	72.00	66.53
Combined	64.47	69.06	66.76

H. $II._6$ There is no significant difference between the pre-test and the post-test scores on flexibility.

The null hypothesis was rejected, for analysis of variance yielded a significant F value of 4.25, $p < .05$. There was a significant difference in the overall flexibility scores from the pre-test to the post-test with scores going up on the final test. (See Table VII.)

A t-test for correlated scores revealed that the closed-minded individuals made a significant gain in flexibility scores from the pre-test to the post-test ($p < .05$). (See Table XV.)

TABLE XV

MEAN FLEXIBILITY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	36.78	37.67	37.22
Post-Test	38.28	42.72	40.50
Combined	37.53	40.19	38.86

$H. II._7$ There is no significant difference between the pre-test and post-test scores on originality.

The null hypothesis was rejected, for analysis of variance yielded a significant F value of 10.68, $p < .005$. There was a significant difference in the overall originality scores from the pre-test to the post-test with scores going down on the final test. (See Table VIII.)

A t-test for correlated scores revealed that the open-minded individuals showed a significant drop in originality scores from the pre-test to the post-test ($p < .001$). (See Table XVI.)

TABLE XVI

MEAN ORIGINALITY SCORES FOR OPEN- AND CLOSED-MINDED SUBJECTS

	Open-Minded	Closed-Minded	Combined
Pre-Test	55.06	41.06	48.06
Post-Test	30.00	41.78	35.89
Combined	42.53	41.42	41.97

H. III. The results of the effective thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

Analysis of variance yielded a significant F value of 11.79, $p < .005$; therefore, the null hypothesis was rejected. There was a significant interaction between the degree of dogmatism (open-mindedness or closed-mindedness) and the particular test (pre-test or post-test). More specifically, open-minded individuals achieved higher effective thinking scores on the pre-test than did the more closed-minded individuals. However, the closed-minded subjects achieved higher scores on the post-test than did the more open-minded subjects. (See Figure 1.)

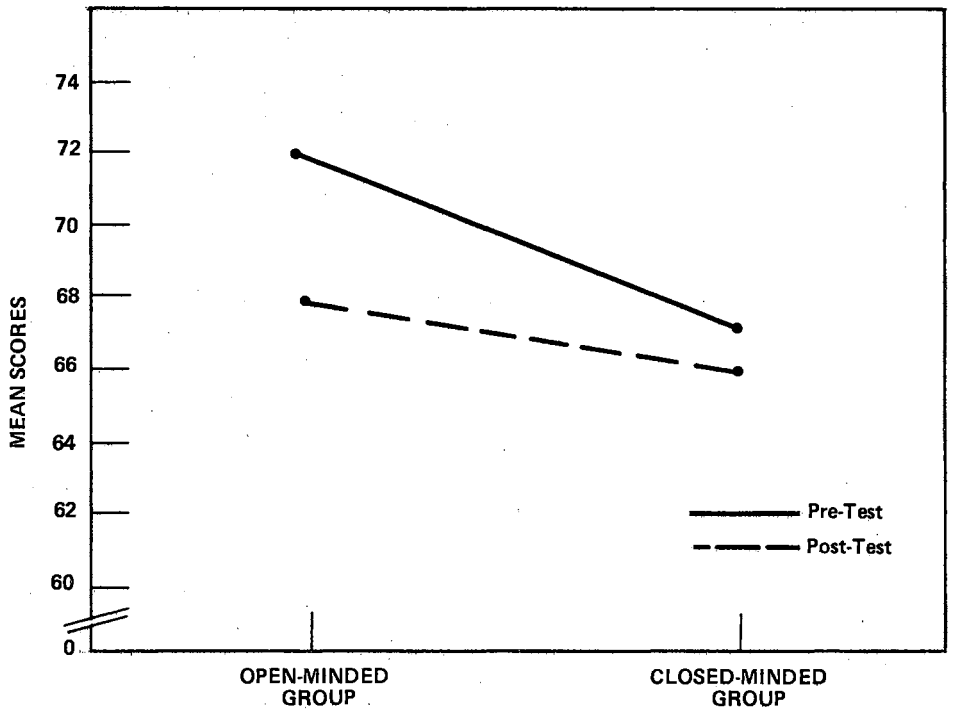

Figure 1. Effect of Dogmatism and Tests on Effective Thinking Scores

H. III.$_1$ The results of the critical thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

There was no significant interactive effect between dogmatism and test on the critical thinking scores ($F < 1$).

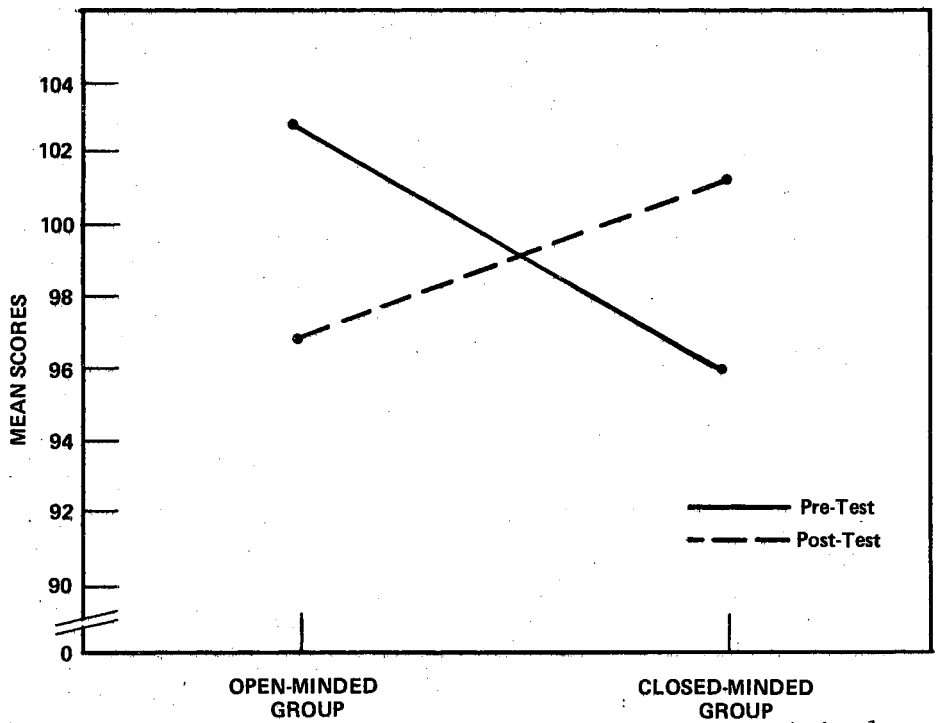

Figure 2. Effect of Dogmatism and Tests on Critical Thinking Scores

H. III.$_2$ The results of the deductive reasoning scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

There was no significant interactive effect between dogmatism and test on the deductive reasoning scores ($F < 1$).

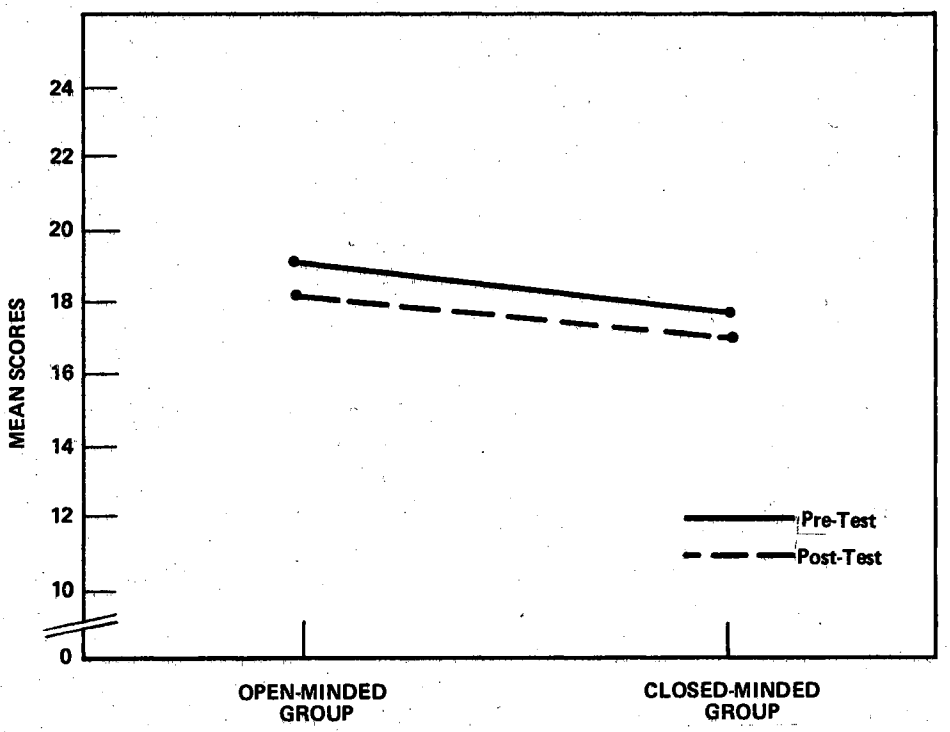

Figure 3. Effect of Dogmatism and Tests on Deductive Reasoning Scores

H. III.$_3$ The results of the interpretation of data scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

There was no significant interactive effect between dogmatism and test on the interpretation of data scores ($F < 1$).

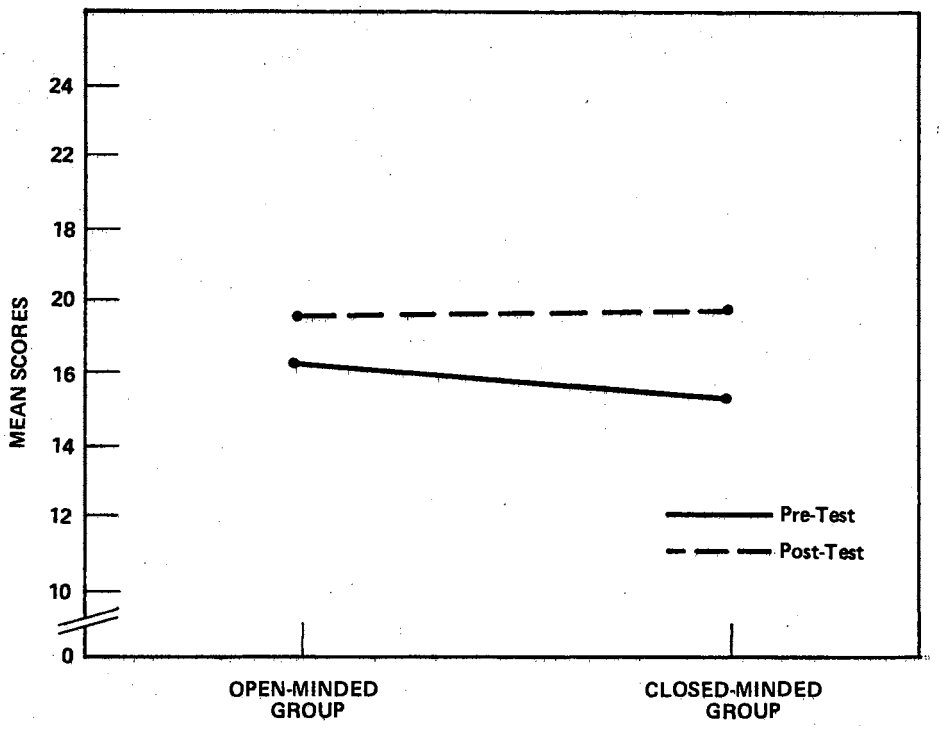

Figure 4. Effect of Dogmatism and Tests on Interpretation of Data Scores

H. III.$_4$ The results of the creative thinking scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

An analysis of the data yielded a significant F value of 9.90, $p < .005$; therefore, the null hypothesis was rejected. There was a significant interaction between the degree of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test). More specifically, open-minded individuals achieved higher creative thinking scores on the pre-test than did the more closed-minded individuals. However, the closed-minded subjects achieved higher

scores on the post-test than did the more open-minded subjects. (See Figure 5.)

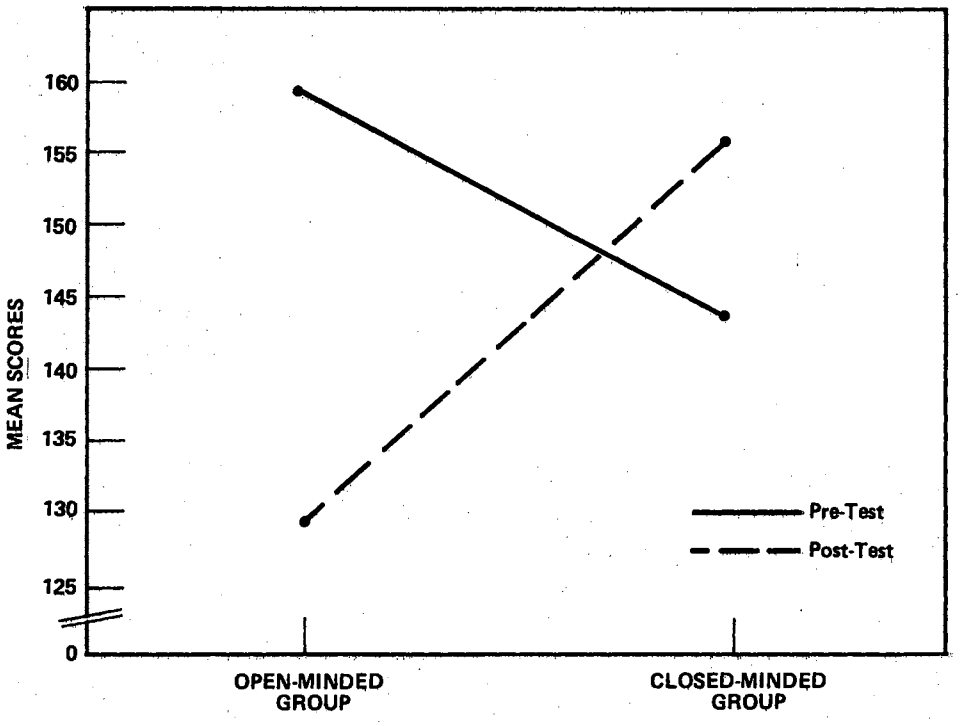

Figure 5. Effect of Dogmatism and Tests on Creative Thinking Scores

H. III.$_5$ The results of the fluency scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

An analysis of the data yielded a significant F value of 4.21, $p < .05$; therefore, the null hypothesis was rejected. There was a

significant interaction between the degree of dogmatism (open-mindedness or closed-mindedness) and the particular test (pre-test or post-test). More specifically, open-minded individuals achieved higher fluency scores on the pre-test than did the more closed-minded individuals. However, the closed-minded subjects achieved higher scores on the post-test than did the more open-minded subjects. (See Figure 6.)

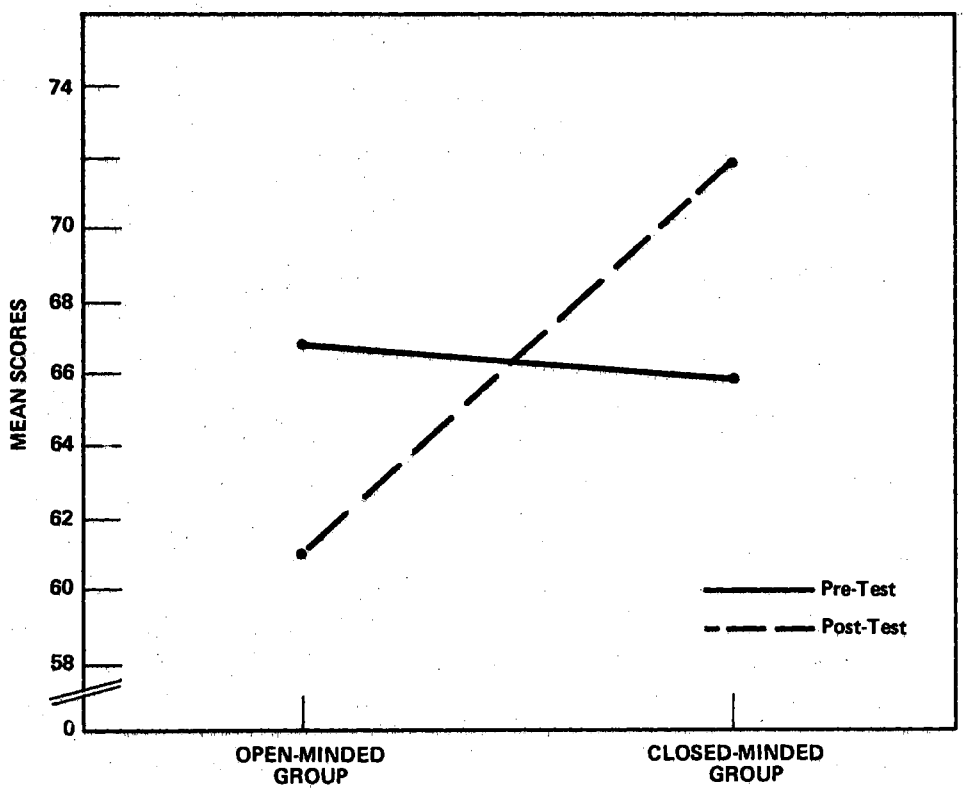

Figure 6. Effect of Dogmatism and Tests on Fluency Scores

H. III.$_6$ The results of the flexibility scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

There was no significant interactive effect between dogmatism and test on the flexibility scores ($F = 1.25$).

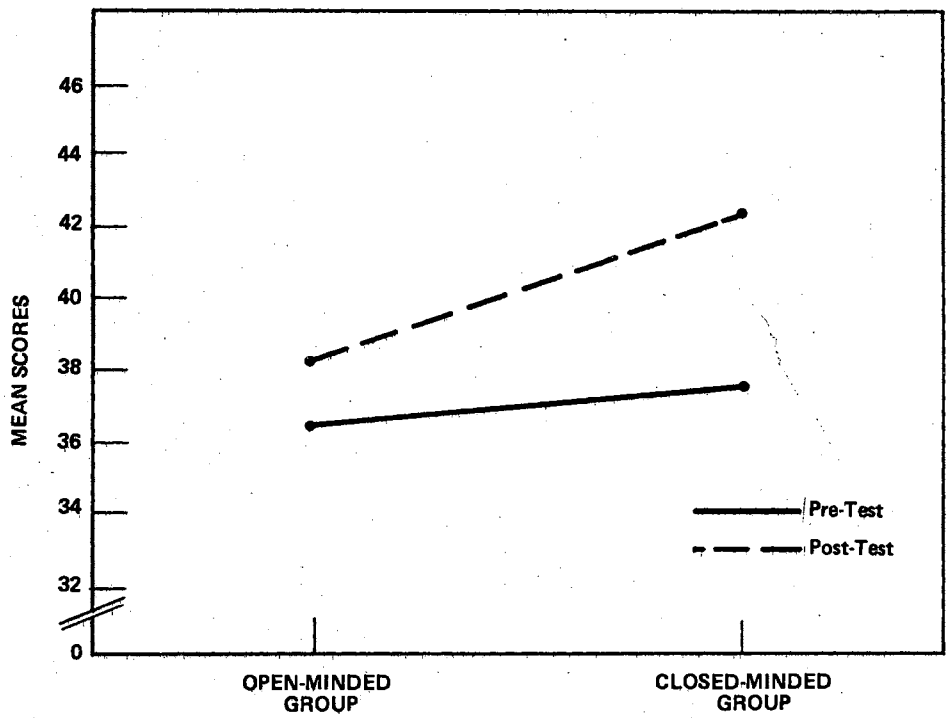

Figure 7. Effect of Dogmatism and Tests on Flexibility Scores

H. III.$_7$ The results of the originality scores will not be significantly influenced by the interaction of dogmatism (open-mindedness or closed-mindedness) and tests (pre-test or post-test).

An analysis of the data yielded a significant F value of 11.99, $p < .005$; therefore, the null hypothesis was rejected. There was a significant interaction between the degree of dogmatism (open-mindedness or closed-mindedness) and the particular test (pre-test or post-test). More specifically, open-minded subjects achieved higher originality scores on the pre-test than did the more closed-minded individuals. However, the closed-minded subjects achieved higher scores on the post-test than did the more open-minded subjects. (See Figure 8.)

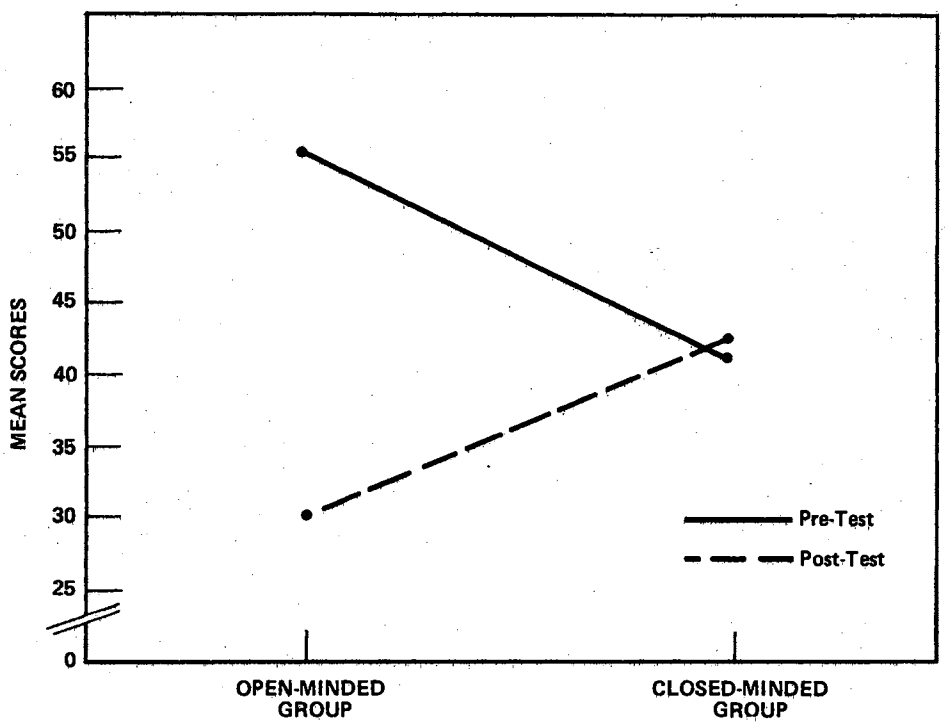

Figure 8. Effect of Dogmatism and Tests on Originality Scores

CHAPTER V

SUMMARY, CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Summary

The objective of this study was to investigate dogmatism and effective thinking. During the fall semester of 1969 the thirty-seven undergraduate students in History 4183-1 at Oklahoma State University comprised the sample. The Dogmatism Scale was administered at the beginning of the semester; and, on the basis of dogmatism scores, the students were divided into two groups, with the eighteen individuals with the highest dogmatism scores being labeled closed-minded and the eighteen individuals with the lowest dogmatism scores being designated open-minded. Effective thinking was defined to include creative and critical thinking components. Effective thinking scores were obtained using pre-test forms of the Torrance Test of Creative Thinking and the Watson-Glaser Critical Thinking Appraisal. To assess effective thinking skills after a four-month interval the post-test forms of the Torrance Test of Creative Thinking and the Watson-Glaser Critical Thinking Appraisal were given. The sum of the t-scores for creative and critical thinking yielded an effective thinking score, and the combination of pre-test and post-test scores constituted the overall effective thinking score. During the course of the semester all of the subjects had common experiences participating in computer-

assisted inquiry activities.

A summary of the findings yielded the following results. Open- and closed-minded individuals did not differ in their overall effective thinking scores. However, consideration of the subhypotheses revealed that the more closed-minded individuals scored significantly above the more open-minded subjects on the post-test subscale of originality.

There was no significant difference in the pre-test and the post-test scores for effective thinking when open- and closed-minded individuals were considered simultaneously; however, further analysis yielded some additional findings. On effective thinking scores the open-minded individuals showed a significant drop in score from the pre-test to the post-test, but the more closed-minded subjects evidenced a significant rise in score from the pre-test to the post-test on effective thinking scores. The more closed-minded students made significant gains from the pre-test to the post-test on the subscales of interpretation of data and flexibility. The more open-minded individuals showed a significant drop in score from the pre-test to the post-test on critical thinking and creative thinking as well as for the subscale of originality.

When the data were analyzed, it was shown that there was a significant interaction between dogmatism (open-mindedness or closed-mindedness) and the test (pre-test or post-test) on effective thinking. Open-minded subjects had higher pre-test effective thinking scores; however, the closed-minded subjects achieved higher scores on the post-test. Also it was revealed that this same interactive effect was seen in creative thinking. The more open-minded students achieved higher scores on the pre-test in creative thinking as well as on the subscales

of fluency and originality, but the more closed-minded persons had higher scores for creative thinking and the subscales of fluency and originality on the post-test.

Conclusions from the Study

This study, an investigation of dogmatism and effective thinking, was intended as exploratory research concerned with the relationship between a personality variable, dogmatism, and creative and critical thinking, major components of effective thinking. This study was not intended to validate a particular methodology but rather to investigate the role of dogmatism in the expression of particular cognitive skills involved in creative and critical thinking. In light of this purpose, the following conclusions are advanced.

The first conclusion is that open- and closed-minded individuals do perform in a significantly different manner in the expression of effective thinking skills, including both creative thinking and critical thinking measures. This conclusion is based upon the finding that open-minded individuals achieved higher scores on the initial test of effective thinking but that the closed-minded subjects achieved higher scores on the second examination of effective thinking skills. Differences between the open- and closed-minded groups were masked by combining pre-test and post-test scores to obtain an overall effective thinking score; however, when the pre-test and the post-test scores were examined separately, differences between the groups became apparent.

The second conclusion from this study is that the expression of creative thinking or critical thinking skills is dependent upon the

situation under which the student is asked to exhibit these skills. Analysis of the data revealed that there was a significant difference in the pre-test and the post-test effective thinking scores for open-minded and closed-minded subjects. The expression of creative and critical thinking skills depended upon the situation in which the individuals found themselves. One possible explanation may lie in the fact that the situation at the time of the second exposure to the instruments was quite different from the initial exposure to equivalent forms of the creative thinking and the critical thinking tests; while the physical conditions for test taking were identical, the second test situation was made different by the pre-test exposure to the equivalent forms of the measures. This first exposure could modify the respondent's perception of the demands and the values of the testing situation. Perception of differences in situations can have decided effects upon individual reactions to a particular situation. For example, the pre-test may be challenging to some individuals and threatening to others. On the other hand, the post-test situation may be boring instead of challenging or secure rather than threatening. The structure and the familiarity of the situation may influence how the individual will express his effective thinking skills at any particular time.

The third conclusion, closely related to the second one, is that open- and closed-mindedness may influence perception of situations; therefore, dogmatism may influence the manner in which individuals respond when they are called upon to express creative thinking or critical thinking skills in various situations. Analysis of the data showed that during the initial testing situation open-minded subjects achieved higher mean scores on effective thinking as well as for its

components creative thinking and critical thinking; however, the more closed-minded individuals achieved higher mean scores on effective thinking and creative thinking on the post-tests than did their less dogmatic colleagues. One explanation for these findings could be that, faced with the test for the first time, the more open-minded students were motivated to do well. In the same situation, the more closed-minded subjects were confronted with the unfamiliar; consequently, the situation might have contained certain inherent threats. Later, when the equivalent forms of the tests were administered, the more open-minded students found themselves confronted with tasks which were similar to those found in the pre-test situation. It is possible that they no longer felt challenged; and, as a result, the level of performance dropped significantly. However, the situation was reversed for the more closed-minded subjects. Having faced similar tasks before, it is possible that they were no longer threatened by the test. Consequently, their persistence and their ability to operate well in a familiar situation brought about a rise in score on the post-test.

Implications of this Study

In light of the findings and conclusions from this exploratory research, the following implications are seen.

Open- and closed-minded individuals, as determined by Rokeach's Dogmatism Scale, respond differently in various situations; as a result, they may react in different ways to situations in the classroom. This fact has important implications for education, particularly educational efforts in inquiry.

Inquiry can vary on a continuum from very unstructured to very

structured situations. The more open-minded person, who is receptive to new ideas, might be challenged by a more open inquiry situation. On the other hand, the more closed-minded person, who is less tolerant of new ideas, might be apprehensive in such an open situation but might respond more favorably to more directed inquiry because of the chance to work in a more structured situation. Such a structured situation, however, is potentially boring to the more open-minded person. As Mouw has observed:

> The degree of dogmatism possessed by an individual should be a consideration in the education process, especially when the emphasis is on self-directed learning or problem-solving skills. (67:12)

Even though inquiry is possible for both open- and closed-minded individuals, optimal conditions for inquiry may differ for the different personality types. Perhaps Kemp's finding that working in small groups reduces the insecurity when closed-minded persons are confronted with new ideas may have meaning for the inquiry-oriented classroom.(53:322) When the risk of hypothesizing is minimized, the more closed-minded individual may respond more favorably to a small group and a familiar situation. For the more open-minded person, a familiar situation may be less desirable. White has stressed that interest requires elements of unfamiliarity, "something still to be found out and learning still to be done."(99:314-315) To amplify this idea a statement by Getzels is appropriate as he said:

> Below the optimal level of stimulation is <u>boredom</u>, which is in effect also <u>frustration</u> - frustration as a consequence of too little that is problematic, too little opportunity to confront the new, to explore, and to experiment.(35:257)

Therefore, a familiar situation may be perceived by the more closed-minded person as a secure environment; but to the more open-minded individual it may lack challenge, suggesting that the learning situation may vary in its effectiveness according to the perception of the learner and that one's perception of a situation may be influenced by the degree of dogmatism.

Dogmatism is concerned with how one believes, and how one believes affects how one thinks. Therefore, dogmatism assumes an important relationship between personality and the way one thinks. Such a relationship holds tremendous implications for educators who wish to truly individualize instruction. As open- and closed-minded persons are ideal types, it is important to realize that most individuals are relatively open-minded or relatively closed-minded; likewise, most inquiry situations vary from being completely open to being totally directed. In light of these differences, it is imperative that schools develop curricula which will allow each person to have a learning environment in which he can function well. When different abilities are developed, it is possible to provide new opportunities for students who are now academically successful; in addition, students who have not fared well in the traditional classroom can be reached and stimulated by providing different kinds of opportunities in which they are able to express themselves. Much of the total educational process may be too structured for the more open-minded individuals, yet structure may be a key factor in making the classroom a proper learning environment for the more closed-minded persons. With this idea in mind, it seems crucial that the educators find ways to avoid continuing conflict with normal patterns of behavior for both open- and closed-minded students and to adapt

such patterns to a more effective educational process.

Also this relationship between personality and the way one thinks is important in any consideration of effective thinking skills. As Bayles has said:

> We need not assume that a people will not think if untrained, or that perfection can be achieved by training. We need only to assume that thinking processes can be improved enough to make the effort worthwhile. (3:100)

Efforts to improve effective thinking skills may well benefit from a consideration of open-mindedness or closed-mindedness.

This study also has possible implications for determining the reliability of instruments designed to measure effective thinking skills. The mean score for a group can remain the same in pre- and post-test situations; however, there is the possibility that, by combining scores of open- and closed-minded individuals, significant differences between pre- and post-test scores are being masked. Perhaps an individual's level of dogmatism should be considered when reliability coefficients are obtained.

Recommendations

It is recommended that a study be conducted to determine the different behavior and potential of open- and closed-minded individuals in controlled inquiry-oriented classroom situations. Such studies should involve enough subjects to enable using extreme scores to determine open- and closed-mindedness. If differences in behavior are significant, efforts must be made to design curriculum materials which will develop individual inquiry potential, using open- and closed-mindedness as one criterion for individualizing instruction.

As it has been established that open- and closed-minded persons respond differently in various situations in which they are called upon to express effective thinking skills, it is recommended that an effort be made to develop specific instructional techniques for effectively developing inquiry skills with open- and closed-minded students. Once developed, these strategies could be field tested in a methodological study.

A further recommendation is that additional research be done with creative thinking tests to assess their value beyond the initial exposure of an individual to the instrument. It may well be that the second time such a test is taken that it is not really a measure of creative thinking but rather of persistence and motivation.

Further research which focuses upon the relationship of dogmatism and effective thinking can offer a meaningful dimension in the individualization of instruction. It is important to consider the possibility that one's degree of open- or closed-mindedness can affect the expression of effective thinking skills in various situations in the classroom. Additional research is warranted if instruction is to be individualized in meaningful ways.

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APPENDIX A

SUMMARY OF DEMOGRAPHIC DATA

Key to Demographic Data Categories

Sex

1 - Male
2 - Female

Class

1 - Freshman
2 - Sophomore
3 - Junior
4 - Senior

Major

1 - History
2 - Education
3 - Other

Hours in History

1 - 1 to 6
2 - 7 to 12
3 - 13 to 18
4 - 19 to 24
5 - 25 and above

H. S. Graduating Class Size

1 - 0 to 99
2 - 100 to 199
3 - 200 to 299
4 - 300 to 399
5 - 400 to 499
6 - 500 and above

Father's Education

1 - Less than high school
2 - High school graduate
3 - Attended college
4 - College graduate
5 - Work beyond bachelor's degree

Mother's Education

1 - Less than high school
2 - High school graduate
3 - Attended college
4 - College graduate
5 - Work beyond bachelor's degree

SUMMARY OF DEMOGRAPHIC DATA

Student	Sex	Class	Major	Hours in History	H.S. Grad. Class Size	Father's Educ.	Mother's Educ.	Cum. G.P.A.	A.C.T. Score
1	1	4	2	5	1	2	3	2.75	16
2	1	3	3	1	2	4	2	2.76	25
3	2	3	2	3	6	4	4	2.18	22
4	1	4	2	4	6	2	1	2.99	28
5	1	3	1	2	3	1	3	3.01	24
6	2	4	2	3	2	4	3	2.43	21
7	1	4	3	2	3	2	3	3.17	29
8	1	4	3	3	1	2	2	2.86	*
9	1	4	1	3	1	1	1	2.78	15
10	2	4	2	2	6	3	3	2.92	19
11	2	4	2	3	1	2	2	2.50	*
12	1	4	3	2	3	4	2	2.56	*
13	1	4	1	5	1	3	3	2.82	23
14	1	4	2	3	1	1	4	3.41	27
15	1	3	2	4	4	3	5	1.75	*
16	1	4	3	3	4	5	4	3.10	15
17	1	3	3	2	1	2	2	1.46	24
18	2	4	2	4	1	3	2	2.90	23
19	2	3	2	4	6	2	2	2.42	22
20	1	3	3	1	6	2	3	2.10	19

*Information not available.

SUMMARY OF DEMOGRAPHIC DATA (Continued)

Student	Sex	Class	Major	Hours in History	H.S. Grad. Class Size	Father's Educ.	Mother's Educ.	Cum. G.P.A.	Score
21	2	4	3	2	4	5	5	1.95	*
22	1	2	3	2	1	*	2	2.80	20
23	1	4	1	3	4	4	2	2.00	19
24	2	3	2	3	2	2	2	2.98	12
25	1	3	3	2	1	5	3	2.68	16
26	2	3	1	2	2	3	2	2.95	27
27	1	4	1	4	1	1	3	2.50	26
28	1	4	2	4	6	4	2	2.24	27
29	1	4	3	1	6	5	4	2.19	*
30	1	3	1	3	3	5	3	3.63	27
31	1	4	3	1	5	4	4	2.63	20
32	1	4	3	1	2	3	2	2.03	26
33	2	3	2	4	6	2	2	2.19	*
34	1	4	3	3	3	3	2	1.90	*
35	1	4	3	2	2	2	2	3.19	23
36	2	3	2	2	3	2	2	3.35	28
37	2	4	2	2	6	5	3	3.02	25

*Information not available.

APPENDIX B

DOGMATISM SCALE, FORM E

IMPORTANT*

All responses to the statements on the following pages will be coded and placed on computer data cards with no reference to the individual providing the information. In this way all responses will remain confidential. No individual will be identified in the report of this study. Thank you for your cooperation.

*This information was on the cover sheet of the Dogmatism Scale, Form E administered to the subjects of this study.

Name:_____

Form E*

INSTRUCTIONS:

The following is a study of what the general public thinks and feels about a number of important social and personal questions. The best answer to each statement below is your personal opinion. We have tried to cover many different and opposing points of view; you may find yourself agreeing strongly with some of the statements, disagreeing just as strongly with others, and perhaps uncertain about others; whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

Mark each statement in the left margin according to how much you agree or disagree with it. Please mark every one. Write +1, +2, +3, or -1, -2, -3, depending on how you feel in each case.

+1:	I AGREE A LITTLE	-1:	I DISAGREE A LITTLE
+2:	I AGREE ON THE WHOLE	-2:	I DISAGREE ON THE WHOLE
+3:	I AGREE VERY MUCH	-3:	I DISAGREE VERY MUCH

_____1. 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.

_____2. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's own camp than by those in the opposing camp.

_____3. In the history of mankind there have probably been just a handful of really great thinkers.

_____4. Most of the ideas which get printed nowadays aren't worth the paper they are printed on.

_____5. It is only natural for a person to be rather fearful of the future.

_____6. If given the chance, I would do something of great benefit to the world.

_____7. The highest form of government is a democracy and the highest form of democracy is a government run by those who are most intelligent.

_____8. A person who gets enthusiastic about too many causes is likely to be a pretty "wishy-washy" sort of person.

*Used with the permission of Dr. Milton Rokeach

Form E (Continued)

+1:	I AGREE A LITTLE	-1:	I DISAGREE A LITTLE
+2:	I AGREE ON THE WHOLE	-2:	I DISAGREE ON THE WHOLE
+3:	I AGREE VERY MUCH	-3:	I DISAGREE VERY MUCH

____9. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.

____10. It is only natural that a person would have a much better acquaintance with ideas he believes in than with ideas he opposes.

____11. The present is all too often full of unhappiness. It is only the future that counts.

____12. The main thing in life is for a person to want to do something important.

____13. Man on his own is a helpless and miserable creature.

____14. It is only when a person devotes himself to an ideal or cause that life becomes meaningful.

____15. My blood boils whenever a person stubbornly refuses to admit he's wrong.

____16. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on.

____17. Once I get wound up in a heated discussion, I just can't stop.

____18. If a man is to accomplish his mission in life, it is sometimes necessary to gamble "all or nothing at all."

____19. Of all the different philosophies which exist in this world, there is probably only one which is correct.

____20. Fundamentally, the world we live in is a pretty lonesome place.

____21. There is so much to be done and so little time to do it in.

____22. 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.

____23. In times like these, a person must be pretty selfish if he considers primarily his own happiness.

Form E (Continued)

+1:	I AGREE A LITTLE	-1:	I DISAGREE A LITTLE
+2:	I AGREE ON THE WHOLE	-2:	I DISAGREE ON THE WHOLE
+3:	I AGREE VERY MUCH	-3:	I DISAGREE VERY MUCH

____24. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.

____25. 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.

____26. The United States and Russia have just about nothing in common.

____27. There are a number of people I have come to hate because of the things they stand for.

____28. A group which tolerates too much difference of opinion among its own members cannot exist for long.

____29. A person who thinks primarily of his own happiness is beneath contempt.

____30. The worst crime a person could commit is to attack publicly the people who believe in the same thing he does.

____31. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what others are saying.

____32. Most people just don't give a "damn" for others.

____33. There are two kinds of people in this world: Those who are for the truth and those who are against the truth.

____34. A man who does not believe in some great cause has not really lived.

____35. It is better to be a dead hero than to be a live coward.

____36. Most people just don't know what's good for them.

____37. While I don't like to admit this even to myself, my secret ambition is to become a great man like Einstein, or Beethoven, or Shakespeare.

Form E (Continued)

+1:	I AGREE A LITTLE	-1:	I DISAGREE A LITTLE
+2:	I AGREE ON THE WHOLE	-2:	I DISAGREE ON THE WHOLE
+3:	I AGREE VERY MUCH	-3:	I DISAGREE VERY MUCH

____38. It is often desirable to reserve judgment about what's going on until one has had a chance to hear opinions of those one respects.

____39: To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.

____40: I'd like it if I could find someone who would tell me how to solve my personal problems.

APPENDIX C

SUMMARY OF TEST SCORES

SUMMARY OF TEST SCORES

Student	Form E	CREATIVE THINKING								CRITICAL THINKING						EFFECTIVE THINKING	
		Pre-Test				Post-Test				Pre-Test			Post-Test				
		Flu.	Flex.	Orig.	Total	Flu.	Flex.	Orig.	Total	3	4	Total	3	4	Total	Pre-Test	Post-Test
1	102	80	40	38	158	61	36	27	124	16	11	63	18	15	68	93.49	95.92
2	138	79	41	42	162	82	46	50	178	24	17	79	24	21	84	110.36	122.68
3	127	108	48	46	202	66	47	43	156	16	12	64	16	13	56	103.61	91.76
4	142	84	40	39	163	92	57	50	199	24	18	83	24	24	79	114.57	122.61
5	174	61	32	36	129	75	34	47	156	22	16	75	20	22	79	99.51	113.19
6	99	72	39	49	160	67	40	34	141	22	20	76	21	19	78	106.93	108.97
7	142	102	52	70	224	75	38	54	167	24	23	88	25	22	84	132.21	120.26
8	183	84	46	52	182	103	60	90	253	19	16	74	15	18	65	109.49	121.41
9	159	83	46	59	188	84	45	69	198	17	19	73	13	16	53	109.73	98.17
10	136	34	23	59	116	71	40	42	153	22	20	84	21	20	73	105.84	106.94
11	149	85	51	36	172	110	67	61	238	16	16	60	17	14	62	93.39	115.32
12	159	41	27	23	91	54	32	23	113	16	13	64	14	18	63	80.62	88.85
13	189	76	37	41	154	66	33	39	138	17	12	57	15	21	61	86.65	92.47
14	106	54	35	28	117	54	35	26	115	22	18	86	22	23	87	108.05	111.65
15	154	53	37	31	121	59	42	42	143	14	14	59	17	13	63	81.82	85.43
16	146	71	36	37	144	103	52	44	199	17	10	61	14	15	57	88.59	102.12
17	171	37	26	26	89	20	14	20	54	13	13	53	15	19	56	69.18	69.40
18	172	71	41	43	155	63	31	38	132	20	19	74	18	16	71	103.89	100.47
19	114	73	41	33	147	65	38	41	144	16	19	76	13	15	51	104.24	84.47
20	131	80	39	44	163	68	40	40	148	15	13	52	14	14	51	83.50	85.35

SUMMARY OF TEST SCORES (Continued)

Student	Form E	CREATIVE THINKING								CRITICAL THINKING						EFFECTIVE THINKING	
		Pre-Test				Post-Test				Pre-Test			Post-Test				
		Flu.	Flex.	Orig.	Total	Flu.	Flex.	Orig.	Total	3	4	Total	3	4	Total	Pre-Test	Post-Test
21	126	56	40	85	181	35	27	24	86	15	16	66	16	16	64	101.26	83.87
22	129	47	24	42	113	42	26	29	97	22	14	75	19	21	68	96.20	90.00
23	105	128	62	137	327	82	54	39	175	17	17	62	16	16	55	127.49	94.99
24	180	74	44	46	164	89	52	32	173	17	16	56	18	13	56	87.72	95.49
25	164	35	25	37	96	49	29	21	99	15	19	68	10	18	64	85.66	86.72
26	125	68	39	66	173	79	42	29	150	20	21	85	18	19	75	118.65	108.14
27	131	81	41	60	182	98	58	37	193	25	18	81	20	21	78	116.50	120.37
28	118	40	22	62	124	51	29	24	104	21	16	75	20	21	73	98.48	96.20
29	136	41	27	42	110	45	33	17	95	17	10	61	19	14	65	81.55	86.77
30	135	85	44	88	217	63	41	20	124	21	19	75	18	21	81	117.74	108.03
31	183	54	30	21	105	55	36	27	118	16	16	69	17	16	62	88.53	89.02
32	164	81	47	60	188	76	56	32	164	16	12	68	19	16	65	104.72	101.90
33	98	72	40	31	143	38	25	12	75	13	12	59	16	12	47	86.38	65.62
34	114	24	19	26	70	32	24	16	72	18	19	80	21	18	78	92.31	93.84
35	150	34	21	19	74	35	33	24	92	18	19	77	21	19	76	90.13	96.36
36	144	65	40	63	168	88	58	39	185	19	13	72	20	22	78	104.58	118.61
37	114	78	39	55	172	32	54	40	176	23	21	83	21	21	78	116.43	116.64

APPENDIX D

STUDENT EXPECTATIONS OR OBJECTIVES

Student Expectations or Objectives

Your project should indicate that you have:

1. Described the development of a problem in a concise and logical fashion.

2. Formulated a testable hypothesis derived from the problem.

3. Identified and described the significant variables.

4. Tested the hypothesis and stated clearly the findings.

5. Interpreted the data

    a. to determine if the hypothesis tested has been supported or refuted and

    b. to identify other testable hypotheses.

VITA

Julia Link Roberts

Candidate for the Degree of

Doctor of Education

Thesis: AN INVESTIGATION OF DOGMATISM AND EFFECTIVE THINKING

Major Field: Higher Education

Biographical:

Personal Data: Born in Kirksville, Missouri, January 13, 1941, the daughter of Robert Lewis and Mary Elizabeth Garth Link.

Education: Attended public school in Kirksville, Missouri; graduated from Kirksville High School, Kirksville, Missouri, in 1958; received the Bachelor of Arts degree from the University of Missouri, Columbia, Missouri, in June, 1962, with a major in history and the humanities; received the Master of Science degree from Oklahoma State University, Stillwater, Oklahoma, in May, 1968, with a major in secondary education with an emphasis on social studies; completed requirements for the Doctor of Education degree at Oklahoma State University in July, 1970, as a National Defense Education Act Fellow.

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