A Comparative Study of Critical Thinking Skills, Dogmatism and American College Testing Program Scores of Seventh-day Adventist College Freshmen Graduated from Church Related and Public Secondary Schools

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ANDREWS UNIVERSITY, ED.D., 1979

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A Dissertation
Presented in Partial Fulfillment
of the Requirements for the Degree
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by
Elizabeth M. Wilkins
March 1979
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APPROVAL BY THE COMMITTEE

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ABSTRACT

A COMPARATIVE STUDY OF CRITICAL THINKING SKILLS, JOURNALISM AND AMERICAN COLLEGE TESTING PROGRAM SCORES OF SEVENTH-DAY ADVENTIST COLLEGE FRESHMEN GRADUATED FROM CHURCH RELATED AND PUBLIC SECONDARY SCHOOLS

by

Elizabeth M. Wilkins

Chairperson: Robert A. Williams
Title: A COMPARATIVE STUDY OF CRITICAL THINKING SKILLS, DOGMATISM, AND AMERICAN COLLEGE TESTING PROGRAM SCORES OF SEVENTH-DAY ADVENTIST COLLEGE FRESHMEN GRADUATED FROM CHURCH RELATED AND PUBLIC SECONDARY SCHOOLS

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Date completed: March 1979

Problem

Development of critical thinking skills is commonly accepted as a desirable outcome of secondary education. The Seventh-day Adventist Church has also accepted this as one of the goals for its educational system. It was the purpose of the present study to compare critical thinking skills developed in Seventh-day Adventist young people in Seventh-day Adventist boarding academies, Seventh-day Adventist day academies, and public high schools. Since earlier studies have shown critical thinking to be negatively correlated with dogmatism and positively correlated with intelligence, both
dogmatism and intelligence were included as variables in the study.

Method

Three hundred and twelve subjects were chosen by a stratified random method from among all Seventh-day Adventist college freshmen in attendance at any of three Seventh-day Adventist institutions of higher learning during the fall of 1977. In order to qualify for the study, subjects had to have attended one type of secondary school for at least three years and have graduated from secondary school in 1977. Each subject was asked to fill in the Rokeach Dogmatism Scale and to take the Watson-Glaser Critical Thinking Appraisal. American College Testing Program scores were gleaned from school records to serve as an indication of intelligence. Sixty-six percent (207) of the stratified random sample selected for the study actually completed both instruments. Two statistical methods were used in analyzing the data. The Mann-Whitney U test was used to test hypotheses dealing with differences between subject groups. The Kendall rank correlation coefficient (tau) was used to test hypotheses dealing with relationships between variables.

Results

None of the between-group comparisons of critical thinking, dogmatism, or American College Testing Program scores were statistically significant. Analysis of relationships between critical thinking scores and dogmatism scores yielded statistically significant negative correlations for two of the three groups tested.
Seventh-day Adventist graduates of public high schools (tau = -.19, significant at the .01 level) and Seventh-day Adventist graduates of Seventh-day Adventist day academies (tau = -.17, significant at the .05 level). The correlation (tau) for Seventh-day Adventist graduates of Seventh-day Adventist boarding academies was -.01, with an associated probability of .44.

Correlations between critical thinking scores and American College Testing Program scores for all three groups yielded positive results, significant at the .001 level. Correlations range from .52 for Seventh-day Adventist graduates of Seventh-day Adventist day academies through .54 for Seventh-day Adventist graduates of Seventh-day Adventist boarding academies to .61 for Seventh-day Adventist graduates of public high schools.

Conclusions

The findings of this study do not suggest that Seventh-day Adventist graduates of any of the three types of secondary school studied are either more or less skilled in critical thinking than their counterparts from the other types of schools. Similarly, the study does not provide support for any conclusions that graduates of one type of secondary school are either more or less dogmatic or score higher or lower on the American College Testing Program tests than do graduates of either of the other two types of secondary schools studied.
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PREFACE

My association with Seventh-day Adventist education began when I was four and my mother accepted a teaching position in a one-room church school. At the age of five I became a student in the same school. Sixteen years later, at the age of twenty-one, I married a budding young chemistry teacher. This decision destined me to a lifelong association with the world of education, particularly Seventh-day Adventist education.

It was through sharing my husband's hopes and dreams for and frustrations with his general chemistry students that I first came upon the idea of studying critical thinking skills in Seventh-day Adventist college freshmen. As a product of the Seventh-day Adventist educational system I have felt more than a casual interest in looking at this very important educational outcome. The members of my doctoral committee also encouraged me to pursue the project.

I am indebted to many people without whom the project could not have been carried out. The administrators and students on each of the three campuses where data were collected provided invaluable assistance. Mr. Kenneth Spears and Mr. Wolfgang Strantz, who served as liaison persons at Southern Missionary College and Union College, were particularly helpful. Without the support provided by these men and their secretaries the project could not have gone forward.

Dr. Robert Williams, who has served as the director of the dissertation and chairman of my doctoral committee, has been a
tremendous inspiration and guide. I have particularly appreciated the warmth and sensitivity he has shown as he has encouraged me to pursue excellence.

Dr. Robert Cruise has served as statistical consultant for the project. His untiring devotion to correctness combined with his seemingly endless patience in teaching have made him a highly valued member of the committee.

Dr. Joseph G. Smoot and Dr. John Youngberg have also given of their time to make meaningful contributions to the dissertation. Their work has been very much appreciated.

Finally, I wish to pay tribute to my husband, Dr. Robert Wilkins, for his inspiration, patience, and love throughout the entire project. Without his support and encouragement I most certainly would never have even embarked upon a doctoral program, much less have brought it to completion.
CHAPTER I

INTRODUCTION

Ellen White (1909) stated:

Every human being, created in the image of God, is endowed with a power akin to that of the Creator—individuality, power to think and to do... It is the work of true education to develop this power to train the youth to be thinkers, and not mere reflectors of other men's thoughts. (p. 17)

This statement is echoed in an official publication, Philosophy and Objectives of Seventh-Day Adventist Education (1959), which lists among the objectives of Seventh-Day Adventist education the development in students of the "ability to think deeply, art skillfully and vigorously, and not be mere reflectors of other men's thoughts" (p. 12).

In its 1961 document, The Central Purpose of American Education, the National Education Association's Educational Policies Commission states that the development of the ability to think is the central concern of American education.

While these three sample statements of purpose stress the central importance of critical thinking as an outcome of education, there is not unanimous agreement among educators that development of optimal critical thinking skills is actually fostered in the schools.

DeZatra (1966) wrote:

Within the school are additional obstacles to effective critical thinking: There are teachers who are emotionalists, who are protagonists in controversial issues, who themselves...
tend to reason by analogy and illogic, and who do not con-
sciously cultivate critical thinking within their pupils. There are examinations which primarily test memory rather
than power of judgment and interpretation. There are widely
heterogeneous classes and too large classes. (p. 234)

Statement of the Problem

It is possible that teaching practices currently in vogue
may actually inhibit development of critical thinking skills. Thus,
there may be a conflict between the stated purposes of education and
the manner in which instruction is carried out. If development of
critical thinking is truly an objective of Seventh-day Adventist
education, it is important to measure the extent to which this
objective is being reached. The problem which this study seeks to
address is that of evaluating critical thinking skills developed in
Seventh-day Adventist students in three types of secondary schools.
The remainder of this chapter will outline the purpose and
significance of this study, state the research hypotheses, define
major terms, set forth delimitations and point out basic underlying
assumptions.

Purpose of the Study

The purpose of this study was to evaluate the critical think-
ing skills of Seventh-day Adventist college freshmen, using scores
on the Watson-Glaser Critical Thinking Appraisal to compare those
who graduated from Seventh-day Adventist boarding academies,
Seventh-day Adventist day academies, and public high schools. Since
a search of the literature has indicated that critical thinking is
associated with high intelligence and low dogmatism, these
factors were also included in the study.

**Significance of the Study**

According to *Philosophy and Objectives of Seventh-day Adventist Education* (1953), the Seventh-day Adventist Church has historically maintained a separate school system "to insure that its youth may receive a balanced religious, intellectual, vocational, social and physical education." (p. 1). In gathering information about the effects of three different forms of secondary education on the development of critical thinking skills in Seventh-day Adventist secondary school students, the present study provides evidence regarding the quality of one phase of intellectual development fostered by Seventh-day Adventist secondary schools as compared with that fostered by public secondary schools. Skill in critical thinking is the specific facet of intellectual development which is the major focus of this study.

**Hypotheses**

The underlying hypothesis of this study is that there is a difference in the degree to which critical thinking is developed in various types of secondary schools. The review of the literature, found in chapter II, indicates that development of critical thinking skills can be improved by teaching. Since the purpose of this study is to examine the critical thinking skills of Seventh-day Adventist young people, the following research hypotheses were developed in order to compare critical thinking skills demonstrated by Seventh-day Adventist graduates of Seventh-day Adventist boarding academies,
Seventh-day Adventist day academies, and public high schools.

Major Hypotheses

The major hypotheses are designed to compare critical thinking skills demonstrated by Seventh-day Adventist college freshmen graduated from three types of secondary schools. These hypotheses are designated by a number beginning with WG, indicating data obtained through use of the Watson-Glaser Critical Thinking Appraisal.

WG-1. There is a statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

WG-2. There is a statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

WG-3. There is a statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies and those of Seventh-day Adventist college freshmen who graduated from public high schools.

WG-4. There is a statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from
Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

Supplementary Hypotheses

Earlier studies cited in the review of the literature suggest that skill in critical thinking is most strongly associated with high intelligence and low dogmatism. It was, therefore, decided to set up the following supplementary hypotheses in order to compare the intelligence and dogmatism of the three groups studied as well as to examine the correlations between critical thinking and intelligence and between critical thinking and dogmatism for each group.

Supplementary hypotheses relative to dogmatism

Hypotheses dealing with comparisons of dogmatism are designated by a number beginning with RD, indicating data obtained through use of the Rokeach Dogmatism Scale.

RD-1. There is a statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

RD-2. There is a statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.
RD-3. There is a statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

RD-4. There is a statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

**Supplementary hypotheses relative to intelligence**

Hypotheses dealing with comparisons of intelligence are designated by a number beginning with ACT, indicating data obtained through use of American College Testing Program (ACT) scores.

ACT-1. There is a statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

ACT-2. There is a statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

ACT-3. There is a statistically significant difference
between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen who graduated from public high schools.

ACT-4. There is a statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

Supplementary hypotheses relative to relationships between critical thinking and dogmatism

Hypotheses dealing with comparisons between critical thinking skills and dogmatism are designated by a number beginning with WG/RD, indicating data obtained through use of Watson-Glaser Critical Thinking Appraisal scores and Token Dogmatism Scale scores.

WG/RD-1. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Token Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies.

WG/RD-2. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Token Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies.

WG/RD-3. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Token Dogmatism Scale scores earned by Seventh-day Adventist college...
freshmen who graduated from public high schools.

WG/RD-4. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies.

WG/RD-5. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen.

Supplementary hypotheses relative to relationships between critical thinking and intelligence

Hypotheses dealing with comparisons between critical thinking skills and intelligence are designated by a number beginning with WG/ACT, indicating data obtained through use of Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores.

WG/ACT-1. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies.

WG/ACT-2. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.
WG/ACT-3. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from public high schools.

WG/ACT-4. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies.

WG/ACT-5. There is a statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen.

Definition of Terms

The following terms are central to this study and are intended to convey the meanings given below.

Critical thinking refers to the ability to discriminate among degrees of truth, falsity, or probability of inferences drawn from given facts or data; recognize unstated assumptions in given assertions or propositions; reason from given premises and recognize logical implication; weigh evidence and discriminate among degrees of probable inference; and discriminate between strong and weak, important and irrelevant arguments.

Dogmatism means inability to evaluate information received from outside in terms of its own merit without yielding to irrelevant internal or external pressures. Irrelevant internal pressures
may include, but are not limited to, such things as habits, beliefs, and personal needs. Irrelevant external pressures may include, but are not limited to, influence exerted by authority figures, either individual or institutional, and social or cultural norms.

A **Seventh-day Adventist** is defined as a student who responded to the questionnaire item asking religious affiliation by indicating that he/she is a Seventh-day Adventist.

**Seventh-day Adventist Boarding Academy Graduate** designates a student who reported that he/she graduated from secondary school and attended a Seventh-day Adventist boarding school for a minimum of three years of his/her secondary school education.

**Seventh-day Adventist Day Academy Graduate** indicates a student who reported that he/she graduated from secondary school and attended a Seventh-day Adventist day school for a minimum of three years of his/her secondary school education.

A **Public School Graduate** is a student who reported that he/she graduated from secondary school and attended a public school for a minimum of three years of his/her secondary school education.

A student who did not spend at least three years in one type of secondary school was considered ineligible for inclusion in the study. It was not necessary, however, that all three years be spent in the same secondary school as long as a total of three years were spent in the same type of school. For example, a student who attended boarding academy A for one year, public school for one year and boarding academy B for two years would have spent a total of three years in a boarding academy and was, therefore, eligible to
participate in the study as a boarding academy graduate even though the boarding academy experience was in two different schools. On the other hand, a student who had spent two years in boarding academy A and two years in public school would not be eligible to participate in the study since he/she had not spent three years in one type of secondary school.

**Delimitations of the Study**

The following delimitations are recognized for the study:

1. The population was drawn from freshmen enrolled in post-secondary institutions in a selected region of the United States (midwest and south).

2. The population was further limited to students who enrolled as freshmen in the three institutions at which the data were gathered (Andrews University, Berrien Springs, Michigan; Southern Missionary College, Collegedale, Tennessee; and Union College, Lincoln, Nebraska).

This limits the degree to which the results of the study may be generalized to the total population of Seventh-day Adventist college freshmen.

**Basic Assumptions**

The following assumptions are basic to this study:

1. *Critical thinking is a desired outcome of secondary education for Seventh-day Adventists.*

2. *The instrument used to measure critical thinking*
measures a form of critical thinking which is desirable for Seventh-day Adventist young people.

Outline of the Study

Chapter I has introduced the study, stated its purpose and significance, outlined the research hypotheses and supplementary hypotheses, defined significant terms, and set forth delimitations and basic assumptions.

Chapter II will review the literature relative to research on critical thinking as well as current understanding of the human thinking process.

Chapter II will outline the methodology of the study.

Chapter IV will report the results of the research.

Chapter V will summarize the results, draw conclusions, and recommend areas for further research.

Appendices and bibliography will complete this document.
No studies were found in the literature dealing with critical thinking in Seventh-day Adventists. Critical thinking has, however, been studied from several points of view. Those studies cited in the present chapter have been divided into three groups:

1. Studies of critical thinking in which religion was a variable
2. Studies of critical thinking in which religion was not a variable
3. Studies dealing with critical thinking as an outcome of teaching

In addition, a brief review of some of the current theories of human thinking processes is included in this chapter.

**Studies of Critical Thinking in Which Religion Was a Variable**

Quinn (1963) examined critical thinking and open-mindedness in seniors from four high schools in the New York City area: two public schools and two Catholic schools. The Watson-Glaser Critical Thinking Appraisal was used to measure critical thinking ability. Protestants ranked highest on the test, with Jews, parochial school Catholics, and public school Catholics following in that order. Intelligence was also compared with critical thinking by Quinn.
Using analysis of covariance he found a coefficient of correlation of .52 between I.Q. test scores and Watson-Glaser Critical Thinking Appraisal scores. A .10 coefficient of correlation was found between socio-economic status and critical thinking scores. Quinn also examined the relationship between the types of elementary school attended by subjects, type of elementary school attended by parents, and critical thinking ability. No significant relationship was found. He concluded that the most probable explanatory factor was the type of secondary school the subject attended.

In his review of the literature, Quinn indicated that he found no other study of critical thinking which compared religious groups or public and parochial school students. A search in connection with the present study revealed only two subsequent studies of critical thinking focusing on religion as a variable. No evidence was found of any study of critical thinking among Seventh-day Adventists.

Haas (1963) compared the critical thinking skills of 282 students enrolled in a Sister Formation Curriculum (a special program designed to prepare young, Catholic, religious women for their apostolic vocation) with similar skills of 272 lay students. Analysis of variance of test scores yielded non-significant F ratios for interaction effects; therefore, the null hypotheses of no difference between sisters and lay students in critical thinking, flexibility of thinking, or reading ability was retained.

A study by Geckler (1965) examined dogmatism, critical thinking, social status, and religious affiliation of 913 tenth
grade students in nine different high schools (four large urban, three small rural, one parochial, one private). Subjects were administered the Watson-Glaser Critical Thinking Appraisal, the Rokeach Dogmatism Scale, Form E, and the McGuire-White Index of Value Orientation. I.Q.'s were obtained from school records. When critical thinking scores were adjusted for verbal intelligence, no significant differences were found attributable to social status or between urban and rural students. An inverse relationship was found between critical thinking and dogmatism and between dogmatism and social status. Episcopalians ranked high in social status and critical thinking and low on dogmatism. Baptists and members of the Church of God ranked high on dogmatism and low on social status and critical thinking. In light of other studies, it seems reasonable to suggest that the low critical thinking scores of the latter two groups are attributable more to high dogmatism than to low social status.

*Studies of Critical Thinking in Which Religion Was Not a Variable*

Kemp (1960) conducted a study in which a total of five hundred freshman students from colleges in Michigan and West Virginia were administered fifty selected items from the Rokeach Dogmatism Scale, Form E, and a set of critical thinking problems. The results indicated that those who scored low on dogmatism were superior in critical thinking to those who scored high on dogmatism.

Ninety-five male and forty-nine female student disciplinary offenders were compared with a group of non-offenders on several
scales, including the Test of Critical Thinking. No differences were found between males and females of either group on critical thinking (Cummins and Lindlahr, 1967).

Bostrom (1969) examined the relationship among achievement level, class size, and the attainment of critical thinking skills using ninety subjects selected from preregistering beginning students admitted to the College of Education at Arizona State University. Forty-five subjects were assigned to one large class. Forty-five subjects were assigned to three small classes of fifteen each. All classes received instruction in principles and techniques of scientific problem-solving. The Watson-Glaser Critical Thinking Appraisal was administered at the end of thirteen weeks. No significant difference was found attributable to class size. When ability was considered, high achievers learned more in large classes; low achievers in small classes. Class size made no difference for students of average ability.

Low correlations between socioeconomic status and critical thinking ability as demonstrated by performance on the Watson-Glaser Critical Thinking Appraisal were found by Jones (1969). He also examined the effect of a series of twelve discussions of analysis of reasoning in formal arguments on critical thinking skills of a group of thirty freshman students. The experimental group showed greater improvement in critical thinking than did the control group, supporting the possibility of a relationship between reasoning in arguments and critical thinking.

Luck and Gruner (1970) examined the relationship between
authoritarianism and critical thinking. One hundred and twenty sub-
jects completed the five tests of the Watson-Glaser Critical Think-
ing Appraisal and the California F Scale. Pearson rs were computed
between authoritarianism and Watson-Glaser Critical Thinking Apprai-
sal scores. A negative r of -.322 (p < .01) was found, indicating
that as authoritarianism increases, critical thinking skill decreases.

In a study of fifth and twelfth grade subjects, Follman and
Lowe (1973) found a multiple (R) between the critical thinking sub-
tests and the language ability subtests of .98. This correlation is
of such magnitude as to probably preclude the existence of either
critical reading or critical thinking, independent of language
ability.

Simon and Ward (1974) studied seventy-nine third-year British
University students and found that sex was related to significant
differences in performance on two of the five subtests of the
Watson-Glaser Critical Thinking Appraisal (Inference, and Evaluation
of Arguments). Overall, in terms of total score, males were signi-
ficantly superior to females.

Hoogstraten and Christians (1975) used ninety-seven male and
ninety-two female first-year psychology student volunteers in a
study of the relationship of scores on the Watson-Glaser Critical
Thinking Appraisal to sex and four selected personality measures.
The investigation was conducted in the Netherlands, using the Dutch
version of the Watson-Glaser Critical Thinking Appraisal. No sta-
tistically significant differences were found between males and
females. It was also concluded that performance on the Watson-Glaser
Critical Thinking Appraisal is independent of introversion-extroversion, neuroticism, and rigidity.

In a study of critical thinking among parents and adolescent children from predominantly white, middle-class, academically successful, intact families, Gurfein (1977) found significant relationships between critical thinking levels of parents and children. No significant differences were found between the amount of critical thinking exhibited by males and females.

**Studies Dealing with Critical Thinking as an Outcome of Teaching**

Can critical thinking skills be enhanced through teaching? Several studies have dealt with this question.

Henderson (1958) used as subjects 1,500 students in English, geometry, science, and social studies classes, grades nine through twelve, taught by thirty-six different teachers. An experimental group was taught specifically to improve critical thinking. The difference between the mean gain in score on the Watson-Glaser Critical Thinking Appraisal for the two groups from September to June was significant at the .05 level in favor of the experimental group.

Duckworth (1968) studied the effect of instruction in general semantics on the critical thinking of tenth and eleventh grade students. It was his conclusion that the teacher, rather than the course material, is an important factor in influencing the improvement of critical thinking on the part of tenth and eleventh graders.

Frank (1969) designed a high school speech program which
emphasized critical thinking skills. One hundred and three students were enrolled in experimental classes, while 103 enrolled in regular classes. Five different teachers participated in the study, with each teacher conducting one experimental class and one control class. At the conclusion of the course, the experimental groups taught by all teachers scored significantly higher on the Watson-Glaser Critical Thinking Appraisal. Students were tested again three months after the completion of the course. The improvement in scores was found to persist. Frank concluded that "The particular teacher involved did not influence the effectiveness of the experimental course" (p. 301).

Poel (1970) studied one thousand physics students from twenty-seven different high schools. He concluded that development of critical thinking skills is related to teacher-pupil interactions that increase the student's potential for actively participating in the teaching/learning process.

One hundred and ninety-three freshman students in a required natural science course at St. Andrews College were studied by Skinner and Houshell (1972). Experimental and control groups were set up. On the pre-test using the Watson-Glaser Critical Thinking Appraisal, the two groups were found not to differ on critical thinking. The experimental group was divided into eight groups stratified by sex, major, pre-attitude toward natural science, verbal aptitude scores, math aptitude scores, prior physics training, prior chemistry training, and prior math training. The control group consisted of twenty-six freshmen not enrolled in the natural
science course. At the conclusion of the experiment, which ran for three months, neither the experimental nor the control group, nor any subgroup, showed significant increase in critical thinking ability.

Seymour and Sutman (1973) studied chemistry and nonchemistry students in public high schools in Philadelphia using the Watson-Glaser Critical Thinking Appraisal. It was their conclusion that instruction in chemistry tended to improve critical thinking.

Newton (1977) studied development of critical thinking skills in eleventh and twelfth grade students through use of higher cognitive questioning. Students whose instruction emphasized higher cognitive questioning showed a statistically significant gain in critical thinking scores on the Watson-Glaser Critical Thinking Appraisal. Those whose instruction did not emphasize higher cognitive questioning showed no statistically significant gain.

Current Theories of Human Thinking Processes

In an attempt to gain an understanding of current theories of the human thinking process, a review of the literature in the area of cognitive psychology was undertaken.

Estes (1975) has described the state of the discipline of cognitive psychology in graphic terms:

... Viewed from the outside, perhaps the most salient features of present-day cognitive psychology are, on the one hand, the volume and heterogeneity of research, and on the other, the absence of any semblance of plan or order. Trying to read through any year's volumes of research articles is much like walking through a field which has been sown by mixing all varieties of seed, from asters to zinnias and alfalfa to wheat, and scattering them at random. Innumerable small plots are cultivated industriously
but autonomously, today's harvest in any one yielding the germ of the next, except perhaps for haphazard wind-blown inputs from neighbors.

This appearance in a way is deceptive. Behind the noisy surface of research output there is actually a substantial measure of plan and order. The order exists, however, not in the activity nor in the products themselves, but only in the mind of the scientifically trained observer who possesses the key to the system. The key is theory. The organizing influence of ideas, concepts, and attitudes generates gradients of subordination, makes it possible to retrieve from diverse sources the information required to solve a problem. Thus, to understand cognitive psychology, one must understand its theories. (p. 3. Italics mine.)

Following Estes' lead a survey was made of several developments in cognitive psychology. Current theories are concerned with basic human cognitive processes such as memory, retrieval, and various types of problem solving; however, no evidence was found that anyone has yet attacked the problem of developing a theoretical framework to explain the nature of the critical thinking processes. Computer simulation of cognition may, at the present, offer the best hope of the development of such a framework.

Chase (1978) uses an information processing point of view to focus on elementary information processes including verification and searching semantic memory. He sees verification as a four-stage additive process in which the individual first encodes the original material, then encodes the material to be verified, compares the two, and finally generates a true-false response.

Chase also uses the concept of searching semantic memory to explain comprehension. He postulates that information is stored hierarchically in a semantic network. Word concepts are stored at various nodes, or intersections, in this network. Associations serve as connections between nodes. Comprehension is assumed to
involve finding a path, or association, between two nodes. Comprehension of virtually every statement not involving a particular fact requires an inference. The basic process underlying inference is a memory search through the nodes in semantic memory; however, this model is not specific about the search process; for example, it does not answer the question as to whether the search proceeds from subject noun to predicate noun or vice versa or in both directions simultaneously. According to Chase's model, one way false sentences are recognized is by locating negative information or a counterexample in the semantic memory.

Greeno (1978) has proposed a typology of problems:

1. **Problems of inducing structure** in which the main task is to identify patterns of relationships among given elements. Solution of such problems requires ability to comprehend relationships and generate representations of relational patterns.

2. **Problems of transformation** in which the task is to find a sequence of desired operations that transform the initial situation into the desired (or goal) situation. These problems require planning by mean–ends analysis (knowing which goals various operators satisfy).

3. **Problems of arrangement** in which the task is to arrange elements in a way that satisfies some criteria. To solve these problems it is necessary to have the power of generating possible solutions and evaluating their potential usefulness.

Simon (1978) has done considerable work in developing computer simulations of human thinking processes based on thinking aloud.
protocols. He theorizes that human problem solving is an interaction between an information processing system (the problem solver) and a task environment (the actual dimensions of the problem). In approaching a problem, the problem solver represents the situation in terms of a problem space (his way of viewing the task environment).

The process of generating the problem representation is composed of two subprocesses: interpreting the language of the instructions and constructing the problem-solving space. Subjects tend to search for the representation derived in the most direct and straightforward way from the language of the problem instructions rather than for the most efficient representation—which will make solving it easiest.

The structure of the task environment determines the possible structures of the problem space. The structure of the problem space, in turn, determines the possible programs or strategies that can be used for problem solving.

The structure of the problem space constrains problem solving behavior in several ways: it defines "legal" moves, defines the goal and direction of movement towards or away from the goal, and interacts with short-term memory to make some solution paths easier to find than others.

The basic problem space (or simplest problem space for any given task) consists of the set of nodes generated by all legal moves. Each node in the problem space may be thought of as a possible state of knowledge the problem solver may attain. The state
of knowledge is what the problem solver knows about the problem in any particular moment of time. The ease of solving a problem depends on how accurately the solver has been able to represent the critical features of the task environment in his problem space.

The human information processing system is neither capable of, nor willing to endure, much trial-and-error search; however, the amount of search required for solutions bears little or no relation to the size of the entire space (i.e., there is no point in worrying about the size of the haystack if you can identify the small part which contains the needle).

Problem solving involves at least two kinds of choices: a choice of node from which to proceed and a choice of an operator to apply at that node. Comparisons between current and desired nodes are used to extract differences which in turn serve as criteria for selecting a relevant operator.

Estes (1975) suggests that in studying cognitive functions, common themes with increasing variations will be found as particular activities are examined. While the explanation of elementary information processes suggested by Chase, the problem-solving typology postulated by Greeno, and the problem-solving model proposed by Simon are not perfectly congruent with critical thinking tasks, some common themes emerge which seem relevant.

For example, in any critical thinking task, it is important that the subject have a clear understanding of the task environment and construct the most accurate problem space available. Although critical thinking is by no means limited to simple verification;
there is certainly a significant element of verification involved, particularly in the process of determining whether or not an inference is valid.

In critical thinking tasks such as presented in the Watson-Glaser Critical Thinking Appraisal, the traditional problem-solving strategy of searching the semantic memory may actually interfere with the subject's ability to concentrate on judging the question solely on the basis of verification.

Critical thinking has been shown to be positively related to intelligence and negatively related to dogmatism (Kemp, 1960; Quinn, 1963; Geckler, 1965; Follman and Lowe, 1973). This may be an outgrowth of the influence of intelligence upon the ability to focus in clearly on the task environment and influence of dogmatism upon the tendency to stray from the original task environment in the verification process and wander through semantic memory searching for and stumbling over stored materials which cloud the issue or redefine the problem space in a manner which is not congruent with the task environment.

**Summary of the Literature**

The studies cited above suggest that critical thinking ability is most strongly associated with high intelligence, high verbal ability, low dogmatism, and parents' level of critical thinking ability. The evidence relative to differences between the sexes in critical thinking skills is mixed. There is considerable evidence that critical thinking skills can be improved by teaching. Thus, it
seems reasonable to set up a study which compares the critical thinking ability of a religiously homogeneous group from different types of secondary schools.

Cognitive psychology has not yet gone beyond postulating theoretical explanations for very basic mental processes. At this point, one can only speculate how these theories might relate to a theoretical framework to explain the nature of the critical thinking process. This chapter suggests that intelligence and the process of semantic memory search may actually interfere with and/or limit the ability to accurately define the problem space and thus interfere with critical thinking.
CHAPTER III

METODOLOGY

Type of Research

This study was quasi-experimental in nature, designed to compare critical thinking skills, depression and American College Testing Program scores of Seventh-day Adventist graduates of Seventh-day Adventist boarding academies, Seventh-day Adventist day academies, and public high schools.

Population and Sample

The population for the study consisted of all Seventh-day Adventists who graduated from secondary school in 1977 and enrolled in any of three Seventh-day Adventist institutions of higher learning for the fall term, 1977. The three institutions of higher learning were Andrews University, Berrien Springs, Michigan; Southern Missionary College, Columbia, Tennessee; and Union College, Lincoln, Nebraska.

The desired power for this study was set at .95. Power is defined as the probability of getting a significant result if the null hypothesis of no difference is indeed false. Power is a function of (1) the significance criterion, (2) the sample size, and (3) the population effect size.

In accordance with the guidelines suggested by Melkowitz,
Ewen, and Cohen (1971) for selection of a medium effect size, the population effect size ($\gamma$) was set at .5 (indicating that any difference between means that is less than one-half of one standard deviation will be considered too small to be of practical significance). The standard deviation for raw scores on the Watson-Glaser Critical Thinking Appraisal for the normative sample of college freshmen was found to be 9.8 (Watson, 1964). Thus, for Watson-Glaser Critical Thinking Appraisal scores there is no interest in a difference between means that is less than 4.90 raw score points. The desired power of .95 gives a 95 percent probability of finding statistical significance if a difference greater than $\pm 4.90$ raw score points actually does exist in the population.

Following the standard formula for power analysis (Welkowitz, Ewen, and Cohen, 1971), the sample size needed to provide for power .95, significance criterion .05, and effect size .5 was found to be 52 subjects for testing the significance of a correlation for a single sample and 104 subjects per sample for comparisons of means of two independent samples. Since the present study involves not only correlations for single samples but also comparisons of means for a total of three independent samples, a random sample of 312 subjects was selected. The sample was stratified according to type of secondary school attended.

**Research Tools**

The Watson-Glaser Critical Thinking Appraisal, revised edition, Form YM, was used to measure critical thinking ability. In reviewing this instrument Hemstadter (1972) stated:
In summary, the Watson-Glaser Critical Thinking Appraisal represents a highly professional attempt to measure an important characteristic. And, while there may be some flaws in the test, it is doubtful whether a significantly better measure will be found until there is a major breakthrough either in test technology or in our understanding of the "thinking" process. Similarly, while some additional information about a test is always helpful, if all publishers were as cautious in their verbal claims, as precise in their test description, and as inclusive with respect to crucial data, there would be no ethical problem in the publishing of tests. (p. 1214)

The test consists of one hundred items distributed among five subtests: Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments. Each group of two to six items is preceded by a paragraph or statement which is to be used as a basis for answering the items. Thus, the test does not rely on any previously acquired information; rather, it tests ability to analyze and evaluate present material.

Two professional counselors examined the instrument for bias with respect to Seventh-day Adventists. These two reviewers were selected on the basis of their being Seventh-day Adventists employed in two different settings and, therefore, sensitive to material which might be biased against Seventh-day Adventists from varying backgrounds. The first is employed as a counselor in a Seventh-day Adventist University and was, therefore, assumed to be in touch with the concerns of Seventh-day Adventist undergraduate students. The second holds a doctoral degree in counseling from a Seventh-day Adventist University, is presently employed in private practice, dealing primarily with non-Seventh-day Adventist clients and was, therefore, assumed to have a somewhat different perspective on Seventh-day Adventist concerns. The first of these reviewers
commented that two of the twenty-five introductory statements expressed views in conflict with traditional Adventist values; however, in view of the fact that the instructions specifically indicate that the questions are to be answered only in light of the introductory paragraph and without reference to personal biases or opinions, he concluded that the test was not biased for or against Seventh-day Adventists. The second reviewer reported that he found no bias relative to Seventh-day Adventists.

The Dogmatism Scale, Form D (Rokeach, 1956) was administered to each participant in the study to measure dogmatism or closed-mindedness. Rokeach (1960) states that a person's belief system is open to

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

Form D of the Dogmatism Scale consists of sixty-six Likert-Type items designed to go beyond specific belief content into the structure of how a belief is held. Possible scores range from 66-442. A high score indicates a high degree of dogmatism.

In discussing the development of the Dogmatism Scale, Rokeach (1960) reports that the highest reliability (.91) was obtained for Form D. The only reason he cites for development of Form E is to shorten the scale (from sixty-six items to forty). The reliability of .91 for Form D was obtained for a group of English college students. Reliability for Form E ranged from .68 to .93. It is of interest to note that the .93 reliability was obtained for a
sample tested at a Veterans' Administration domiciliary. Reliabilities obtained for samples of college students ranged from .68 to .85. These data do not support Form E as even equal to Form D in reliability for use with college students. It was, therefore, decided to use Form D for this study, in spite of its being considerably longer than Form E.

Uingley (1974) used the Rokeach Dogmatism Scale in a study of administrator and faculty dogmatism and senior student passivity in Seventh-day Adventist secondary schools in the northwestern United States. He used as norms data gathered in a study conducted by Rabkin (1966) utilizing as subjects teachers attending summer school at the University of Washington. Hingley found that Seventh-day Adventist administrators and faculty members were higher in measured dogmatism than the normative group at the .001 level of confidence. These results suggest the possibility that Seventh-day Adventists as a group may score higher on the dogmatism scale than the general population.

Previous studies (see Kemp, 1960 and Geckler, 1965) have found a negative correlation between dogmatism and critical thinking skills. This means that as dogmatism increases, critical thinking skill tends to decrease. It was, therefore, decided to examine dogmatism as a variable in this study.

Follman and Lowe (1973), and Feely (1975) found a positive relationship between critical thinking scores and verbal ability. Quinn (1963) found a positive correlation between I.Q. test scores and critical thinking scores. These results suggest that as
intelligence (particularly verbal) increases, critical thinking skills will also tend to increase. On this basis, it was decided to examine intelligence as a variable in this study.

American College Testing Program Scores for each participant were gathered from school records in order to give some indication as to the intelligence of the subjects.

Martin and Rudolph (1972) correlated scores on the Wechsler Adult Intelligence Scale (WAIS), the Slosson Intelligence Test (SIT), and American College Testing Program (ACT) scores. They found a correlation (r) of .70 between WAIS Full Scale and SIT scores and a correlation (r) of .56 between ACT and SIT scores.

In order to further explore the relationship between ACT scores and intelligence test scores, a correlational study was done on ACT scores and California Test of Mental Maturity (CTMM) scores. Four hundred and thirty-four subjects were chosen from the files of the Andrews University Counseling and Testing Center. These subjects consisted of all those cases in the file for whom both ACT scores and California Test of Mental Maturity Scores (CTMM) were available. Kendall's tau was used to measure the degree of correlation between each standard ACT score (English, Mathematics, Social Studies, Natural Science, and Composite) and each CTMM Score (Language IQ, Nonlanguage IQ, Total IQ, Language Raw Score, Nonlanguage Raw Score, Total Raw Score). An examination of table 1 shows that the strongest correlational relationship exists between CTMM Total IQ and Composite ACT Scores (tau = .596 on a scale of 0.00 to 1.00). These results are significant at the .001 level. On the basis of
these findings, American College Testing Program composite standard scores were accepted as an adequate indicator of intelligence for the present study.

Table 1.—Kendall Rank Correlation Coefficients (tau) between American College Testing Program (ACT) Scores and California Test of Mental Maturity (CTMM) Scores.*

<table>
<thead>
<tr>
<th></th>
<th>English ACT</th>
<th>Math ACT</th>
<th>Social Studies ACT</th>
<th>Natural Science ACT</th>
<th>Composite ACT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTNN Language IQ</td>
<td>.475</td>
<td>.380</td>
<td>.505</td>
<td>.469</td>
<td>.555</td>
</tr>
<tr>
<td>CTMM Nonlanguage IQ</td>
<td>.370</td>
<td>.367</td>
<td>.387</td>
<td>.425</td>
<td>.467</td>
</tr>
<tr>
<td>CTMM Total IQ</td>
<td>.490</td>
<td>.434</td>
<td>.515</td>
<td>.519</td>
<td>.596</td>
</tr>
<tr>
<td>CTMM Language Raw Score</td>
<td>.477</td>
<td>.384</td>
<td>.510</td>
<td>.475</td>
<td>.560</td>
</tr>
<tr>
<td>CTMM Nonlanguage Raw Score</td>
<td>.370</td>
<td>.366</td>
<td>.388</td>
<td>.427</td>
<td>.468</td>
</tr>
<tr>
<td>CTMM Total Raw Score</td>
<td>.490</td>
<td>.434</td>
<td>.514</td>
<td>.319</td>
<td>.596</td>
</tr>
</tbody>
</table>

*All correlations are significant at the .001 level.

Procedure

The president of each college was contacted by telephone in order to obtain permission to use students from his school as subjects for the study. The president was asked to designate either the director of freshman education, the director of the counseling center, or some other staff member to serve as liaison person to work with the researcher in arranging for data collection. At
Southern Missionary College the Director of Admissions and Records served as liaison person. At Union College, the Director of Counseling and Testing performed a similar function. At Andrews University, the researcher, who was employed as Director of Freshman Education, arranged for data collection.

The registrar of each college was contacted in order to make arrangements to have a special demographic survey card included in the registration packet for all freshmen and collected at the final check station for registration. A copy of the card is included as appendix A. Cards collected during the registration process were mailed to the researcher along with a computer listing of all freshmen enrolled at the school. These lists were used to identify freshmen who had not filled out a survey card.

At Southern Missionary College, approximately one hundred freshmen did not complete cards during the registration process. In order to gather the needed information on these students, the researcher went to the campus and spent two days collecting the information from student records. At Union College approximately fifty of the freshmen did not complete the cards during the registration process. The secretary to the Director of the Counseling Center obtained the necessary information on those students from records in the registrar's office. At Andrews University approximately eighty freshmen did not fill out the card during registration. Information on these students was obtained from records in the registrar's office.

In order to qualify for the study it was necessary that the
student be a Seventh-day Adventist (as evidenced by his/her own report on the demographic survey card) and a 1977 secondary school graduate who had attended one type of secondary school for at least three years. The survey cards were hand sorted in order to cull out those students who failed to meet all of the criteria for participation in the study. Cards of students qualifying for the study were divided into groups according to the type of secondary school the student had attended. Calculations were made to determine what percentage of each of the three population subgroups occurred at each of the three schools where data were to be collected. Thus, a total of nine cells were examined: boarding academy graduates at each of the three schools, day academy graduates at each school, and public school graduates at each school. The desired number of subjects had previously been set at 312 (104 graduates of each of the three types of secondary school); therefore, the percentage of the population occurring in each cell was multiplied by 104 in order to determine how many subjects should be selected from each category at each of the three schools where data were collected. All members in each cell of the population were assigned consecutive numbers. A computerized random number generator was used to select subjects from the population for inclusion in the stratified random sample.

Each member of the sample was assigned a unique number which included a code for college, sex, type of secondary school attended, and a discrete number for identification purposes.

Each subject was sent a packet including the following items:

1. A letter from the investigator explaining the study and asking for the student's participation.
2. A letter from the college president introducing the researcher and the study and encouraging the student to participate. (This item was not included in the packet at Andrews University where the investigator was employed as Director of Freshman Education and, consequently, well known to the students.)

3. The Rokeach Dogmatism Scale.

4. A return envelope for submitting the dogmatism scale to the liaison person. The envelope included a listing of the times at which the critical thinking appraisal would be administered on that campus.

Copies of these materials are included in appendices B, C, and D.

Subjects were requested to fill in the appointment section of the return envelope making a commitment to take the test at a time convenient for them. They were also asked to fill in the dogmatism scale, seal it in the return envelope, and turn it in to the liaison person on their home campus.

Subjects who had not returned the dogmatism scale and made an appointment to take the Watson-Glaser Critical Thinking Appraisal by the deadline indicated in the introductory letter were sent a follow-up card urging them to participate. Students who had returned the dogmatism scale and selected a time to take the test were sent a reminder card approximately three days before the test date. A copy of these cards is included in appendices B, C, and D.

The researcher traveled to each of the campuses to administer the Watson-Glaser Critical Thinking Appraisal and to follow
up those subjects who had not responded.

The night before testing was scheduled to begin at Union College, the researcher checked the list of subjects against the list of those who had made appointments to take the Watson-Glaser Critical Thinking Appraisal and returned the dogmatism scale. The following morning telephone messages were left in the rooms of residence hall students who had not responded, asking them to take the critical thinking appraisal and turn in the dogmatism scale. Throughout that day, telephone calls were placed to community students urging them to participate. All nonresponding members of the random sample were contacted either by phone or by message. That evening a second check was made. Subjects who still had not made an appointment or who had failed to keep appointments they had made were left messages urging them to come to the Counseling Center to participate in the testing. A noon on the third day, a final appeal was delivered to residence hall rooms of nonresponding subjects encouraging them to call the Counseling Center and set up an appointment to take the critical thinking appraisal and fill in the dogmatism scale. When the researcher left the campus, 56 percent (33) of the subjects had been tested.

At Southern Missionary College, the list of appointments was also checked against the list of subjects the evening before testing was scheduled to begin. An attempt was made to contact all nonresponding subjects by telephone in order to encourage them to participate. All subjects were contacted personally, or messages left for them. Following each testing period, messages were
delivered to the room of each residence-hall subject who failed to keep a testing appointment requesting that the subject select another time to take the test and strongly urging participation in the study. The researcher left the campus of Southern Missionary College having tested 66 percent (84) of the subjects.

In view of the fact that procedures employed at the first two campuses had not been adequate to gain full subject participation, additional follow-up procedures were used at Andrews University as suggested by Berdie and Anderson (1974).

Students who had not returned the dogmatism scale by the deadline indicated in the introductory letter were sent a duplicated reminder card urging them to return the materials to the Counseling Center and select a time to take the test. Students who still had not responded three days before the testing was scheduled to begin were sent a second reminder letter urging them to participate and emphasizing the importance of participation to the overall strength of the study. Throughout the testing period, students who were scheduled to take the critical thinking appraisal but who failed to keep their appointments were sent a special reminder urging them to come at one of the other testing times. Eighteen days following the beginning of the testing period, a final reminder letter was sent to those students who still had not participated in the study. This was a xerox copy of a handwritten letter mailed in a hand-addressed top-quality personal stationery style envelope to which a commemorative postage stamp was affixed. Students who had not responded to any of these reminders were contacted by telephone one week later.
No testing was done after December 14, which marked the end of the fall quarter. A total of 71 percent (90) of the subjects were tested at Andrews University.

Samples of all follow-up correspondence are included in appendices B, C, and D.

There are four possible explanations for the difficulty experienced in getting subjects to participate:

1. While the study is significant it was not particularly appealing to college freshmen.

2. The instruments used in the study were neither attractive nor interesting to students. The first two items of the dogmatism scale place a great deal of emphasis on concerns which were prevalent in the 1950s when the scale was developed and are no longer of major interest to freshmen. The Watson-Claser Critical Thinking Appraisal is a rather taxing instrument for the average college freshman.

In spite of those objections it was not feasible to use other instruments. No more attractive and interesting instruments were found to measure critical thinking and dogmatism as effectively as those developed by Rokeach and Watson and Claser. Furthermore, these two instruments have been used in the majority of studies dealing with critical thinking and dogmatism.

3. The study went beyond the simple survey in that subjects were required not only to fill out the dogmatism scale at their own convenience but also to meet with the investigator in order to complete the critical thinking appraisal.
4. The nature of the study placed limits on the time available to gather data. It was not possible to complete identification of the sample until October 18 due to difficulty in getting accurate lists of freshman students. Since the study was designed to measure critical thinking skills developed in secondary schools, it was felt that it was important to complete collection of data during the first quarter or semester of the freshman year in order to minimize contamination by the college experience.

It will be noted that while various procedures were used on each campus to follow-up reluctant subjects, the percentage of subjects participating on each campus does not vary greatly from campus to campus (56 percent at Union College, 66 percent at Southern Missionary College, and 71 percent at Andrews University).

The only incentive given to subjects to participate was the offer of immediate scoring and reporting of test results for the Watson-Glaser Critical Thinking Appraisal. A copy of the report form used is included in appendix 5. While this did generate some interest, it was apparently not of sufficient interest to involve subjects who would not otherwise have participated.

Dogmatism scales and Watson-Glaser Critical Thinking Appraisals were hand scored. Raw scores were entered into the computer along with the subject code number and American College Testing Program standard scores.

Statistical Analysis

The Mann-Whitney U test was used to test the major null hypotheses and the supplementary hypotheses dealing with differences
between variables. The Kendall rank correlation coefficient (tau) was used to test null hypotheses dealing with relationships between variables.

The Mann-Whitney U Test was selected because the data are ordinal measures. The Mann-Whitney U is one of the most powerful alternatives to the t test. Its power approaches 95.5 percent as N increases. The power efficiency of the median test is about 95 percent for $n_1 + n_2$ as low as 6; however, the power efficiency decreases as the sample size increases (Siegel, 1956). The Mann-Whitney U test was, therefore, preferred over the median test because of the relatively large number of subjects.

The Kendall rank correlation coefficient (tau) was selected because the data are ordinal measures. The Kendall rank correlation coefficient yields different numerical values than Spearman rank correlation coefficients for the same pair of rankings. This is due to the fact that the two tests have different underlying scales. It will be noted, however, that the two tests use the same amount of information from the data and, therefore, have the same power to detect the existence of an association in the population; however, the Kendall rank correlation coefficient is more sensitive for data which include a large number of ties. Therefore, it was decided to use the Kendall rank correlation coefficient for this study since a large number of ties is present.

Kendall's tau has a power efficiency of 91 percent. This means that tau is approximately as sensitive a test of association between two variables in a bivariate normal population with a sample
of one hundred cases as is the Pearson $r$ with ninety-one cases (Siegel, 1956).

The significance criterion for this study was set at the .05 level. The region of rejection consisted of all values of $r$ or $\tau$ which are so extreme that their associated probability under $H_0$ is equal to or less than $\alpha = .05$.

**Summary of Chapter III**

Chapter III has summarized the methodology of the study. This has included an explanation of the criteria used to select the research instruments, a description of how the population was identified and sample selected, an outline of the data collection procedures, and a justification of the statistical analyses used.
CHAPTER IV

RESULTS

The first three chapters have outlined the rationale and methodology of this study and have reviewed relevant literature. The present chapter will summarize the findings of the study.

The underlying hypothesis of this study was that there is a difference in the degree to which critical thinking is developed in various types of secondary schools. More specifically, the research hypotheses were set up to compare critical thinking skills demonstrated by Seventh-day Adventist college freshmen who were graduates of Seventh-day Adventist boarding academies, Seventh-day Adventist day academies, and public high schools. The Watson-Glaser Critical Thinking Appraisal was used to measure critical thinking skills.

Two hundred and seven students were tested on the three campuses where data were collected. This is 66 percent of the stratified random sample originally selected for the study. As indicated in chapter III, power is a function of (1) significance criteria, (2) sample size, and (3) population effect size. The significance criteria and population effect size remain unchanged. Since only 66 percent of the stratified random sample originally selected for the study actually participated, the randomness of the sample cannot be evaluated. It is, therefore, not possible to compute an accurate power for the study.
In other words, whereas the design of the study undertook to examine the null hypotheses with a 95 percent probability of getting a significant result if the null hypotheses of no difference were indeed false, the numbers of subjects actually participating in the study make it impossible to calculate this probability.

**Testing of Major Hypotheses**

The Watson-Glaser Critical Thinking Appraisal, Form YM, was used to measure critical thinking skills. The test consists of one hundred items distributed among five subtests: Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments. Each group of two to six items is preceded by a paragraph or statement which is to be used as a basis for answering the items. Thus the test does not rely on any previously acquired information; rather, it tests ability to analyze and evaluate present materials. Possible scores range from 0—100. A high score indicates highly developed critical thinking skills.

The major hypotheses set forth in chapter I will be examined individually. They are here stated in the null form in order to facilitate retaining or rejecting them according to the statistical criterion established for this study (\( \alpha = .05 \)).

Hypotheses dealing with comparisons of critical thinking skills are preceded by the letters WG, indicating data obtained through use of the Watson-Glaser Critical Thinking Appraisal.

**Hypothesis WG-1.** There is no statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from
Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to Watson-Glaser Critical Thinking Appraisal scores obtained for seventy graduates of Seventh-day Adventist boarding academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .10; therefore the null hypothesis was retained.

No statistically significant difference was found between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

Hypothesis WG-2. There is no statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

The Mann-Whitney U test was applied to Watson-Glaser Critical Thinking Appraisal scores obtained for seventy boarding academy graduates and sixty-three day academy graduates. The associated probability of the obtained U was .46; therefore the null hypothesis is retained.

No statistically significant difference was found between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen subjects who graduated from
Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies.

Hypothesis WG-3. There is no statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

The Mann-Whitney U test was applied to Watson-Glaser Critical Thinking Appraisal scores obtained for sixty-three graduates of day academies and seventy-four graduates of public schools. The associated probability of the obtained U was .27; therefore the null hypothesis is retained.

No statistically significant difference was found between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist public schools.

Hypothesis WG-4. There is no statistically significant difference between the Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to Watson-Glaser
Critical Thinking Appraisal scores obtained for 133 graduates of Seventh-day Adventist academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .11; therefore the null hypothesis is retained.

No statistically significant difference was found between Watson-Glaser Critical Thinking Appraisal scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

Table 2 shows the mean scores obtained on the Watson-Glaser Critical Thinking Appraisal. Seventh-day Adventist subjects who were graduates of both types of Seventh-day Adventist secondary schools obtained a higher mean score on this instrument than did Seventh-day Adventist subjects who were graduates of public high schools.

Table 2.—Mean scores obtained on the Watson-Glaser Critical Thinking Appraisal

<table>
<thead>
<tr>
<th>Type of School</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy</td>
<td>69.78</td>
</tr>
<tr>
<td>SDA boarding academy plus SDA day academy</td>
<td>69.38</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>68.77</td>
</tr>
<tr>
<td>Public high school</td>
<td>66.65</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist
The differences between means in table 2 do suggest that for the particular group of subjects studied, Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score somewhat higher on the Watson-Glaser Critical Thinking Appraisal than do Seventh-day Adventist graduates of public high schools. In order to evaluate these differences, it is helpful to compare them with the effect size originally chosen for this study. The effect size originally chosen was .5 (indicating that any difference between means that is less than one-half of one standard deviation, or 4.90 raw score points, will be considered too small to be of practical significance.) The differences between means actually occurring in the data range from .48 to 3.13 raw score points. Thus, none meet the effect size criterion originally set. Therefore the differences are not large enough to be of practical significance.

Table 3 shows the probabilities associated with U obtained by comparison of subject scores for the Watson-Glaser Critical Thinking Appraisal. The probability associated with the obtained U indicates the number of chances in one hundred that the two groups come from the same population relative to scores on the Watson-Glaser Critical Thinking Appraisal.

Comparisons between Seventh-day Adventist boarding academy graduates studied and Seventh-day Adventist public school graduates studied carry an associated probability of .10. Comparisons between subjects who were Seventh-day Adventist graduates of public high schools and Seventh-day Adventist boarding academy graduates combined with Seventh-day Adventist day academy graduates carry an
associated probability of .11. This means that there are ten and eleven chances in one hundred, respectively, that these groups come from the same population relative to scores on the Watson-Glaser Critical Thinking Appraisal.

Table 3.—Probabilities associated with U obtained by comparison of subject scores for the Watson-Glaser Critical Thinking Appraisal

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Probability of U</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy vs. SDA day academy</td>
<td>.46</td>
</tr>
<tr>
<td>SDA day academy vs. public school</td>
<td>.27</td>
</tr>
<tr>
<td>SDA boarding academy plus SDA day academy vs. public school</td>
<td>.11</td>
</tr>
<tr>
<td>SDA boarding academy vs. public school</td>
<td>.10</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist

These data fall short of the criterion selected for statistical significance. They do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score lower on the Watson-Glaser Critical Thinking Appraisal than do Seventh-day Adventist graduates of public high schools. Similarly, they do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score higher on the Watson-Glaser Critical Thinking Appraisal than do Seventh-day Adventist graduates of public high schools.
Testing of Supplementary Hypotheses

The supplementary hypotheses were set up in order to compare the dogmatism and intelligence of the three groups studied as well as to examine the correlations between critical thinking and intelligence and between critical thinking and dogmatism for each group. This was done in recognition of the fact that earlier studies have found critical thinking ability to be most strongly associated with high intelligence and low dogmatism (Kemp, 1960; Quinn, 1963; Geckler, 1965; Follman and Lowe, 1973).

The supplementary hypotheses will also be examined individually. They are here stated in the null form in order to facilitate retaining or rejecting them according to the statistical criterion established for this study ($\alpha = .05$).

Testing of Supplementary Hypotheses
Relative to Dogmatism

The Dogmatism Scale, Form D (Rokeach, 1956), was administered to each participant in the study to measure dogmatism or closed-mindedness. Form D of the Dogmatism Scale consists of sixty-six Likert-type items designed to examine the structure of how a belief is held. Possible scores range from 66–442. A high score indicates a high degree of dogmatism.

Hypotheses dealing with comparisons of dogmatism are preceded by the letters RD, indicating data obtained through use of the Rokeach Dogmatism Scale.

Hypothesis RD-1. There is no statistically significant difference between the Rokeach Dogmatism Scale scores obtained by
Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to Rokeach Dogmatism Scale scores obtained by seventy boarding academy graduates and seventy-four public high school graduates. The associated probability of the obtained U was .49; therefore the null hypothesis is retained.

No statistically significant difference was found between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

**Hypothesis RD-2.** There is no statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

The Mann-Whitney U test was applied to Rokeach Dogmatism Scale scores obtained by seventy boarding academy students and sixty-three day academy graduates. The associated probability of the obtained U was .15; therefore the null hypothesis is retained.

No statistically significant difference was found between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen.
subjects who graduated from Seventh-day Adventist day academies.

**Hypothesis RD-3.** There is no statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to Rokeach Dogmatism Scale scores obtained by sixty-three graduates of Seventh-day Adventist day academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .47; therefore the null hypothesis is retained.

No statistically significant difference was found between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

**Hypothesis RD-4.** There is no statistically significant difference between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to Rokeach Dogmatism Scale scores obtained by 133 graduates of Seventh-day Adventist academies and seventy-four graduates of public schools. The associated probability of the obtained U was .99; therefore the null hypothesis is retained.
No statistically significant difference was found between the Rokeach Dogmatism Scale scores obtained by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

Table 4 shows the mean scores obtained on the Rokeach Dogmatism Scale. While none of the differences between mean scores was statistically significant, it is noteworthy that subjects who were graduates of Seventh-day Adventist boarding academies scored the highest, followed by subjects who were graduates of public high schools, with subjects who were graduates of Seventh-day Adventist day academies scoring the lowest. (High scores indicate high dogmatism.)

Table 4.—Mean scores obtained on the Rokeach Dogmatism Scale.

<table>
<thead>
<tr>
<th>Type of School</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy</td>
<td>279.59</td>
</tr>
<tr>
<td>SDA boarding academy plus SDA day academy</td>
<td>275.10</td>
</tr>
<tr>
<td>Public high school</td>
<td>274.03</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>270.12</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist

The differences between means in table 4 do suggest that for the particular group of subjects studied, Seventh-day Adventist graduates of Seventh-day Adventist boarding academies score somewhat higher on the Rokeach Dogmatism Scale than do Seventh-day Adventist
graduates of public high schools and Seventh-day Adventist graduates of Seventh-day Adventist day academies score somewhat lower on the Rokeach Dogmatism Scale than do Seventh-day Adventist graduates of public high schools. In order to evaluate these differences, it is helpful to compare them with the effect size originally chosen for this study. The effect size originally chosen was .5 (indicating that any difference between means that is less than one-half of one standard deviation, or 14.2 raw score points will be considered too small to be of practical significance. The differences between means actually occurring in the data range from 1.07 to 9.47 raw score points. Thus, none meet the effect size criterion originally set. Therefore the differences are not large enough to be of practical significance.

Table 5 shows the probabilities associated with U obtained by comparison of subject scores for the Rokeach Dogmatism Scale. The probability associated with the obtained U indicates the number of chances in one hundred that the two groups come from the same population relative to scores on the Rokeach Dogmatism Scale.

Examination of tables 4 and 5 shows that the greatest differences occur between Seventh-day Adventist boarding academy graduates studied and Seventh-day Adventist day academy graduates studied. Comparisons between these two groups carry an associated probability of .15. This means that there are only fifteen chances in one hundred that these groups come from the same population relative to scores on the Rokeach Dogmatism Scale.

Comparisons between subjects who were Seventh-day Adventist
boarding academy graduates and Seventh-day Adventist graduates of public schools carry an associated probability of .49. Comparisons between subjects who were Seventh-day Adventist day academy graduates and Seventh-day Adventist graduates of public schools carry an associated probability of .46. This means that there are forty-nine and forty-six chances in one hundred, respectively, that these groups come from the same population relative to scores on the Rokeach Dogmatism Scale.

Table 5.—Probabilities associated with U obtained by comparison of subject scores for the Rokeach Dogmatism Scale

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Probability of U</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy plus SDA day academy</td>
<td>.99</td>
</tr>
<tr>
<td>vs. public school</td>
<td></td>
</tr>
<tr>
<td>SDA boarding academy</td>
<td>.49</td>
</tr>
<tr>
<td>vs. public school</td>
<td></td>
</tr>
<tr>
<td>SDA day academy</td>
<td>.47</td>
</tr>
<tr>
<td>vs. public school</td>
<td></td>
</tr>
<tr>
<td>SDA boarding academy</td>
<td>.15</td>
</tr>
<tr>
<td>vs. SDA day academy</td>
<td></td>
</tr>
</tbody>
</table>

*Seventh-day Adventist

These data fall short of the criterion selected for statistical significance. They do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score lower on the Rokeach Dogmatism Scale than do Seventh-day Adventist graduates of public high schools. Similarly, they do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools
score higher on the Rokeach Dogmatism Scale than do Seventh-day Adventist graduates of public high school.

Testing of Supplementary Hypotheses Relative to Intelligence

American College Testing Program (ACT) composite standard scores were gleaned from school records for each subject in order to have an indication as to the intelligence of the subjects. According to an official publication of the American College Testing Program (1978), ACT standard scores range from one to thirty-six. The standard deviation for composite scores is 6.0. The approximate mean composite score of college-bound high school students is eighteen.

Hypotheses dealing with comparisons of intelligence are preceded by the letters ACT, indicating data obtained through use of American College Testing Program scores.

Hypothesis ACT-1. There is no statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U test was applied to American College Testing Program scores earned by seventy graduates of Seventh-day Adventist boarding academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .08; therefore, the null hypothesis is retained.

No statistically significant difference was found between
American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

**Hypothesis ACT-2.** There is no statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

The Mann-Whitney U test was applied to American College Testing Program scores earned by seventy graduates of Seventh-day Adventist boarding academies and sixty-three graduates of Seventh-day Adventist day academies. The associated probability of the obtained U was .74; therefore the null hypothesis is retained.

No statistically significant difference was found between the American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies and Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies.

**Hypothesis ACT-3.** There is no statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen who graduated from public high schools.
The Mann-Whitney U was applied to American College Testing Program scores earned by sixty-three graduates of Seventh-day Adventist day academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .12; therefore the null hypothesis is retained.

No statistically significant difference was found between the American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.

Hypothesis ACT-1. There is no statistically significant difference between the American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen who graduated from public high schools.

The Mann-Whitney U was applied to American College Testing Program scores earned by 133 graduates of Seventh-day Adventist academies and seventy-four graduates of public high schools. The associated probability of the obtained U was .06; therefore the null hypothesis is retained.

No statistically significant difference was found between the American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies and Seventh-day Adventist college freshmen subjects who graduated from public high schools.
Table 6 shows the mean scores obtained on the American College Testing Program tests.

Table 6.—Mean scores obtained on the American College Testing Program tests.

<table>
<thead>
<tr>
<th>Type of School</th>
<th>Mean Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy</td>
<td>19.64</td>
</tr>
<tr>
<td>SDA boarding academy plus SDA day academy</td>
<td>19.62</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>19.59</td>
</tr>
<tr>
<td>Public high school</td>
<td>17.89</td>
</tr>
</tbody>
</table>

*Séventh-day Adventist

Although differences are not statistically significant, subjects who were graduates of Seventh-day Adventist boarding academies obtained the highest mean score, followed by graduates of Seventh-day Adventist day academies, with Seventh-day Adventist graduates of public high schools obtaining the lowest mean score among the groups studied.

The differences between means in table 6 do suggest that for the particular group of subjects studied, Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score somewhat higher on the American College Testing Program tests than do Seventh-day Adventist graduates of public high schools. In order to evaluate these differences, it is helpful to compare them with the effect size originally chosen for this study. The effect size originally chosen was .5 (indicating that any difference between means
that is less than one-half of one standard deviation, or 3.0 raw score points, will be considered too small to be of practical significance. The differences between means actually occurring in the data range from .02 to 1.75 standard points. Thus, none meet the effect size criterion originally set. Therefore the differences are not large enough to be of practical significance.

Table 7 shows the probabilities associated with $U$ obtained by comparison of subject scores for the American College Testing Program. The probability associated with the obtained $U$ indicates the number of chances in one hundred that the two groups come from the same population relative to scores on the American College Testing Program tests.

Table 7.—Probabilities associated with $U$ obtained by comparison of subject scores for the American College Testing Program tests.

<table>
<thead>
<tr>
<th>Groups Compared</th>
<th>Probability of U</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy vs. SDA day academy</td>
<td>.74</td>
</tr>
<tr>
<td>SDA day academy vs. public school</td>
<td>.12</td>
</tr>
<tr>
<td>SDA boarding academy vs. public school</td>
<td>.08</td>
</tr>
<tr>
<td>SDA boarding academy plus SDA day academy vs. public school</td>
<td>.06</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist

Examination of the data in tables 6 and 7 indicates that the greatest differences occur between Seventh-day Adventist boarding
academy graduates studied and public school graduates studied. Comparisons between subjects who were Seventh-day Adventist day academy graduates and Seventh-day Adventist graduates of public schools carry an associated probability of .12. Comparisons between subjects who were Seventh-day Adventist boarding academy graduates and Seventh-day Adventist graduates of public high schools carry a probability of .08. Comparisons between subjects who were public school graduates and Seventh-day Adventist boarding academy graduates and Seventh-day Adventist day academy graduates combined carry a probability of .06. This means that there are twelve, eight, and six chances in one hundred (respectively) that these groups come from the same population relative to American College Testing Program scores.

These data fall short of the criterion selected for statistical significance. They do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score lower on the American College Testing Program tests than do Seventh-day Adventist graduates of public high schools. Similarly, they do not suggest that Seventh-day Adventist graduates of Seventh-day Adventist secondary schools score higher on the American College Testing Program tests than do Seventh-day Adventist graduates of public high schools.

Testing of Supplementary Hypotheses Relative to Relationships Between Critical Thinking and Dogmatism

Quinn (1963) used analysis of covariance to study the relationship between dogmatism and critical thinking. He found a
coefficient of correlation of -.25 with an associated probability of .01. A set of supplementary hypotheses was set up for the present study in order to examine the relationships between dogmatism and critical thinking for each of the groups examined. These hypotheses are stated in the null form in order to facilitate rejection or retention according to the statistical criterion established for this study (α = .05).

Hypotheses dealing with comparisons between critical thinking skills and dogmatism are preceded by the letters WG/RD, indicating data obtained through use of Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores.

**Hypothesis WG/RD-1.** There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies.

A Kendall rank correlation coefficient (tau) of -.01 was obtained for Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by seventy graduates of Seventh-day Adventist boarding academies. The associated probability of the obtained tau was .44; therefore the null hypothesis is retained.

No statistically significant relationship was found between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies.
Hypothesis WG/RD-2. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

A Kendall rank correlation coefficient (tau) of -.17 was obtained for Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by sixty-three graduates of Seventh-day Adventist day academies. The associated probability of the obtained tau was .026; therefore the null hypothesis is rejected.

There is a statistically significant negative relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies. That is to say, for Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies, critical thinking scores were found to increase as dogmatism scores decreased. Thus, individuals more skilled in critical thinking were generally found to be less dogmatic, and vice versa. It should be noted, however, that the strength of the relationship is -.17 on a scale of -1.00 to 1.00.

Hypothesis WG/RD-3. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from public high schools.
A Kendall rank correlation coefficient (tau) of -.19 was obtained for Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by seventy-four graduates of public high schools. The associated probability of the obtained tau was .009; therefore the null hypothesis is rejected.

There is a statistically significant negative relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen subjects who graduated from public high schools. In other words, for Seventh-day Adventist college freshmen subjects who graduated from public high schools, critical thinking scores were found to increase as dogmatism scores decreased. Thus, individuals more skilled in critical thinking were generally found to be less dogmatic, and vice versa. It should be noted, however, that the strength of the relationship is -.19 on a scale of -1.00 to 1.00.

Hypothesis WG/RD-2. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies.

A Kendall rank correlation coefficient (tau) of -.08 was obtained for Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by 133 graduates of Seventh-day Adventist academies. The associated probability of the obtained tau was .09; therefore the null hypothesis is retained.

No statistically significant relationship was found between
Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies.

**Hypothesis WG/RD-5.** There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen.

A Kendall rank correlation coefficient (tau) of -0.12 was obtained for Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by 207 Seventh-day Adventist college freshmen. The associated probability of the obtained tau was 0.004; therefore the null hypothesis is rejected.

There is a statistically significant negative relationship between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores earned by Seventh-day Adventist college freshmen subjects. Thus, for Seventh-day Adventist college freshmen subjects, critical thinking scores were found to increase as dogmatism scores decreased. In other words, individuals more skilled in critical thinking were generally found to be less dogmatic, and vice versa. It should be noted, however, that the strength of the relationship is -0.12 on a scale of -1.00 to 1.00.

Table 8 summarizes the findings relative to relationships between scores on the Watson-Glaser Critical Thinking Appraisal and the Rokeach Dogmatism Scale.

Quinn (1963) used analysis of covariance to study the relationship between dogmatism and critical thinking. He found a
coefficient of correlation of -.25 with an associated probability of .01. All of the relationships between these two variables for the groups examined by the present study are negative. The strength of the relationship found in boarding academy graduates studied is considerably less than for other groups; however, the relationship for boarding academy graduates carries a probability of .44. This means that there are only 44 chances in one hundred that the relationship found in the present sample of boarding academy graduates actually exists in the population of boarding academy graduates. Relationships for public school graduates and day academy graduates studied are not only stronger but also significant at the .05 level.

Table 8.—Kendall Rank Correlation Coefficients (tau) obtained between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale score

<table>
<thead>
<tr>
<th>Type of School</th>
<th>tau</th>
<th>probability of tau</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy</td>
<td>-.01</td>
<td>.44</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>-.17</td>
<td>.026</td>
</tr>
<tr>
<td>Public high school</td>
<td>-.19</td>
<td>.009</td>
</tr>
<tr>
<td>SDA boarding academy and</td>
<td>-.08</td>
<td>.09</td>
</tr>
<tr>
<td>SDA day academy combined</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All subjects</td>
<td>-.12</td>
<td>.004</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist
Testing of Supplementary Hypotheses Relative to Relationships Between Critical Thinking and Intelligence

Quinn (1963) used analysis of covariance to study the relationship between intelligence and critical thinking. He found a coefficient of correlation of .52 with an associated probability of .01. A set of supplementary hypotheses was set up for the present study in order to examine relationships between intelligence and critical thinking for each of the groups examined. These hypotheses are stated in the null form in order to facilitate rejection or retention according to the statistical criterion established for this study (α = .05).

Hypotheses dealing with comparisons between critical thinking skills and intelligence are preceded by the letters WG/ACT, indicating data obtained through use of Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores.

**Hypothesis WG/ACT-1.** There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist boarding academies.

A Kendall rank correlation coefficient (tau) of .54 was obtained for Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by seventy graduates of Seventh-day Adventist boarding academies. The associated
There is a statistically significant positive relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies.

That is to say, for Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist boarding academies, critical thinking scores were found to increase as American College Testing Program scores increased. Thus, individuals more skilled in critical thinking generally also earned higher American College Testing Program scores, and vice versa. The strength of the relationship is .54 on a scale of -1.00 to 1.00.

**Hypothesis WG/ACT-2.** There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist day academies.

A Kendall rank correlation coefficient (tau) of .52 was obtained for Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by sixty-three graduates of Seventh-day Adventist day academies. The associated probability of the obtained tau was ≤.001; therefore the null hypothesis is rejected.

There is a statistically significant positive relationship
between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies.

In other words, for Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist day academies, critical thinking scores were found to increase as American College Testing Program scores increased. Thus, individuals more skilled in critical thinking generally also earned higher American College Testing Program scores, and vice versa. The strength of the relationship is .52 on a scale of -1.00 to 1.00.

Hypothesis WG/ACT-3. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from public high schools.

A Kendall rank correlation coefficient (tau) of .61 was obtained for Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by seventy-four graduates of public high schools. The associated probability of the obtained tau was ≤ .001; therefore the null hypothesis is rejected.

There is a statistically significant positive relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshman subjects who graduated from public high schools.
In other words, for Seventh-day Adventist college freshmen subjects who graduated from public high schools, critical thinking scores were found to increase as American College Testing Program scores increased. Thus, individuals more skilled in critical thinking generally also earned higher American College Testing Program scores, and vice versa. The strength of the relationship is .61 on a scale of -1.00 to 1.00.

Hypothesis WC/ACT-4. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen who graduated from Seventh-day Adventist academies.

A Kendall rank correlation coefficient (tau) of .53 was obtained for Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by 133 graduates of Seventh-day Adventist academies. The associated probability of the obtained tau was ≤ .001; therefore the null hypothesis is rejected.

There is a statistically significant positive relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies.

That is to say, for Seventh-day Adventist college freshmen subjects who graduated from Seventh-day Adventist academies, critical thinking scores were found to increase as American College Testing Program scores increased. Thus, individuals more skilled in
critical thinking generally also earned higher American College Testing Program scores, and vice versa. The strength of the relationship is .53 on a scale of -1.00 to 1.00.

Hypothesis WC/ACT-5. There is no statistically significant relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen.

A Kendall rank correlation coefficient (tau) of .56 was obtained for Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by 207 Seventh-day Adventist college freshmen. The associated probability of the obtained tau was ≤ .001; therefore the null hypothesis is rejected.

There is a statistically significant positive relationship between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores earned by Seventh-day Adventist college freshmen subjects.

In other words, for Seventh-day Adventist college freshmen studied, critical thinking scores were found to increase as American College Testing Program scores increased. Thus, individuals more skilled in critical thinking generally also earned higher American College Testing Program scores and vice versa. The strength of the relationship is .56 on a scale of -1.00 to 1.00.

Table 9 summarizes the findings relative to relationships between critical thinking and American College Testing Program scores.

An examination of the data displayed in table 9 shows that
all relationships between Watson-Glaser Critical Thinking Appraisal scores and Composite American College Testing Program scores are positive and statistically significant at the .001 level.

Table 9.—Kendall rank correlation coefficients (τ) obtained between Watson-Glaser Critical Thinking Appraisal scores and composite American College Testing Program scores.

<table>
<thead>
<tr>
<th>Type of School</th>
<th>τ</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA* boarding academy</td>
<td>.54**</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>.52**</td>
</tr>
<tr>
<td>Public high school</td>
<td>.61**</td>
</tr>
<tr>
<td>SDA boarding academy and SDA day academy combined</td>
<td>.53**</td>
</tr>
<tr>
<td>All subjects</td>
<td>.56**</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist  
**Significant at .001 level

That is to say, for all groups tested, Watson-Glaser Critical Thinking Appraisal scores have increased as American College Testing Program scores have increased. Individuals who have scored high on critical thinking have generally also earned high American College Testing Program scores and vice versa.

Summary of Results

Table 10 summarizes the mean scores for each group tested for each of the instruments used as well as Kendall Rank correlation coefficients (τ) between Watson-Glaser Critical Thinking Appraisal scores and American College Testing Program scores for each group.
Table 10.—Summary of Kendall Rank Correlations (τ) and mean American College Testing Program scores (ACT), Watson Glaser Critical Thinking Appraisal (W-G), and Rokeach Dogmatism Scale scores (Dogmatism) obtained for each group tested.

<table>
<thead>
<tr>
<th>Type of School</th>
<th>τ (ACT/W-G)</th>
<th>Mean ACT</th>
<th>Mean W-G</th>
<th>Mean Dogmatism</th>
<th>τ (W-G/Dogmatism)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SDA boarding academy</td>
<td>.54††</td>
<td>19.64</td>
<td>69.78</td>
<td>279.59</td>
<td>-.01</td>
</tr>
<tr>
<td>SDA day academy</td>
<td>.52††</td>
<td>19.59</td>
<td>68.77</td>
<td>270.12</td>
<td>-.17**</td>
</tr>
<tr>
<td>Public high school</td>
<td>.61††</td>
<td>17.89</td>
<td>66.65</td>
<td>274.03</td>
<td>-.19†</td>
</tr>
</tbody>
</table>

*Seventh-day Adventist  
**Significant at .05 level  
†Significant at .01 level  
††Significant at .001 level
Examination of table 10 shows that boarding academy graduates obtained the highest mean of all three groups tested on all of the instruments used. This seems unusual in view of the fact that earlier studies have shown a positive correlation between intelligence and critical thinking skills (Quinn, 1963; Follman and Lowe, 1973), and a negative correlation between dogmatism and critical thinking skills (Kemp, 1960; Quinn, 1963; Geckler, 1965). Data from the present study follow a generally similar pattern; however, while boarding academy students obtained a higher mean critical thinking score they also obtained a higher mean dogmatism score. For boarding academy graduates the correlation between dogmatism and critical thinking is .01 with an associated probability of .44; whereas, for day academy graduates the correlation is -.17, significant at the .01 level. For public school graduates the correlation is -.19, significant at the .001 level. In view of the high probability (.44) that the relationship between critical thinking and dogmatism for boarding academy graduates is due to sampling error rather than to the presence of a similar relationship in the population, it is not appropriate to draw any conclusions for this correlation.

Table 10 also shows that while day academy graduates obtained the second highest mean score on the Watson-Glaser Critical Thinking Appraisal, they obtained the lowest mean score on the Rokeach Dogmatism Scale. In light of the negative relationship between the two variables (which is supported by data for the present study) one would expect that the group scoring lowest on dogmatism would tend to score highest on critical thinking; however,
this is not the case. For day academy graduates the correlation between dogmatism and critical thinking is -.17, significant at the .05 level; whereas, for public school graduates the correlation is -.19, significant at the .01 level. It must be remembered, however, that the difference between these two correlations is so small (.02) as to be practically negligible. Therefore, it is not appropriate to draw further conclusions based on this difference.

The Seventh-day Adventist public high school graduates obtained the lowest mean American College Testing Program scores, the lowest mean scores on the Watson-Glaser Critical Thinking Appraisal, the strongest negative correlation between critical thinking and dogmatism, and the strongest positive correlation between critical thinking and American College Testing Program scores. Again, it is important to recognize that the differences between the correlations are so small (.09 to .18) that it is not practical to use them as the basis for any conclusions.

**Summary of Chapter IV**

This chapter has presented the findings of the study and examined each of the major and supplementary hypotheses. In addition, the findings have been summarized and a discussion of the results presented.
Summary

Summary of the Problem

A review of several goal statements for education, not only from secular sources, such as the National Education Association's Educational Policies Commission's The Central Purpose of American Education (1961), but also from Seventh-day Adventist sources, such as the book, Education, by Ellen G. White (1903), and the official Seventh-day Adventist church publication, Philosophy and Objectives of Seventh-day Adventist Education (1952), suggests that the development of critical thinking skills is a widely accepted objective of both public and Seventh-day Adventist education.

This study has investigated critical thinking skills in Seventh-day Adventist college freshmen, comparing those found in graduates of three types of secondary school: Seventh-day Adventist boarding academies, Seventh-day Adventist day academies, and public high schools.

Since earlier research has shown that critical thinking is positively associated with intelligence and negatively associated with dogmatism, both intelligence and dogmatism have also been examined as variables in the present study.
Twenty-two hypotheses were set forth. Four major hypotheses compared critical thinking skills among the three groups studied. Eighteen supplementary hypotheses dealt with other variables: four with comparisons of dogmatism, four with comparisons of intelligence, five with relationships between critical thinking and dogmatism, and five with relationships between critical thinking and intelligence.

Summary of the Methodology

The population for the study consisted of all Seventh-day Adventists who attended one of three types of secondary school for at least three years, graduated from secondary school in 1977, and enrolled in any of three Seventh-day Adventist institutions of higher learning for the fall term, 1977. The three types of secondary schools were: Seventh-day Adventist boarding academy, Seventh-day Adventist day academy, and public high school. The three institutions of higher learning were Andrews University, Berrien Springs, Michigan; Southern Missionary College, Collegedale, Tennessee; and Union College, Lincoln, Nebraska. A stratified random sample of 312 subjects was selected for participation in the study. Two hundred and seven of these subjects actually completed the research instruments required for inclusion in the study.

The Watson-Glaser Critical Thinking Appraisal, revised edition, Form YM, was used to measure critical thinking skills. The Dogmatism Scale, Form D (Rokeach, 1956), was administered to each participant in the study to measure dogmatism. American College Testing Program scores were used as an index of intelligence. Since no studies were found correlating American College Testing Program
scores with intelligence, a study was done using data available in the files of the Andrews University Counseling and Testing Center. On the basis of these findings, it was decided to accept American College Testing Program scores as an adequate index of intelligence for the present study.

Data were collected during the first quarter of the 1977-78 school year. Dogmatism scales were sent to the subjects by mail. Watson-Glaser Critical Thinking Appraisals were administered in group testing sessions on each campus. American College Testing Program scores were obtained from school records.

Data were analyzed at the Andrews University Computing Center. The Mann-Whitney U test was used for between-group comparisons of critical thinking skills, dogmatism, and intelligence. The Kendall Rank Correlation Coefficient (tau) was used to test relationships between the variables.

Summary of the Findings

None of the between-group comparisons of critical thinking appraisal scores were statistically significant. Close examination of the data shows, however, that boarding graduates obtained the highest mean score, followed by day academy graduates and public high school graduates, in that order. Comparisons between all graduates of Seventh-day Adventist academies (both day and boarding) and Seventh-day Adventist graduates of public high schools yielded differences with an associated probability of .11. Comparisons between Seventh-day Adventist boarding academy graduates and
Seventh-day Adventist public high school graduates yielded differences with an associated probability of .10.

Comparisons of dogmatism scores also failed to yield any statistically significant differences. Graduates of Seventh-day Adventist boarding academies earned the highest mean dogmatism score, followed by Seventh-day Adventist graduates of public high schools and graduates of Seventh-day Adventist day academies, in that order. (High scores indicate high dogmatism.) Probabilities associated with these comparisons range from .99 (for comparisons between Seventh-day Adventist graduates of both types of Seventh-day Adventist academies and Seventh-day Adventist graduates of public high schools) to .15 (for comparisons between Seventh-day Adventist graduates of Seventh-day Adventist boarding academies and Seventh-day Adventist day academies).

No statistically significant between-group differences in American College Testing Program scores were found. Seventh-day Adventist graduates of Seventh-day Adventist boarding academies obtained the highest mean score, followed by Seventh-day Adventist graduates of Seventh-day Adventist day academies, and Seventh-day Adventist graduates of public high schools, in that order. Probabilities associated with these comparisons range from .74 (for Seventh-day Adventist graduates of Seventh-day Adventist boarding academies compared with Seventh-day Adventist graduates of Seventh-day Adventist day academies) to .06 (for comparisons between Seventh-day Adventist graduates of both types of Seventh-day Adventist academies and Seventh-day Adventist public high school
graduates). Comparisons between Seventh-day Adventist graduates of Seventh-day Adventist boarding academies and Seventh-day Adventist graduates of public high schools carried an associated probability of .08, while comparisons between Seventh-day Adventist graduates of Seventh-day Adventist day academies and Seventh-day Adventist graduates of public high schools carried an associated probability of .12.

Analysis of relationships between critical thinking scores and dogmatism scores yielded statistically significant negative correlations for two of the three groups tested: Seventh-day Adventist graduates of public high schools (tau = -.19, significant at the .01 level) and Seventh-day Adventist graduates of Seventh-day Adventist day academies (tau = -.17, significant at the .05 level). The correlation for Seventh-day Adventist graduates of Seventh-day Adventist boarding academies was -.01, with an associated probability of .44.

Correlations between critical thinking scores and American College Testing Program scores yielded positive results, significant at the .001 level. Correlations range from .52 for Seventh-day Adventist graduates of Seventh-day Adventist day academies to .61 for Seventh-day Adventist graduates of public high schools.

Conclusions

The findings of this study suggest several conclusions. They are presented below.

1. The results of the present study corroborate Quinn's findings regarding the negative relationship between critical
thinking and dogmatism. If the finding from this study relative to correlation between dogmatism and critical thinking for boarding academy graduates is disregarded on the grounds of its associated probability of .44, then the correlations of -.19 (significant at the .01 level) for Seventh-day Adventist public high school graduates, and -.17 (significant at the .05 level) for Seventh-day Adventist graduates of Seventh-day Adventist day academies remain. These values are very similar to Quinn's value of -.25, significant at the .01 level. Thus, the present study suggests that relationships between dogmatism and critical thinking for Seventh-day Adventist graduates of Seventh-day Adventist day academies and public high schools are very similar to those found by Quinn for his total sample, which consisted of parochial school Catholics, and public school Catholics, Protestants, and Jews.

2. The results of the present study corroborate Quinn's findings regarding the positive relationship between intelligence and critical thinking. The correlations of .52 for Seventh-day Adventist day academy graduates, .54 for Seventh-day Adventist boarding academy graduates and .61 for Seventh-day Adventist graduates of public high schools are all significant at the .001 level. These correlations are very similar to Quinn's value of .52, significant at the .01 level. Thus, the present study suggests that relationships between critical thinking and intelligence (measured in this study by American College Testing Program scores) are very similar for Seventh-day Adventist graduates of all three types of secondary schools studied to those found by Quinn (using I.Q. scores
as a measure of intelligence) for his total sample, which consisted of parochial school Catholics, and public school Catholics, Jews, and Protestants.

3. For the students sampled in the present study, some differences do emerge. There are, however, three factors which must be considered in evaluating these differences. First, none of the differences are statistically significant. Second, the differences are so slight that they are of no practical significance. Third, due to problems in subject participation there is no way to evaluate the randomness of the sample. It is thus obvious that the study has yielded no conclusive evidence regarding any of the variables examined. It remains for further research to explore these questions more fully.

Observations Relative to the Present Data

In the absence of statistically significant results, the researcher is left with two choices. On one hand it is possible to contend that for the variables studied, there are, indeed, no significant differences in the population. The other alternative is to suspend judgment pending further research into the question (Hays, 1973).

The percentage of subjects participating in this study (66 percent) limits the potential for inferring from the present data to the population from which the sample was drawn. Furthermore, the percentages of subjects participating from each type of secondary school vary. Whereas 60 percent of day academy graduates selected for the sample actually participated in the study, 67 percent of
boarding academy graduates participated and 71 percent of public school graduates participated.

The primary variable examined in this study was critical thinking. Presumably some type of thinking entered into the subjects' choice either to participate or not participate in the study. If, for example, it could be determined that the nonparticipating subjects were those most skilled in critical thinking, it is conceivable that the addition of their scores to the data pool might alter the results so that significant differences would emerge in favor of Seventh-day Adventist education. Similarly, if it could be determined that the nonparticipating subjects were those least skilled in critical thinking, the opposite effect might well occur. It is thus impossible to predict what effect the scores of the nonparticipating subjects would have on the direction of the data. It has, therefore, been determined that the prudent decision relative to these data is to suspend judgment pending further research.

Some descriptive statements relative to the sample from whom data were collected are warranted. They are presented below.

1. For the subjects studied, the findings of this study suggest that Seventh-day Adventist boarding academies and/or Seventh-day Adventist day academies are neither more nor less successful in developing critical thinking skills in Seventh-day Adventist students than are public high schools.

The data obtained in this study do not yield any practical differences between critical thinking skills among Seventh-day Adventist graduates of Seventh-day Adventist boarding academies,
Seventh-day Adventist day academies and public high schools. They do not support any allegations about the quality of Seventh-day Adventist education being either inferior or superior to that obtained by Seventh-day Adventist students in the public school system.

2. For the subjects studied, the findings of this study suggest that Seventh-day Adventist boarding academies are neither more nor less successful in developing critical thinking skills in Seventh-day Adventist students than are Seventh-day Adventist day academies.

There is no indication in the data obtained from this study that there are any practical differences between critical thinking skills found among Seventh-day Adventist graduates of Seventh-day Adventist boarding academies and Seventh-day Adventist day academies.

3. For the subjects studied, the findings suggest that Seventh-day Adventist graduates of public high schools are neither more nor less dogmatic than Seventh-day Adventist graduates of Seventh-day Adventist day academies and/or Seventh-day Adventist boarding academies.

The data obtained in this study neither support nor discredit any allegation that Seventh-day Adventist boarding academies and/or Seventh-day Adventist day academies engender dogmatism in Seventh-day Adventist students to any different degree than do public high schools.

4. For the subjects studied, the findings suggest that
Seventh-day Adventist graduates of Seventh-day Adventist boarding academies are neither more nor less dogmatic than Seventh-day Adventist graduates of Seventh-day Adventist day academies.

The data obtained in this study neither support nor discredit any allegation that Seventh-day Adventist boarding academies engender dogmatism in students to any different degree than do Seventh-day Adventist day academies.

5. For the subjects studied, the findings suggest that Seventh-day Adventist graduates of Seventh-day Adventist boarding academies and/or day academies obtain neither higher nor lower scores on the American College Testing Program tests than those obtained by Seventh-day Adventist graduates of public high schools.

The data obtained in this study neither support nor discredit any allegation that the quality of education received in Seventh-day Adventist schools is different from that obtained in public high schools.

6. For the subjects studied, the findings suggest that Seventh-day Adventist graduates of Seventh-day Adventist boarding academies obtain neither higher nor lower scores on the American College Testing Program tests than those obtained by Seventh-day Adventist graduates of Seventh-day Adventist day academies.

The data obtained in this study neither support nor discredit any allegation that the quality of education received in Seventh-day Adventist boarding academies is different from that obtained in Seventh-day Adventist day academies.
Recommendations for Further Research

The following suggestions for additional research emerge from the findings of this study:

1. It is recommended that this study be replicated for the purpose of obtaining more generalizable results. Efforts to gain subject participation in the present study centered around an appeal to the subjects to give of their time to add to the existing body of knowledge about Seventh-day Adventist education. An additional incentive of immediate reporting of Watson-Glaser Critical Thinking Appraisal scores was also offered. These procedures did not hold sufficient interest for an unfortunately large number of the subjects. In replicating the study, particular attention should be given to devising some type of reward system which would insure participation by a much larger number of subjects. Financial remuneration may be one way to accomplish this.

2. A study of the relationship between dogmatism and critical thinking in Seventh-day Adventist boarding academy students would be helpful. The data obtained in the present study raise a question regarding the possibility that, for Seventh-day Adventist boarding academy students, dogmatism may not be as strongly negatively related to critical thinking as for other groups. A thorough study of a random sample of Seventh-day Adventist boarding academy students in the United States would provide further evidence regarding this question.

3. Although the correlations between Watson-Glaser Critical Thinking Appraisal scores and Rokeach Dogmatism Scale scores obtained
in the present study do not provide any conclusive evidence regarding the relationship between these two variables for Seventh-day Adventists, they do raise the possibility that dogmatism in Seventh-day Adventists may be somewhat different than in other populations. It would, therefore, be helpful to study the nature of dogmatism in Seventh-day Adventists. Such a study might include measuring dogmatism in a Seventh-day Adventist population and a control group of non-Seventh-day Adventists, and then conducting a factor analysis of the data obtained for the two groups to see if different factors emerge as prominent for each group.

4. The data from the present study have raised a question regarding the relationship between critical thinking and dogmatism for Seventh-day Adventists. There is also the possibility that relationships between dogmatism and other variables may be different for Seventh-day Adventists than for other groups. It would, therefore, be of interest to study relationships between dogmatism and other variables in a Seventh-day Adventist population.

5. One might also ask if there is something about Seventh-day Adventism which tends to engender dogmatism in its adherents. This suggests the possibility of a study of how the dogmatism scale relates to traditional Seventh-day Adventist beliefs. Such a study would, of necessity, include a definition of traditional Seventh-day Adventist beliefs relative to items on the dogmatism scale. For example, the dogmatism scale might be administered to a group of Seventh-day Adventist church leaders in order to obtain a normative body of data for traditional Seventh-day Adventist beliefs. It
would also be of interest to ask such a group to indicate which items on the scale deal with religious beliefs and which items (if any) might be considered to be free from religious connotations.

6. Critical thinking skills and dogmatism of Seventh-day Adventist parents and teachers should be studied. Such a study would provide information about the kind of modeling which Seventh-day Adventist youth experience at home and at school. These data could also serve as a basis for exploring the relationship between student dogmatism and critical thinking and parent/teacher dogmatism and critical thinking.

7. A study of affective variables operating in Seventh-day Adventist graduates of Seventh-day Adventist day academies, Seventh-day Adventist boarding academies and public high schools would provide valuable insight into how this dimension of the school experience might be influencing educational outcomes. Variables relating to self-concept would be of particular interest since the values taught by the Seventh-day Adventist church tend to separate the student socially from his/her peers in the public school setting.

8. While earlier research (Quinn, 1963) suggests that differences in the type of secondary school attended are associated with differences in the level of critical thinking skills developed in students, the results of the present study do not show any significant differences in critical thinking associated with differences in type of secondary school attended. It would be of interest to study critical thinking in Seventh-day Adventists, examining a wide range of variables in order to see which variable(s) would emerge as
associated with differences in critical thinking skills. Possible variables to be examined in such a study might include: sex, socioeconomic status, personality factors, urban vs. rural home environment, type of elementary school attended, occupation of parents, presence or absence of affiliation with a large Seventh-day Adventist community, etc.

9. Examination of the dogmatism scale suggests that several items (such as those dealing with devotion to a cause) place a negative connotation on values prized by conservative Christians such as Seventh-day Adventists. It would be of interest to conduct a factor analysis study of the various items on the dogmatism scale and several variables found to correlate with dogmatism in order to see which factors correlate with dogmatism and how the individual items load on each factor. A follow-up of such a study might be the development of a dogmatism scale which would not place a negative evaluation upon conservative Christian beliefs.

10. The Watson-Glaser Critical Thinking Appraisal purports to measure critical thinking through use of material similar to that which the average citizen encounters in everyday life. It would be of interest to construct an instrument using more sophisticated material and concepts to measure critical thinking. Such an instrument could be of value in measuring educational outcomes at post-secondary levels and possibly also in predicting success in graduate study.

Summary of Chapter V

Chapter V has summarized the problem, the methodology and
findings of a study of critical thinking skills in three groups of Seventh-day Adventist youth. Several conclusions have been outlined. Suggestions for further research have also been presented.
APPENDIX A

DEMOGRAPHIC SURVEY CARD
PLEASE FILL IN THIS CARD AND LEAVE IT AT THE FINAL CHECK OUT STATION

Name ___________________________________________ Religious Affiliation: SDA ____ Other ____

Local Address ___________________________________ Year of Graduation from high school/academy ___

_________________________________________ Sex: Female ____ Male ____

Local Phone ___________________________________

Please indicate by checking the appropriate space the type of school you attended for each of the following grades. If you changed from one type of school to another during a school year (e.g., from a day academy to a boarding academy, or from public day school to either type of academy or vice versa) please check "Combination".

<table>
<thead>
<tr>
<th>Grade</th>
<th>SDA Boarding Academy</th>
<th>SDA Day School</th>
<th>Public Day School</th>
<th>Combination</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Village Student</td>
<td>Day Student</td>
<td>Academy</td>
<td>Student</td>
<td>Day School</td>
</tr>
<tr>
<td>9</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
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<tr>
<td>10</td>
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<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
<td>_______</td>
</tr>
</tbody>
</table>

Do Not Write in This Space
APPENDIX B

CORRESPONDENCE WITH SUBJECTS AT ANDREWS UNIVERSITY

Initial Letter
Return/Appointment Envelope
Reminder to Responding Subjects
First Reminder to Nonresponding Subjects
Reminder to Subjects Who Missed Test
Second Reminder to Nonresponding Subjects
Third Reminder to Nonresponding Subjects
Your thinking is important to me! I am conducting a study of the thinking of Seventh-day Adventist college freshmen. In order to carry out this study I have carefully selected a random sample of freshmen in three Seventh-day Adventist colleges. You have been chosen to be a member of this random sample. This means that you are important to my study.

There are two things I will ask you to do as part of the study. The first is to fill out the enclosed questionnaire according to the instructions it contains. When you have completed the questionnaire, please place it in the enclosed envelope and seal the envelope. Secondly, I will need to have you take a special test which I will be administering at Andrews during the week of November 20. You will notice that the front of the envelope lists several times when the test will be given. The test is not timed and most students will finish in approximately 50 minutes; however, we have set aside two hours for each testing period in order to give everyone ample time to finish. Please select the time which is best for you and check the appropriate space. Print your name clearly at the bottom of the envelope and then turn the envelope in to the Counseling Center (Ed 123) by Monday, November 14.

Why should you participate in this study? We believe the findings will be helpful in evaluating Seventh-day Adventist education. By participating you will make a significant contribution to this evaluation process. I also want you to be able to have some immediate, personal benefit from the study. For this reason, I am planning to do on the spot scoring of the test you take in the Gold Room. It takes approximately 60 seconds to score each test. If you wish to receive an immediate report of your score you will be able to do so within a few minutes after turning the test in to me. I hope you will find this not only interesting but helpful.
There is one final item I would like to clarify for you. The questionnaire asks for your name. I will also be asking you to put your name on the test you take later. This is done solely for the purpose of enabling us to put together all the data for each individual subject. Your answers will be used strictly for research purposes. Your identity will not be disclosed in the study. We have provided the envelopes for your use in returning the initial questionnaire in order to guarantee your confidentiality.

I want to thank you in advance for your willingness to participate in the study. If you have questions, please feel free to get in touch with me.

Sincerely yours,

Elizabeth N. Wilkins, Director
Freshman Orientation Activities

P.S. Here is a brief summary of what I am asking you to do:

1. Fill out the enclosed questionnaire and seal it in the envelope addressed to me.

2. Select a time for your test and check that time on the front of the envelope in which you have placed your questionnaire. Be sure to print your name clearly on the envelope.

3. Take the envelope to the Counseling Center (Gold Hall 121).

4. Come to the Walter Hall Gold Room for testing at the time you have selected on the front of the envelope.

Thanks again for helping.
Please select one of the times listed below to take the test for the Freshman Thinking Study:

___ Sunday, November 20, 8:00 p.m.
___ Monday, November 21, 8:30 a.m.
___ Monday, November 21, 10:30 a.m.
___ Monday, November 21, 1:00 p.m.
___ Monday, November 21, 3:00 p.m.

Your Name: ____________________________
(Please Print Clearly)

All testing will be done in the Miller Hall Gold Room

RETURN TO:

Mrs. Beth Wilkins
Counseling Center
123 Bell Hall
Andrews University
Berrien Springs, MI 49104

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JUST A FRIENDLY REMINDER...

We have a date to meet for a test on

_________________________ at ______________

in the Meier Hall Gold Room.

I will look forward to seeing you then.

Thanks for your help!

[Signature]

[Name]
Having trouble getting your homework done?

There's no way I can get mine done without your help. A few days ago I sent you a letter requesting your participation in a study of freshman thinking. We haven't heard a word from you. Please fill out the questionnaire, select a time for your test and turn in your questionnaire to my office in the Counseling Center in Bell Hall as soon as possible. If you have mislaid your materials you can pick up another set from the Counseling Center.

Thanks so much for your help. I will look forward to seeing you in a few days.

[Signature]
Monday, November 21

Hi!

You were scheduled to take the test for the Freshman Thinking Study today at________. We missed you. In order to have an acceptable statistical base I need YOU to participate. If you do not come you will weaken the entire study. Please come to the Gold Room in Meier Hall at one of the times listed below and take the test. You should be finished in about an hour. Thanks for your help.

Beth Welch

Monday, 11/21

8:30 a.m., 9:30 a.m., 10:30 a.m., 11:30 a.m.,

12:30 p.m., 1:30 p.m., 2:30 p.m., 3:30 p.m., 4:30 p.m., 5:30 p.m.

8:00 p.m., 9:00 p.m.
Hi!

YOU are really important to the study of Freshman Thinking which I am currently conducting. The results of the study will be meaningful only if all members of the carefully selected random sample participate. This means that if you do not participate you will weaken the entire study. Please come to the Meier Hall Gold Room at one of the times listed below and take the test. If possible, bring with you the completed questionnaire which you received earlier. If you have lost the questionnaire please come anyway. I will have additional copies available at the time of the test.

You should be able to complete the test in about an hour. If you really can't make it to any of the testing sessions listed below, please call my office (ext. 3470) and set up an appointment to take the test later.

Thanks so much for your help. If you have any questions, please feel free to call me at the office (471-3470) or at home (471-5231).

Sincerely yours,

Beth Weisner

Test Times:
Sunday, 11/20 - 8:00 p.m.
Monday, 11/21 - 8:30 a.m., 9:30 a.m., 10:30 a.m., 11:30 a.m.
  12:30 p.m., 1:30 p.m., 2:30 p.m., 3:30 p.m., 4:30 p.m.
  5:30 p.m., 8:00 p.m., 9:00 p.m.

ALL TESTING WILL BE DONE IN THE MEIER HALL GOLD ROOM.
November 28, 1977

I'm sorry you weren't able to make it to the test for my study of freshman thinking. I'm still very anxious to have you take the test. The study will be significantly weakened if you don't participate.

Please call my office (471-3470) and make an appointment to take the test at your earliest convenience.

Thank you so much for helping.

Sincerely yours,

[Signature]

Karl Wilkeirs
APPENDIX C

CORRESPONDENCE WITH SUBJECTS AT SOUTHERN MISSIONARY COLLEGE

Introductory Letter from the President
Initial Letter
Return/Appointment Envelope
Reminder to Responding Subjects
First Reminder to Nonresponding Subjects
Reminder to Subjects Who Missed Test
Dear Friend:

A study of critical thinking among freshmen in Seventh-day Adventist colleges is currently being conducted by Mrs. Beth Wilkins, who is Director of Freshman Education at Andrews University. A random sample of freshmen from Southern Missionary College will be included in the study. You have been selected to be a member of the random sample.

I would like to encourage you to cooperate with Mrs. Wilkins in this study. Your participation is important to an increased understanding of Seventh-day Adventist education.

Thank you for helping.

Sincerely yours,

Frank Knittel
President
Your thinking is important to me! I am conducting a study of the thinking of Seventh-day Adventist college freshmen. In order to carry out this study I have carefully selected a random sample of freshmen in three Seventh-day Adventist colleges. You have been chosen to be a member of this random sample. This means that you are important to my study.

There are two things I will ask you to do as part of the study. The first is to fill out the enclosed questionnaire according to the instructions it contains. When you have completed the questionnaire, please place it in the enclosed envelope and seal the envelope. Secondly, I will need to have you take a special test which I will be administering at SMC during the week of November 7. You will notice that the back of the envelope lists several times when the test will be given. The test is not timed and most students will finish in approximately 50 minutes; however, we have set aside two hours for each testing period in order to give everyone ample time to finish. Please select the time which is best for you and check the appropriate space. Print your name clearly at the bottom of the envelope and then turn the envelope in to Elder Kenneth Spears' office by Wednesday, November 2. Elder Spears is serving as liaison person for students at Southern Missionary College.

Why should you participate in this study? We believe the findings will be helpful in evaluating Seventh-day Adventist education. By participating you will make a significant contribution to this evaluation process. I also want you to be able to have some immediate, personal benefit from the study. For this reason, I am planning to do on the spot scoring of the test you take while I am at SMC. It takes approximately 60 seconds to score each test. If you wish to receive an immediate report of your score you will be able to do so within a few minutes after turning the test in to me. I hope you will find this not only interesting but helpful.
There is one final item I would like to clarify for you. The questionnaire asks for your name. I will also be asking you to put your name on the test you take later. This is done solely for the purpose of enabling us to put together all the data for each individual subject. Your answers will be used strictly for research purposes. Your identity will not be disclosed in the study. We have provided the envelopes for your use in returning the initial questionnaire in order to guarantee you confidentiality. They will remain sealed until I arrive to administer the second test. No one on the staff of SMC will see the contents of the envelopes.

I want to thank you in advance for your willingness to participate in the study. If you have questions, you may either direct them to Elder Spears or I will be happy to talk with you personally when I visit your campus.

Sincerely yours,

Elizabeth M. Wilkins, Director
Freshman Education/Activities

P.S. Here is a brief summary of what I am asking you to do:

1. Fill out the enclosed questionnaire and seal it in the envelope addressed to Elder Spears.

2. Select a time for your test and check that time on the front of the envelope in which you have placed your questionnaire. Be sure to print your name clearly on the envelope.

3. Take the envelope to Elder Spears' office in Wright Hall.

4. Come to the Banquet Room for testing at the time you have selected on the back of the envelope.

Thanks again for helping. I will look forward to meeting you while I am at SMC.
Please select one of the times listed below to take the test for the Freshman Thinking Study:

- Thursday, November 10, 8:00 a.m.
- Thursday, November 10, 10:00 a.m.
- Thursday, November 10, 1:00 p.m.
- Thursday, November 10, 3:00 p.m.
- Thursday, November 10, 7:00 p.m.

Your Name: ________________________________
(Please Print Clearly)

All testing will be done in the Banquet Room of the Cafeteria.
JUST A FRIENDLY REMINDER...

We have a date to meet for a test on
Thursday, November 10, at ________
in the Banquet Room in the Cafeteria.
I will look forward to seeing you then.
Thanks for your help!

[Signature]

[Name]
Having trouble getting your homework done?

There's no way I can get mine done without your help. A few days ago I sent you a letter requesting your participation in a study of freshman thinking. We haven't heard a word from you. Please fill out the questionnaire, select a time for your test and turn in your questionnaire to Elder Spears' office as soon as possible. If you have mislaid your materials you can pick up another set from Elder Spears' office.

Thanks so much for your help. I will look forward to seeing you in a few days.

Beth Webber
Hi!

You were scheduled to take the test for the Freshman Thinking Study today at _______. We missed you. In order to have an acceptable statistical base, I need YOU to participate. If you do not come you will weaken the entire study. Please come to the Banquet Room in the Cafeteria at one of the times listed below and take the test. You should be finished in about an hour. Thanks for your help.

Thursday, 11/10
9:00 a.m., 10:00 a.m., 11:00 a.m., 1:00 p.m., 2:00 p.m., 3:00 p.m., 4:00 p.m., 5:00 p.m., 7:00 p.m., 8:00 p.m.
APPENDIX D

CORRESPONDENCE WITH SUBJECTS AT UNION COLLEGE

Introductory Letter from the President
Initial Letter
Return/Appointment Envelope
Reminder to Responding Subjects
First Reminder to Nonresponding Subjects
Second Reminder to Nonresponding Subjects
Third Reminder to Nonresponding Subjects
Dear Student Friend:

An important study of critical thinking among freshmen in Seventh-day Adventist Colleges is currently being conducted by Mrs. Beth Wilkins, who is Director of Freshman Education at Andrews University. A random sample of freshmen from Union College will be included in this study. You have been selected as one of the persons to be a member of this sample.

I wish to encourage you to cooperate with Mrs. Wilkins in this study which she is making. Your participation is really important to an increased understanding of Seventh-day Adventist education.

Thank you for helping.

Sincerely,

Myri Manley
President

vk
Your thinking is important to me! I am conducting a study of the thinking of Seventh-day Adventist college freshmen. In order to carry out this study I have carefully selected a random sample of freshmen in three Seventh-day Adventist colleges. You have been chosen to be a member of this random sample. This means that you are important to my study.

There are two things I will ask you to do as part of the study. The first is to fill out the enclosed questionnaire according to the instructions it contains. When you have completed the questionnaire, please place it in the enclosed envelope and seal the envelope.

Secondly, I will need to have you take a special test which I will be administering at Union College during the week of November 7. You will notice that the back of the envelope lists several times when the test will be given. The test is not timed and most students will finish in approximately 50 minutes; however, we have set aside two hours for each testing period in order to give everyone ample time to finish. Please select the time which is best for you and check the appropriate space. Print your name clearly at the bottom of the envelope and then turn the envelope in to the Counseling Center (Ad 515) by Wednesday, November 2. Mr. Wolfgang Struntz is serving as liaison person for students at Union College.

Why should you participate in this study? We believe the findings will be helpful in evaluating Seventh-day Adventist education. By participating you will make a significant contribution to this evaluation process. I also want you to be able to have some immediate, personal benefit from the study. For this reason, I am planning to do on the spot scoring of the test you take while I am at Union. It takes approximately 60 seconds to score each test. If you wish to receive an immediate report of your score you will be able to do so within a few minutes after turning the test in to me. I hope you will find this not only interesting but helpful.
There is one final item I would like to clarify for you. The questionnaire asks for your name. I will also be asking you to put your name on the test you take later. This is done solely for the purpose of enabling us to put together all the data for each individual subject. Your answers will be used strictly for research purposes. Your identity will not be disclosed in the study. We have provided the envelopes for your use in returning the initial questionnaire in order to guarantee you confidentiality. They will remain sealed until I arrive to administer the second test. No one on the staff of Union College will see the contents of the envelopes.

I want to thank you in advance for your willingness to participate in the study. If you have questions, you may either direct them to Mr. Struntz or I will be happy to talk with you personally when I visit your campus.

Sincerely yours,

Elizabeth M. Wilkins, Director
Freshman Education/Activities

P.S. Here is a brief summary of what I am asking you to do:

1. Fill out the enclosed questionnaire and seal it in the envelope addressed to Mr. Struntz.

2. Select a time for your test and check that time on the front of the envelope in which you have placed your questionnaire. Be sure to print your name clearly on the envelope.

3. Take the envelope to Mr. Struntz' office in the Counseling Center (Ad 515).

4. Come to the Counseling Center for testing at the time you have selected on the back of the envelope.

Thanks again for helping. I will look forward to meeting you while I am at Union College.
Please select one of the times listed below to take the test for the Freshman Thinking Study:

_____ Monday, November 7, 8:10 a.m.
_____ Monday, November 7, 10:10 a.m.
_____ Monday, November 7, 1:10 p.m.
_____ Monday, November 7, 3:10 p.m.
_____ Monday, November 7, 7:30 p.m.

Your Name: _____________________________
(Please Print Clearly)

All testing will be done in the Counseling Center.

RETURN TO:
Mr. Wolfgang Struntz
Counseling Center
Ad 515
Union College
Lincoln, Nebraska
JUST A FRIENDLY REMINDER

We have a date to meet for a test on

Monday, November 7 at__________.

in the Counseling Center in the Administration
Building.

I will look forward to seeing you then.

Thanks for your help!

[Signature]
Having trouble getting your homework done?

There's no way I can get mine done without your help. A few days ago I sent you a letter requesting your participation in a study of freshman thinking. We haven't heard a word from you. Please fill out the questionnaire, select a time for your test and turn in your questionnaire to Mr. Struntz's office in the Counseling Center as soon as possible. If you have mislaid your materials you can pick up another set from the Counseling Center.

Thanks so much for your help. I will look forward to seeing you in a few days.

[Signature]
UGENT

To: [Name]

Date: [Date]

Time: [Time]

While You Were Out

Mr./Mrs. [Name] of [Address]

Phone No. [Phone Number]

☐ Telephoned ☐ Please call back
☐ Called to see you ☐ Will call again
☐ Wants to see you ☐ Rush

Message: [Message]

[Signature]

Received by [Name]

UNION COLLEGE

5040 Prescott Ave.
Lincoln, NE 68506

402-483-4163

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Tuesday, noon, 11/7

Hi!

Here I am again begging you to come and participate in my study of freshman thinking. This is a doctoral dissertation project. In order to have an acceptable statistical base I need you to participate. Please call ext. 216 and make an appointment to come in for testing today or this evening. Thanks much.

[Signature]

[Name]
Name ________________________________

The Watson-Glaser Critical Thinking Appraisal which you have just taken tests several important abilities involved in critical thinking about everyday data, statements, arguments and issues. The percentile ranking of your score is ______.
This percentile score gives an indication as to where you rank in relation to other college freshmen. For example, if you score at the 75th percentile this means that 75 percent of college freshmen tested obtained equal or lower scores than you did, while 25 percent of freshmen tested received higher scores.

Thank you again for participating in this study.

Fall, 1971
SELECTED BIBLIOGRAPHY


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VITA

Name: Elizabeth May Foster Wilkins

Date of birth: September 5, 1940

Place of birth: Paris, Ontario, Canada

Secondary education: Oshawa Missionary College, 1954-58

Collegiate Institutions Attended:

<table>
<thead>
<tr>
<th>Institution</th>
<th>Dates</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andrews University</td>
<td>1958-1962</td>
<td>B.A.</td>
</tr>
<tr>
<td>Andrews University</td>
<td>1973-1975</td>
<td>M.A.</td>
</tr>
<tr>
<td>The Ohio State University</td>
<td>1976</td>
<td></td>
</tr>
<tr>
<td>Andrews University</td>
<td>1975-1979</td>
<td>Ed.D.</td>
</tr>
</tbody>
</table>

Major: Educational psychology and counseling

Cognate: Student personnel administration

Positions Held:

Instructor of Speech, Andrews University, Berrien Springs, Michigan 1966

Assistant to the Vice-President for Student Affairs, Andrews University, Berrien Springs, Michigan 1973-1977

Director of Freshman Education/Activities, Andrews University, Berrien Springs, Michigan 1976-