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A COMPARATIVE STUDY OF BELIEF
SYSTEMS OF COLLEGE STUDENTS MAJORING
IN DIFFERENT FIELDS.

The University of Oklahoma, Ph.D., 1969
Education, psychology

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THE UNIVERSITY OF OKLAHOMA
GRADUATE COLLEGE

A COMPARATIVE STUDY OF BELIEF SYSTEMS OF COLLEGE
STUDENTS MAJORING IN DIFFERENT FIELDS

A DISSERTATION
SUBMITTED TO THE GRADUATE FACULTY
in partial fulfillment of the requirements for the
degree of
DOCTOR OF PHILOSOPHY

BY
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Norman, Oklahoma
1969

A COMPARATIVE STUDY OF BELIEF SYSTEMS OF COLLEGE
STUDENTS MAJORING IN DIFFERENT FIELDS

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ACKNOWLEDGMENTS

I am greatly indebted to my advisor and committee chairman, Dr. Herbert R. Hengst, for his wise guidance and expert advice throughout the period of the doctoral program. His continued support and encouragement have sustained me in many difficult hours. I am also grateful to Dr. Gerald T. Kowitz who gave freely of his time and lent invaluable suggestions on the research design and statistical analysis. Appreciation is extended to Drs. Thomas W. Wiggins and John D. Pulliam who provided many ideas and criticisms in the formulation and the construction of this research.

Finally, I wish to acknowledge the assistance I received from many instructors and students at the University of Oklahoma. Without their cooperation, this investigation would not have been possible.

TABLE OF CONTENTS

	Page
ACKNOWLEDGMENTS	iii
LIST OF TABLES	vi
LIST OF FIGURES	ix
 Chapter	
I. INTRODUCTION.	1
Rokeach's Belief Systems Theory	4
Statement of the Problem.	6
Definition of Terms	7
Theoretical Framework and Hypotheses.	10
Significance of the Study	21
Delimitation of the Study	22
II. REVIEW OF RELATED LITERATURE.	23
Studies on College Major and Students'	
Beliefs and Attitudes.	23
Earlier Studies	24
Recent and Contemporary Studies	30
Research in the Area of Open- and	
Closed-Belief System	38
Summary of Related Research	44
III. PROCEDURE	46
Sampling.	46
Instrument.	50
Method of Collecting the Data	57
Treatment of Data	58

TABLE OF CONTENTS--Continued

Chapter	Page
IV. RESULTS AND DISCUSSION.	61
Belief System as Related to Sex	61
Belief System as Related to Major Area. . .	63
A) An Overall Difference Among Majors . .	65
B) Difference Among Levels for All Majors Combined.	68
C) Differences Among Majors Within Levels	70
D) Difference Among Levels Within Majors	74
Summary of the Results.	77
Discussion.	79
V. SUMMARY, CONCLUSIONS, AND IMPLICATIONS. . . .	83
Summary	83
Conclusions	86
Implications.	88
Recommendations for Further Research. . . .	90
BIBLIOGRAPHY.	91
APPENDICES.	98

LIST OF TABLES

Table	Page
I. Responses of Merit Scholarship Winners	35
II. Number, Title, and Description of Courses and the Number of Respondents in Each Course.	48
III. Distribution of the Sample by Major Area and Level.	49
IV. Distribution of the Sample Among Cells.	50
V. Distribution of the Sample by Major Within Each Area.	51
VI. Intercorrelations Between the <u>Dogmatism</u> <u>Scale</u> , <u>California F Scale</u> , and the <u>Ethnocentrism Scale</u> (English Subjects)	54
VII. Intercorrelations Between the <u>Dogmatism</u> <u>Scale</u> , <u>California F Scale</u> , and the <u>Ethnocentrism Scale</u> (American College Students)	55
VIII. Means, Standard Deviations, and t-value Comparison of the Total Males and Females on the <u>D-Scale</u>	62
IX. Means, Standard Deviations, and t-value Comparison of Male and Female Social Science Majors.	62
X. Means, Standard Deviations, and t-value Comparison of Male and Female Humanities Majors	62

LIST OF TABLES--Continued

Table		Page
XI.	Means, Standard Deviations, and t-value Comparison of Male and Female Natural Science Majors.	63
XII.	Summary of Analysis of Variance for Testing Main Effect for Major, Level, and Interaction	64
XIII.	Means and Standard Deviations of Social Science, Humanities, Natural Science, and Business and Engineering students on the <u>D-Scale</u>	65
XIV.	Tukey's Test for Comparison Between Means of Social Science, Humanities, Natural Science, and Business and Engineering Students on the <u>Dogmatism</u> <u>Scale</u>	66
XV.	Means and Standard Deviations in the <u>D-Scale</u> for Levels I, II, and III of All Majors	68
XVI.	Tukey's Test for Comparison Between Means of Levels I, II, and III of All Majors	69
XVII.	Means and Standard Deviations of Level I Social Science, Humanities, Natural Science, and Business and Engineering Students on the <u>D-Scale</u>	71
XVIII.	Tukey's Test for Comparison Between Means of Level I Social Science, Humanities, Natural Science, and Business and Engineering Students on the <u>D-Scale</u>	71
XIX.	Tukey's Test for Comparison Between Means of Level II Social Science, Humanities, Natural Science, and Business and Engineering Students on the <u>D-Scale</u>	73

LIST OF TABLES--Continued

Table	Page
XX. Tukey's Test for Comparison Between Means of Level III Social Science, Humanities, Natural Science, and Business and Engineering Students on the <u>D-Scale</u>	74
XXI. Tukey's Test for Comparisons Between Means of Levels I, II, and III Social Science Majors on the <u>D-Scale</u>	75
XXII. Tukey's Test for Comparisons Between Means of Levels I, II, and III Humanities Majors on the <u>D-Scale</u>	76
XXIII. Tukey's Test for Comparisons Between Means of Levels I, II, and III Natural Science Groups on the <u>D-Scale</u>	77
XXIV. Tukey's Test for Comparisons Between Means of Levels I, II, and III Business and Engineering Groups on the <u>D-Scale</u>	77

LIST OF FIGURES

Figure	Page
1. Social Behavior Model	12
2. The College as a Social System Model.	14

A COMPARATIVE STUDY OF BELIEF SYSTEMS OF COLLEGE
STUDENTS MAJORING IN DIFFERENT FIELDS

CHAPTER I

INTRODUCTION

The American college student has been the subject of extensive research for many years. Until recently, however, the focus of such research had been largely on intellectual and occupational factors. In recent years the scope of investigation was broadened to include questions dealing with non-intellectual factors such as personality, beliefs, and attitudes.

The broadening of research interest to include intellectual as well as non-intellectual factors in the development of college students is in the main stream of the goals and purposes of American higher education. Since their inception, American colleges and universities have declared their functions in terms of both intellectual as well as non-intellectual objectives. General and liberal education courses, the wide range of extra-curricula activities, and professional and personnel services have been

always justified by their assumed contribution to the development of student's personality.

One dimension of research which has received little attention is the relationship between student's personality and the type of curriculum he is pursuing. Several questions need to be answered. Is there a relationship between personality characteristics and intellectual pursuits? Are there personality differences among students majoring in different areas? Do various fields of study differ in their attraction to students with distinctive personality characteristics? Do different fields of study vary in their influence on the development of student's personality?

Since fields of study differ in their purposes, structure, and content,¹ it can be expected that they differ in their attraction and impact on students with different personality characteristics. Some fields of study (i.e., psychology, sociology) are more directly involved in the study of human behavior and conduct than others.

The dimension of personality which is of interest to this study is the comparison of beliefs and attitudes of students majoring in different fields. Previous research that dealt with specific attitudes such as attitude toward war, Communism, civil liberties, Negro, prohibition, and

¹Robert S. Vreeland and Charles C. Bidwell, "Classifying University Departments: An Approach to the Analysis of Their Effects Upon Undergraduates' Values and Attitudes," Sociology of Education, 39, (1966), 237-254.

birth control, has indicated that students in different fields of study vary in their attitudes toward such issues. Most of these studies interpret their results in terms of liberal-conservative dimension.² With some consistency, students in social science were found to be the most liberal, while students in applied fields such as engineering and agriculture appear to be the most conservative. Humanities and natural science students were found to stand between the two extremes.

While the foregoing studies have revealed belief and attitude differences among students majoring in different fields of study, they were, nevertheless, concerned with the comparison of single beliefs and single attitudes with major emphasis on their content. The need is for further research which should be directed to more basic personality dimensions

²For detailed account see: W. J. Boldt and J. B. Stroud, "Changes in Attitudes of College Students," Journal of Educational Psychology, 25 (1934), 611-619; V. A. Jones, "Attitudes of College Students and Changes in Such Attitudes During Four Years in College," Journal of Educational Psychology, 29 (1938), 464-466; P. J. Fay and W. C. Middleton, "Certain Factors Related to Liberal and Conservative Attitudes of College Students: Sex, Classification, Fraternity Membership, Major Subject," Journal of Educational Psychology, 30 (1939), 378-390; T. R. Newcomb, Personality and Social Change, (New York: Dryden Press, 1943); G. Hanchett, "Attitudes Toward the British: Churchill and the War Effort," Journal of Social Psychology, 23 (1946), 143-162; C. M. Stephenson, "The Relation Between the Attitudes Toward Negroes of White College Students and the College or School in Which They Are Registered," Journal of Social Psychology, 36 (1952), 197-204; Lois A. Noble and R. E. Noble, "A Study of the Attitudes of College Students Toward Civil Rights," Journal of Social Psychology, 40 (1954), 289-297.

which underlie and integrate particular beliefs and attitudes. In this regard Rokeach's work on belief systems has provided the conceptual ground and the measurement tool for such inquiries.³

Rokeach's Belief Systems Theory

Rokeach's theory of belief system stems from his dissatisfaction with earlier theory and research in the area of beliefs and attitudes. He felt that earlier efforts were too content, or topic bound; they focused on the study of, ". . . the properties, the determinants, and the measurement of single beliefs and single attitudes rather than of belief system and attitude system."⁴ Rokeach asserted that an individual social behavior can be better understood by relating it to the individual's total network of belief system rather than to separate elements in the system. He constructed the belief system theory as a descriptive model to account for the underlying cognitive structure of all beliefs, without regard to their content. A belief system is viewed as:

. . . representing all the beliefs, sets, expectancies, or hypotheses, conscious or unconscious, that a person at a given time accepts as the true of the world he lives in.⁵

³Milton Rokeach, The Open and Closed Mind, (New York: Basic Books, Inc., 1960).

⁴Ibid., p. 18.

⁵Ibid., p. 33.

This refers to the individual's network of political-religious-social-scientific beliefs.

A belief system is assumed to extend on a continuum of "openness" and "closedness." To the extent that a person is able to receive and evaluate information in terms of its intrinsic merit, he is said to have an "open" belief system. To the extent that he rejects or resists information without regard to its intrinsic merit, he is said to have a "closed" belief system.

Rokeach used the term dogmatism as synonymous with closedness. He defines dogmatism as:

. . . (a) a relatively closed cognitive organization of beliefs and disbeliefs about reality, (b) organized around a set of beliefs about absolute authority which in turn, (c) provides a framework⁶ for patterns of intolerance and qualified tolerance.

This definition is comprehensive in its attempt to tie together the organization of social attitudes with that of cognition, as well as the nature of authority and intolerance. Since it does not emphasize specific content, it can apply to a wide variety of research situations.

The Dogmatism Scale was designed to measure the degree of "openness" and "closedness" of belief systems. It also serves as a measure of authoritarianism and

⁶Milton Rokeach, "The Nature and the Meaning of Dogmatism," Psychological Review, 61 (1954), p. 204.

intolerance. The continuing research has supported the validity and the reliability of the instrument.⁷

It is, therefore, the purpose of this study to apply Rokeach's definition of belief systems and to use the Dogmatism Scale in determining the degree of "openness" and "closedness" of such belief systems among students majoring in different fields of study.

Statement of the Problem

The problem for this study was to explore the relationship between two sets of variables: belief system and college major. The following questions were explored: Are there significant differences in the belief systems of college students majoring in different fields of study? Are there significant differences among the various curricula groups at the beginning of their majors? Similarly, are there characteristic differences among those who are at the end of their majors?

In order to answer the above questions, the study tried to determine the degree of "openness" and "closedness" of belief systems as measured by the Dogmatism Scale among students majoring in different fields and at different levels of their majors. Fields of study were grouped into four general areas: Social Science, Humanities, Natural Science,

⁷Fred N. Kerlinger, Foundations of Behavioral Research, (New York: Holt, Rinehart and Winston, Inc., 1967), p. 453.

and Business and Engineering. Within each area, students were divided into three levels: Level I comprises students who have completed from 1 to 5 credit hours in their major; Level II comprises students who have completed from 6 to 18 credit hours in their major; Level III includes students who have completed more than 18 credit hours in their major.

Definition of Terms

Belief.--A belief refers to any set, proposition, or expectancy which an individual accepts as true of the object, event, or people. A belief is a predisposition to action. It can be verbal and nonverbal, explicit or implicit in the individual's behavior.⁸

System.--A system is defined here in a psychological, not logical sense. It refers to the total organization of a person's beliefs and disbeliefs.⁹

Belief System.--A belief system refers to the individual's total framework for understanding the universe. It includes "each and every belief and disbelief of every sort the person may have built up about the physical and social universe he lives in."¹⁰

Open-and-Closed Belief System.--Theoretically defined, it is:

⁸Rokeach, The Open and Closed Mind, op. cit., p. 32.

⁹Ibid., p. 35.

¹⁰Ibid., p. 35.

. . . the extent to which the person can receive, evaluate, and act on relevant information received from the outside on its own intrinsic merits, unencumbered by irrelevant factors in the situation,¹¹ arising from within the person or from outside.

Operationally, it is defined by a person's total score on the Dogmatism Scale. A high score represents a closed belief system and a low score indicates an open belief system. A person with a closed belief system differs from a person with an open belief system in the way he thinks and believes rather than in what he thinks and believes.

Dogmatism.--The term dogmatism is used synonymously with closedness and they are used interchangeably.

Field of Study.--Refers to the formal academic program which a student selects as his undergraduate area of concentration at The University of Oklahoma. Previous research comparing students in different fields in their personalities and beliefs had found that they can be grouped into four major areas along disciplinary divisions. These four areas are: social science, humanities, natural science, and applied fields.¹² This classification is used in this study, and students in each area are defined as follows:

Social Science Majors.--Students majoring in one or a combination of the following fields: Sociology, Anthropology, Psychology, and Political Science. These fields

¹¹Ibid., p. 57.

¹²Bereiter and Freedman, op. cit., pp. 563-569.

are defined as the core of the social science fields.¹³

Humanities Majors.--Students majoring in one or a combination of the following fields: English, Speech, History, Philosophy, Fine Arts, and Modern Languages.¹⁴

Natural Science Majors.--Students majoring in one or a combination of the following fields: Mathematics, Physics, Biology, Chemistry, and Zoology.

Applied Fields Majors.--Defined in this study as those students majoring in Business or Engineering. Business students include those majoring in Accounting, Business Administration, Finance, Management, Marketing, and Economics and Statistics. Engineering students include those in Chemical, Civil, Electrical, Mechanical, Petroleum, and Aerospace Engineering.

Level.--The term Level is designated to indicate the number of credit hours completed by a student in his major. Since the study is specifically concerned with the student's academic major, it was decided that the number of credit hours would serve as a better criterion than the regular classification of freshman, sophomore, junior, and senior.

Students were divided into three levels according to the number of credit hours completed in their majors

¹³Paul L. Dressel and L. B. Mayhew, General Education: Exploration and Evaluation. (Washington, D. C. ACE, 1954), p. 223.

¹⁴Ibid., p. 259.

(most departments at The University of Oklahoma require the completion of a minimum of 24 credit hours in a student's major for graduation).¹⁵

Level I Students.--Are those who have completed from 1 to 5 credit hours in their majors. The assumption is that a student in this level at least has completed the introductory course in his major.

Level II Students.--Are those who have completed between 6 to 18 credit hours in their majors.

Level III Students.--Are those who have completed more than 18 credit hours in their majors.

Theoretical Framework and Hypotheses

The study attempts to explore the relationship between two sets of variables: belief system and field of study. There is a need for a theoretical model to understand the articulation of the hypothesized relationship between the two variables. One possible approach for the development of such a model is to consider how the characteristics of the college as a social system may affect the social behavior of the students. In this regard, the general model developed by Getzels and Guba for describing social behavior is relevant.¹⁶ The model presumes that

¹⁵Bulletin of the College of Arts and Sciences, University of Oklahoma, 1968.

¹⁶J. W. Getzels and G. E. Guba, "Social Behavior and the Administrative Process," School Review, 65 (1957), 423-434.

social system is defined in "conceptual rather than descriptive terms, and be a single classroom, a whole school, or a community."¹⁷

The social system is conceived of having two major elements "which are at once conceptually independent and phenomenally interactive."¹⁸ On the one side, there are institutions with defined roles and expectations, which will fulfill the goals of the social system. On the other side, there are individuals inhibiting the system with certain personalities and need-dispositions, "whose interactions comprise what is called social behavior."¹⁹

Social behavior is considered to be the result of interaction of two basic dimensions: (1) the nomothetic dimension represented by institutions, roles, and expectations, and (2) the ideographic dimension represented by individuals, personality, and need-disposition. The two dimensions are shown in Figure 1.

An institution is defined as the agency established to carry out the functions desired by the social system. Roles are the most important analytic units of institutions. A role is defined "by the expectations (the rights, privileges,

¹⁷Ibid., p. 424.

¹⁸Ibid., p. 424.

¹⁹J. W. Getzels, "Conflict and Role Behavior in the Educational Setting," in W. W. Charters and N. L. Gage, (eds), Reading in the Social Psychology of Education, (Boston: Allen and Bacon, 1963), p. 310.

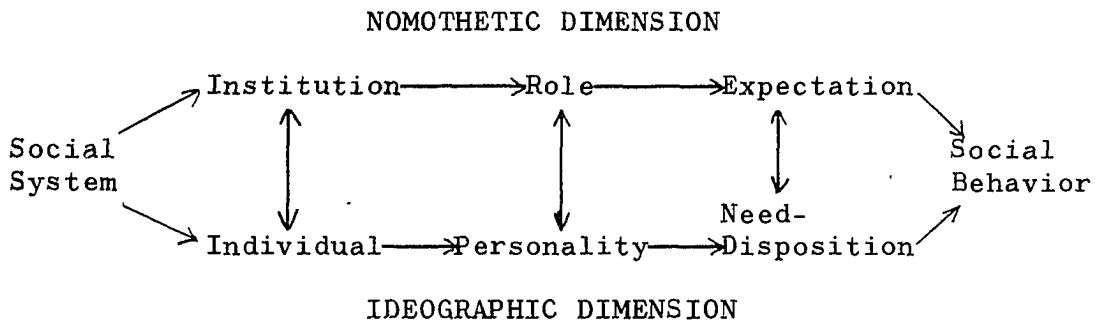


Fig. 1.--Social Behavior Model²⁰

and obligations) to which any incumbent of the role must adhere."²¹ Roles are interrelated and complementary to each other.

Roles are carried out by individuals with different characteristics and personalities. Each individual may carry out his role in a particular manner unique to his personality. Thus, it is not enough to analyze roles and expectations, but also to analyze the personalities and need dispositions of the individuals inhabiting the roles.

The basic analytic elements of the individual dimension is personality and need-disposition. Personality may be defined "as the dynamic organization within the individual of those need-dispositions that govern his unique perceptions and reactions to the environment and to its expectations."²² Need-dispositions are the basic analytic

²⁰Ibid., p. 311.

²¹Ibid., p. 311.

²²Ibid., p. 311.

elements of personality and refer to "individual tendencies to orient and act with respect to objects in certain manners and to expect certain consequences of those actions."²³

Social behavior, then, is the product of the interaction between role and personality. When role is maximized, personality factors are minimized, but can't be diminished, "because no role is ever so closely defined as to eliminate all individual latitude."²⁴ When personality is maximized, role is minimized, but social behavior still maintains some role description.

The relevance of this model to the socializing function of college curricula is apparent when the college is seen as a social system comprising two major elements: academic curricula and individuals.²⁵ Academic curricula are institutionalized into academic departments as administrative units with certain roles and expectations in fulfilling the goals of the system. These departments are occupied by individuals with certain personalities and need-dispositions. These individuals include the professional staff who play the role-model and students who play the

²³Ibid., p. 311.

²⁴Ibid., p. 311.

²⁵The college in mind here is the large college with specialized faculty and curricula. There is substantial evidence that in such colleges the primary identification of the student is with the field of study he is pursuing (see Bereiter and Freedman, 1962, op. cit.).

role-learners.²⁶ This can be depicted in the same way as the general model.

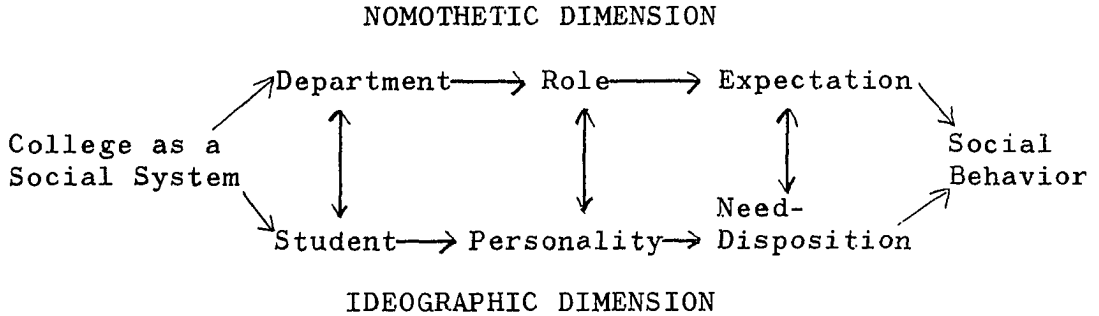


Fig. 2.--The College as a Social System²⁷

The college as a social system involves both nomothetic role expectation and ideographic need-disposition in fulfilling the goals of the larger social system. The academic department, in turn, as a subsystem carries out the functions of the college.²⁸

The college as a social system has both technical and moral goals.²⁹ Socialization involves both technical

²⁶Charles Bidwell and Robert Vreeland, "College Education and Moral Orientations: An Organizational Approach," Administrative Science Quarterly, 8 (1963), 166-191.

²⁷Adopted from Getzels, op. cit., p. 311.

²⁸Getzels and Guba define an institution as the agency established to carry out the functions of the social system. Such a definition can be applied to a single classroom, an academic department, or to the college as a whole. (Getzels and Guba, 1957; Getzels and Associates, 1968).

²⁹For detailed account of the socializing function of the college see A. Etzioni, A Comparative Analysis of Complex Organizations, (New York: The Free Press of Glencoe, op. cit.; Vreeland and Bidwell, 1966, op. cit.).

training and moral indoctrination.³⁰ Students as role learners must be taught:

. . . the knowledge and skills which the role demands. But they must also acquire the values and attitudes specific to the role and the broader moral orientations which contain and support them.³¹

Technical socialization can be accomplished through "the interaction of a coach with a technically and normatively subordinate novice."³² Moral socialization requires a far more complex resource and occurs "through the psychological processes of identification and internalization."³³ Identification occurs:

. . . when the individual espouses a value or attitude as a consequence of a desire to emulate a role model or as a result of reciprocal interaction with a role partner.³⁴

Internalization occurs:

. . . when a perceived legitimacy of some sources of moral influence gives that influence such a force that the new moral orientations are incorporated within the individual's existing system of values and attitudes.³⁵

Although socialization involves both technical and moral components, they need not be given an equal weight.

³⁰Bidwell and Vreeland, 1963, op. cit., p. 175.

³¹Ibid., p. 174.

³²Ibid., p. 174.

³³Ibid., p. 174.

³⁴Ibid., p. 175.

³⁵Ibid., p. 175.

Within a college, different departments can be assigned different roles. Some departments attempt only to increase students' competence and knowledge in technical skills (technical roles), while others, attempting to increase technical competence, also seek to affect students' beliefs and attitudes (moral roles).³⁶ For example, the Bulletin of the College of Arts and Sciences at the University of Oklahoma states:

. . . in all its courses, the College fosters the spirit of free inquiry and independent thought; it emphasizes the value of intellectual growth and the satisfaction which comes from knowledge alone. It encourages in students a sense of personal integrity and of civic responsibility to the community, the country, and the world in which we live. Thus, through liberal education - the education becoming to free man and woman - the College of Arts and Sciences seeks to enrich the lives of the students both as individuals and as active and useful members of society.³⁷

The Bulletin of the College of Engineering states:

. . . the curricula in engineering are constantly being updated and modified to meet the need of industry and future graduate work, trying to increase the versatility of the student, and prolong the usefulness of the material taught.³⁸

Two recent studies were able to classify academic departments in terms of a technical-moral goal dimension.

³⁶ Bidwell and Vreeland, 1966, op. cit., p. 245.

³⁷ Bulletin of the College of Arts and Sciences, 1968, The University of Oklahoma, Norma, Oklahoma, p. 39.

³⁸ Bulletin of the College of Engineering, 1968, The University of Oklahoma, Norman, Oklahoma, p. 37.

Vreeland and Bidwell³⁹ asked 127 faculty members of an eastern university with large and distinguished departments to describe goals of undergraduate education in their departments. Most science faculty endorsed technical goals, while most social science faculty centered on moral goals. Humanities professors defined their departments in diverse goals. Some were defined in terms of technical category and others in terms of moral category.

Gamson⁴⁰ reported another study in which he used similar technique to that of Vreeland and Bidwell. He interviewed the faculty of Hawthorn, a small experimental college, and reached identical conclusions.⁴¹

Faculty perceptions of their roles were also found to coincide with departmental goals. Natural science faculty saw their roles in terms of technical socializing function. They wanted to coach but not to indoctrinate. They restricted their role to "affecting students cognitively . . . changes other than this were seen as undesirable or irrelevant."⁴² Social science professors saw their roles

³⁹Bidwell and Vreeland, 1966, op. cit., p. 247.

⁴⁰Z. F. Gamson, "Utilitarian and Normative Orientations Toward Education," Sociology of Education, 39 (1966), 46-73.

⁴¹Ibid., p. 46-73.

⁴²Ibid., p. 72.

in terms of coaching as well as indoctrinating. Besides affecting students cognitively, they wanted to do more "to change students' values and self-identities."⁴³ Vreeland and Bidwell reported similar results.⁴⁴

The second set of variables in this study representing the ideographic dimension of Getzels and Guba's model are BELIEF SYSTEMS. Belief system is seen as a personality characteristic embracing all the beliefs, sets, and expectancies which the individual accepts as the true of his world.⁴⁵

Belief system is assessed in terms of degrees of dogmatism. Dogmatism is defined as:

. . . (a) a relatively closed cognitive organization of beliefs and disbeliefs about reality, (b) organized around a central set of beliefs about absolute authority which, in turn, (c) provides a framework for pattern of intolerance and qualified tolerance toward others.⁴⁶

The first defining characteristic of dogmatism as a closed cognitive structure indicates that persons high in dogmatism (having a closed belief system) are more resistant to change and less acceptant of new beliefs which do not conform to their established belief system. If the postulated cognitive structure is empirically correct, then

⁴³Ibid., p. 72.

⁴⁴Vreeland and Bidwell, 1966, op. cit.

⁴⁵Rokeach, 1960, op. cit.

⁴⁶Milton Rokeach, 1954, op. cit., p. 204.

persons high in dogmatism are expected to avoid situations where their beliefs are challenged and sought to be changed. Since fields of study are shown to differ in their influence on students' beliefs and attitudes, with some as more directly seeking to change students' beliefs than others, it can be expected that students with "closed" belief systems would shy away from fields where their beliefs are challenged and sought to be changed. This would lead to the BASIC RESEARCH HYPOTHESIS of this study: Students majoring in the areas of Social Science and Humanities are less dogmatic in their belief systems than students majoring in the areas of Natural Science and Applied Fields.

In order to test the above research hypothesis, the following null hypotheses were formulated:

- (1) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale among Social Science, Humanities, Natural Science, and Business and Engineering students.
- (2) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale between Levels I, II, and III for all groups combined.
- (3) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale among Level I Social Science, Humanities,

Natural Science, and Business and Engineering students.

- (4) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale among Level II Social Science, Humanities, Natural Science, and Business and Engineering students.
- (5) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale among Level III Social Science, Humanities, Natural Science and Business and Engineering students.
- (6) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale between Levels I, II, and III Social Science students.
- (7) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale between Levels I, II, and III Humanities students.
- (8) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale between Levels I, II, and III Natural Science students.
- (9) There is no statistically significant difference in dogmatism as measured by the Dogmatism Scale

between Levels I, II, and III Business and Engineering students.

Significance of the Study

American colleges and universities have been concerned for a long time in guiding students to select fields of study that are more suitable to them. Apart from its contributions in the area of intellectual achievement and occupational development, educational and psychological research has not been very helpful in this difficult area. In recent years, however, there has been the beginning of interest in the relationship between personality characteristics and intellectual activities. This interest has been guided by the thesis that:

. . . all the individual's knowledge is a part of his personality, and that all curricula either favor or hamper personality development regardless of whether they were designed with such development in mind.⁴⁷

Better understanding of interaction between personality characteristics and different types of curricula would provide a sounder policy for selecting students and helping them find fields of study that are more beneficial to their intellectual as well as personality growth.

⁴⁷ Joseph Katz and Nevitt Sanford, "The Curriculum in the Perspective of the Theory of Personality Development," in N. Sanford (ed.), The American College, op. cit., p. 425.

Delimitation of the Study

The first delimitation of the study is inherent in the nature of the problem. The problem called for an ex-post-facto type of research design. The variables under consideration should not be thought of as independent variables in the experimental sense. Both are fixed variables and, therefore, cannot be manipulated or randomly assigned. Thus, relationships were determined, but no definite causality may be deduced.

The second delimitation of the study is imposed by its defined population, which was limited to a random sample of students majoring in specified areas at The University of Oklahoma. The generalizations derived from the study cannot be extended beyond the defined population.

CHAPTER II

REVIEW OF RELATED LITERATURE

The purpose of this chapter is to review related literature which serves as a historical background for the present study. There are two types of studies reviewed here: (1) studies related to the question of the relationship between college curricula and students' beliefs and attitudes, and (2) studies conducted within the framework of belief system theory.

Studies on College Major and Students' Beliefs and Attitudes

The relationship between student's choice of a field of study and his politico-social beliefs and attitudes has been a subject of a number of investigations. These investigations have dealt with students pursuing diverse programs of study in different kinds of higher education institutions in various sections of the country. These studies can be divided into two parts: (1) earlier studies, which were concerned with the comparison of particular beliefs and attitudes, and (2) recent and contemporary studies, which have

been directed to more generalized personality tendencies which underlie particular beliefs and attitudes.¹

Earlier Studies

Earlier studies have tried to measure students' attitudes and beliefs toward a single or several issues, such as civil rights, Communism, war, religion, and political ideologies. The attitude instrument most frequently used was Thurstone's Social Attitude Scales.² These scales measure the content of attitudes toward several social issues and lend themselves to interpretation in terms of liberalism-conservatism. Some of these studies will be reviewed here since they have provided a background for the most recent studies.

Boldt and Stroud³ in 1934, reported the earliest study on changes in attitudes of college students, using Harper's test of Social Beliefs and Attitudes. One dimension of their study was to compare students in different majors to ascertain whether students who major in one field of study show greater change in the test than those who major in another field. Boldt and Stroud also compared students

¹Harold Webster, Mervin Freedman, and Paul Heist, "Personality Changes in College Students," in Nevitt Sanford (ed.), The American College, op. cit., p. 828.

²L. Thurstone and E. Chave, The Measurement of Attitude, (Chicago: University of Chicago Press, 1929).

³Boldt and Stroud, 1934, op. cit.

majoring in one area to the number of credit hours they have accumulated in their field.

The results of Boldt and Stroud's study indicate that students majoring in social sciences show more liberal tendencies than those majoring in humanities or physical sciences. When students majoring in social sciences were compared on the number of credit hours they accumulated in this area, a significant relationship was found between the number of hours taken in social science and the liberal tendency. When the same comparison was done between students in the two other major areas, no significant differences were found.

Boldt and Stroud interpreted their results as supporting their hypotheses "that much of the change manifested appears to be due to the influence of the college life rather than to difference in age and maturity."⁴ This interpretation, they point out, is substantiated

by the fact that the amount of changes in attitudes in question from one class level to another is a function of the particular academic courses pursued and by the fact that a direct relationship exists between the extent of change in attitudes and the number of hours taken in these subjects.⁵

Carlson⁶ reported similar findings. Using five of Thurstone's Social Attitudes Scales he found that

⁴Ibid., p. 19.

⁵Ibid., p. 19.

⁶H. B. Carlson, "Attitudes of Undergraduate Students," Journal of Social Psychology, 5 (1934), 202-212.

undergraduates at the University of Chicago who majored in social science were more tolerant in their attitudes toward Communism and pacifism than students in physical sciences. Carlson concluded that "students in social sciences are more liberal in their attitudes on social questions than are students in physical sciences."⁷

In 1938, Jones⁸ reported the results of a carefully planned longitudinal investigation on the changes of students' beliefs and attitudes. The study lasted for six years and included a follow-up of two college classes from freshman through senior year. Again he used Thurstone's attitude scales (Attitude toward War, Attitude toward Negro, Attitude toward Religion, Attitude toward the Church). In contrast to the previous findings, Jones' study indicates that senior students majoring in natural sciences changed more in the liberal direction. Students in geography-history were the least liberal, and English, economics, and sociology majors were found to stand in the middle between the two groups.

Another study reported by Fay and Middleton⁹ supports Jones' findings. Using the same instrument, they found that science majors, along with philosophy and Bible majors, to be the most liberal.

⁷Ibid., p. 212.

⁸Jones, 1938, op. cit.

⁹Fay and Middleton, 1939, op. cit., pp. 378-390.

Bugleski and Lester¹⁰ administered an opinion test to 222 freshman students at the University of Buffalo. The test was readministered to the same students four years later when they became seniors. The results showed that freshman students in social science, while being slightly more liberal than freshman students in biological and physical sciences, became considerably more liberal as seniors than the other majors.

The relationship between attitude change and academic curricula was disputed by Newcomb.¹¹ As a result of a thorough study conducted at Bennington College during the thirties, Newcomb asserts that, "attitude change was only slightly related to courses of study pursued in college."¹² While students who chose to major in social studies were initially slightly more liberal than students in science and music, the difference increased slightly during three or four years of college experience. Newcomb concludes that, ". . . the important influences making for attitude change were clearly of a community-wide rather than of an academic major sort."¹³ He contends that attitude change "could be

¹⁰R. Bugelski and Olive Lester, "Changes in Attitudes of College Students During Their College Course and After Graduation," Journal of Social Psychology, 12 (1940), 319-332.

¹¹T. R. Newcomb, Personality and Social Change, (New York: Dryden Press, 1943).

¹²Ibid., p. 148.

¹³Ibid., p. 148.

predicted far better from information concerning community relationships than from area of major work."¹⁴

Drucker and Remmers¹⁵ compared science and engineering students on citizenship attitudes. Their study indicated that good citizenship attitudes vary inversely with the degree of technical specialization.

The attitudes toward civil liberties of four groups majoring in architecture, engineering, home economics, and arts at a professional and technical school in New York City were compared by Noble and Noble.¹⁶ They found that architecture students had the most favorable and engineering students the least favorable attitudes. Home economics and arts majors ranked second and third, respectively.

The results of the above and similar studies have indicated some statistically significant differences in the beliefs and attitudes of college students majoring in different fields. While the findings of these studies are not consistent, the majority of them, however, show that students in social science subjects are the most liberal. Students in applied fields were found to be the most conservative.

¹⁴Ibid., p. 148.

¹⁵A. J. Drucker and H. H. Remmers, "Citizenship Attitudes of Graduate Seniors at Purdue University, U. S. College Graduates and High School Pupils," Journal of Educational Psychology, 42 (1951), 231-235.

¹⁶Noble and Noble, 1954, op. cit.

Humanities and natural science students were found to stand between the two groups.¹⁷

The inconsistency and the small magnitude of belief and attitude differences among students majoring in different fields led one investigator, Jacob,¹⁸ to dismiss such differences as having no real significance. He asserts that these differences are quite small and that they were not "necessarily indicative of a powerful and persistent influence upon values stemming from a particular type of educational program of study."¹⁹

Based upon his review of the Cornell Values Survey, Jacob concludes that "the patterns of values are almost identical among students in different fields -- within each university and across the sample as a whole."²⁰ There is little evidence, Jacob contends, that

. . . the values of students change consistently as a result of the particular type of educational program in which they are enrolled and/or the field of study in which they major.²¹

Social science students are not different from students in other areas in regard to their attitudes toward race, civil

¹⁷Bereiter and Freedman, 1962, op. cit.

¹⁸Philip Jacob, Changing Values in College, (New York: Harper Brothers, 1957), p. 147.

¹⁹Ibid., p. 66.

²⁰Ibid., p. 59.

²¹Ibid., p. 58.

obligation, political and economic philosophy, religion and self-satisfaction.

Jacob's conclusions, however, have been questioned from different points of view. Barton²² questioned the methodology and the validity of sources upon which the conclusions were based. Riesman²³ objected to the generalizations and lack of differentiations among the data analyzed. Studies that are on sound ground are not distinguished from the less defensible ones. Riesman also feels that Jacob's emphasis on uniformity among college students seems to obscure the fact that college graduates are different in important ways from noncollege population.

Recent and Contemporary Studies

Most of the earlier studies compared students' beliefs and attitudes along a single dimension of liberalism vs. conservatism. Bereiter and Freedman²⁴ feel that this is not the only dimension along which attitudes may vary, and may not be the most useful one in the study of college students. They hypothesize another dimension "which separate

²²Allen H. Barton, Studying the Effects of College Education, (New Haven: Edward W. Hazen Foundation, 1959), p. 96.

²³David Riesman, "The Jacob Report," American Sociological Review, 23 (1958), p. 732-738.

²⁴Berierter and Freedman, 1962, op. cit.

people with internalized social attitudes from those whose attitudes are largely external tapping."²⁵

Using this two dimensional approach, Bereiter and Freedman interpret the findings of Lehmann and Ikenberry's study²⁶ in terms of "a four-way split of major groups in attitudes,"²⁷ Lehmann and Ikenberry used two attitude scales in their study, the Inventory of Beliefs and Prince's Differential Values Inventory. Bereiter and Freedman suggest that the Inventory of Beliefs can be interpreted in terms of a liberal-conservative dimension and the Differential Values Inventory can be interpreted in terms of inner-directed and other-directed type of character. According to this multi-dimensional interpretation, the liberal, other-directed students were represented by those majoring in communication arts; liberal, inner-directed students were represented by those in the science and the arts; the conservative, inner-directed are those in applied science; and the conservative, other-directed are those majoring in education, business and public service.²⁸

²⁵Ibid., p. 570.

²⁶I. J. Lehmann and S. O. Ikenberry, "Critical Thinking, Attitudes and Values in Higher Education," (East Lansing: Michigan State University, 1959).

²⁷Bereiter and Freedman, 1962, op. cit.

²⁸Ibid., p. 571.

Combining several attitude and personality measures, Sternberg²⁹ reported a study in which he used Kuder Preference Record, the Allport-Vernon Study of Values, and Minnesota Multiphasic Personality Inventory (MMPI). The study was carried out in one of New York's municipal colleges with all male subjects majoring in nine different fields. The nine major groups did not differ significantly on the MMPI, but they differed significantly on the other interests and values measures. Strenberg interprets this to be:

. . . in accord with what might be termed 'logical expectation,' that is, there appeared to be a logical relationship between a particular major group and the need satisfaction which would probably be found in the study field or in related occupation.³⁰

Using quite different samples, all female students at Vassar College, Bereiter and Freedman³¹ reported similar findings. Students majoring in different areas were found to differ significantly on all seven of the Vassar Attitude Inventory Scales. By the use of factor analytic technique the scales were reduced to three factors, and only two of them differentiated significantly among the various curricula groups. These two factors were identified as Unconventionality and Social Confidence. Students in literary fields scored significantly higher on the unconventionality factor

²⁹Sternberg, 1955, op. cit.

³⁰Ibid., p. 17.

³¹Bereiter and Freedman, 1960, op. cit.

than students in natural science and applied fields. On the social confidence factor, social science majors scored significantly higher than the natural science groups.³²

The third factor which did not distinguish among the various major groups was identified as Emotional Stability factor, that is, "control of impulses combined with a freedom from overt conflicts and worries."³³

The Center for Research and Development on Higher Education at the University of California, Berkeley, has undertaken a nation-wide longitudinal study of the educational and intellectual development of National Merit Scholarship winners and near winners who rank at the top one per cent or two per cent of all high school graduates in measured scholastic ability.³⁴ At their freshman year they responded to an attitudinal questionnaire that covered various cultural and social issues. It was found "that there was little diversity in the attitudes of the students who had chosen certain academic majors."³⁵ The majority of the responses across majors tend toward liberal direction, with men showing

³²Bereiter and Freedman, 1962, op. cit., p. 576.

³³Ibid., p. 576.

³⁴Harold Webster, Mervin Freedman, and Paul Heist, "Personality Changes in College Students," in Nevitt Sanford (ed.), The American College, op. cit., pp. 811-846.

³⁵T. R. McConnell and Paul Heist, "The Diverse College Student Population," in Nevitt Sanford (ed.), 1962, op. cit., p. 240.

more liberal tendencies than women. Based upon these results, McConnell and Heist conclude that,

. . . attitudes on items such as these seem ordinarily to be unrelated to choice of academic major, especially in the case of students of such exceptionally high ability.³⁶

This uniformity, however, decreased gradually during three years in college, with some variation among majors. With regard to religious attitudes all majors showed a decreasing need for religious faith and lessened belief that colleges should teach religious instructions. Students in engineering changed the least and humanities majors changed the most. Men showed wider change than women. On the basis of these results it was concluded that, "changes appear to be related both to academic major and to the sex of the respondents."³⁷

Further findings from the study of National Merit Scholars support the assumption that change in attitudes is sometimes related to academic major. For example, in response to the question, "Should the government provide medical and dental care for citizens who cannot afford such services?", the following data were obtained.³⁸

For engineering majors the significant change was from positive to negative, for the mathematics and

³⁶Ibid., p. 242.

³⁷Webster, Freedman, and Heist, 1962, op. cit., p. 827.

³⁸Ibid., p. 827.

TABLE I

RESPONSES OF MERIT SCHOLARSHIP WINNERS

	End of Freshman Year		End of Junior Year	
	Yes	No	Yes	No
Engineering - Men	56%	29%	47%	42%
Mathematics - Men	55%	19%	70%	11%
Humanities - Men	57%	38%	77%	22%
Humanities - Women	50%	39%	61%	26%

humanities students the significant change was in the forward direction.³⁹

In response to another question concerning the political party to which these able students would vote, 30 per cent checked "Republican," about 17 per cent "Democrat," and about 50 per cent "Independent." After two years the humanities students reduced their preference of the Republican Party in favor of the Democratic for men and Independent for women. Many mathematics students also changed to the Independent category. The authors see these changes in the liberal directions, and on the basis of the data, they conclude that:

³⁹Ibid., p. 827.

the amount and direction of change is sometimes related to academic major, and the notion that educational experiences during the two years are contributing to the change cannot be ruled out.⁴⁰

Two very recent studies⁴¹ have used different approaches in studying the relationship between a student's major and his beliefs and attitudes. Rather than comparing the beliefs and attitudes of students in different fields, they interviewed faculty members in different departments to identify the goals of their departments and to assess their effects on students' beliefs and attitudes.

Gamson reported his study on the faculty of Hawthorn College, a small liberal arts college located in a large industrial city. The college is non-vocational and offers mainly general education courses to a non-elite student body. Gamson interviewed thirty of a total of thirty-three faculty and high administrators at the college. He classified the faculty into three major departmental divisions, natural science, social science, and humanities.

The major difference was found between social science and natural science faculty. Social scientists viewed the goals of their disciplines in terms of intellectual as well as personality development of the student. They also saw their role to extend beyond the intellectual development of their students. They wanted "to change students' values

⁴⁰Ibid., p. 826.

⁴¹Gamson, 1966, op. cit.; Vreeland and Bidwell, 1966, op. cit.

and self-identities."⁴² For the science faculty, "affecting students cognitively was enough; changes other than this were seen as undesirable or irrelevant."⁴³

The faculty also differed significantly in their concept of student-faculty relationship. Social science faculty expressed the view that this relationship should be "particularistic, diffuse, and affective."⁴⁴ For the natural scientists, the relationship should be somewhat formal, structured, and the boundaries between faculty and students should be sustained.

The other study was reported by Vreeland and Bidwell.⁴⁵ The study took place in an Eastern university with large and distinguished undergraduate departments. The authors interviewed a stratified random sample of 127 faculty members, representing proportionally all departments. On the basis of the faculty responses, the authors arranged twenty-three departments on a continuum representing their effects on students' beliefs and attitudes. Social science fields (history, economics, sociology) stood at the end of the continuum representing the most effective. Natural science fields (physics, chemistry) stood at the other end representing the least effective. Humanities fields were mixed.

⁴²Gamson, 1966, op. cit., p. 72.

⁴³Ibid., p. 72.

⁴⁴Ibid., p. 72.

⁴⁵Vreeland and Bidwell, 1966, op. cit.

Fine arts were placed in the most effective category, while German and Slavic in the least effective category.

In summary, the review of related research leads to the conclusion that there is a considerable evidence to support the contention of significant attitude and belief differences among college students majoring in different fields. There are more findings reported that indicate significant differences than findings which indicate no significant differences, although the consistency of these findings on the direction of the differences is far from perfect.

Research in the Area of Open-and-Closed Belief System

Since the formulation of the belief system theory and the construction of the Dogmatism Scale, a great deal of research studies have been reported. A few of these studies are reviewed here to shed more light on the theoretical framework used in the present study.

The relationship of belief system to other cognitive and personality variables such as critical thinking, problem solving, perceptual analysis, verbal ability, and value and attitude change has been investigated. While the results of these studies are not clear cut, they provide evidence for the validity of Rokeach's theoretical reasoning and the validity of the Dogmatism Scale.⁴⁶

⁴⁶Fred Kerlinger, 1967, op. cit., p. 453.

Kemp⁴⁷ contended that low dogmatic individuals would be superior in solving critical thinking problems to high dogmatic individuals. He used the Dogmatism Scale, Form E, to identify two high and low dogmatic groups. The two groups were given one hundred critical thinking problems. The results support Kemp's contention. Those low in dogmatism were found to be more efficient in solving the problems than those high in dogmatism.

In a series of investigations, Rokeach and associates⁴⁸ have sought to determine the relationship between belief system and problem solving process. Two high and low dogmatic groups were presented with a novel but fictitious problem called the "Doodlebug Problem." The results indicate that subjects with relatively open belief system took less time to solve the problem than did subjects with relatively closed systems. Interpreting the findings, the authors comment:

Those having relatively open systems take less time to solve the Doodlebug Problem not because they overcome beliefs faster but because they can more readily integrate new beliefs, once the older ones have been overcome, into a new system. Their greater capacity to integrate is seen to be related to and possibly a function of a greater capacity to remember the elements to be integrated. This capacity, in turn, is related to and possibly a function of a greater capacity to entertain novel problem-solving situations.⁴⁹

⁴⁷C. Gratton Kemp, "Effects of Dogmatism on Critical Thinking," Social Science and Mathematics, LX (1960), 314-319.

⁴⁸Milton Rokeach, The Open and Closed Mind op. cit., Chapters 9, 10, and 11.

⁴⁹Ibid., p. 211.

Derived from Rokeach's theoretical definition of dogmatism, Ehrlich⁵⁰ hypothesized an inverse relationship between dogmatism and classroom learning. Using a college sociology class, he found that low dogmatic students get better grades than those high in dogmatism. This was found to be independent of academic ability. Dogmatism accounted for the larger proportion of the variance in the criterion measure than did scholastic tests. Similar findings were reported by Christensen.⁵¹

The relation of open-and-closed belief system to changing values was explored by Kemp.⁵² The subjects were 102 religiously oriented college students who were given the Allport-Vernon Study of Values Scales in 1950 and retested again in 1956, at which time they were also given the Dogmatism Scale. The results reveal that for the closed subjects there was a significant increase in political and economic values and significant decrease in social values. The open-system group remained unchanged in its social and religious values but decreased in its economic and political values and increased in its theoretical values. Kemp concludes that:

⁵⁰Howard J. Ehrlich, "Dogmatism and Learning," Journal of Abnormal and Social Psychology, LXII (1961), 148-149.

⁵¹C. M. Christensen, "A Note on Dogmatism and Learning," Journal of Abnormal and Social Psychology, LXIV (1963), 75-76.

⁵²C. Gratton Kemp, "Changes in Values in Relation to Open-Closed Systems," in Milton Rokeach, The Open and Closed Mind, op. cit., pp. 335-346.

. . . both open and closed persons change their values over time. But the basic differences in the quality of such changes seems to lie in diametrically opposed directions as far as personality integration is concerned.⁵³

In a related study, Frumkin⁵⁴ found closed- and open-minded individuals to differ significantly in their economic and religious values as measured by Allport-Vernon Study of Values. Closed persons scores significantly higher on these two values than did the open-minded persons.

The relation of belief system to self-concept was investigated by Kemp.⁵⁵ He hypothesized that individuals with more open-belief systems would be more accurate in self-perception than are those with more closed-belief systems. A total of 150 students were administered the Dogmatism Scale and an adjective check list for measurement of anxiety. Each subject was requested to estimate his degree of open-mindedness and anxiety. The open-minded perceived themselves to be more closed-minded, and the closed-minded perceived themselves to be more open-minded. With reference to anxiety, open-minded subjects showed no discrepancy between their estimated and measured anxiety. Those with relatively

⁵³Ibid., p. 345.

⁵⁴Robert M. Frumkin, "Dogmatism, Social Class, Values and Academic Achievement in Sociology," The Journal of Educational Sociology, XXXIV (1961), 398-403.

⁵⁵C. Gratton Kemp, "Self-Perception in Relation to Open-Closed Belief Systems," The Journal of General Psychology, LXX (1964), 341-344.

closed-belief systems perceived their degree of anxiety very inaccurately.

In a series of recent investigations, Zagona and Zurcher⁵⁶ sought to determine the extent to which high dogmatic and low dogmatic individuals will demonstrate their characteristic action behavior in specially created social situations. Two extreme groups of high and low dogmatism (30 Ss each) were selected from a total distribution of 517 freshman and sophomore respondents at the University of Arizona. The two groups formed two sections in an introductory psychology class and their behavior was observed by the authors throughout a semester both in normal classroom and in small group settings. The authors derived several predictions from Rokeach's basic theory of the dogmatic personality. The results confirmed the predictions.

In the classroom, the high dogmatic individuals were observed to be leader-oriented. They showed preference for formal lectures and clearly structured topics and instructional situations. They were typically uncreative and routine-oriented. They were disturbed by the instructor's behavior

⁵⁶ Salvatore V. Zagona and Louis A. Zurcher, Jr., "Participation, Interaction and Role Behavior in Groups Selected From the Extremes of the Open-Closed Cognitive Continuum," The Journal of Psychology, LVIII (1964), 255-264; "The Relationship of Verbal Ability and Other Cognitive Variables to the Open-Closed Cognitive Dimension," The Journal of Psychology, LX (1965), 213-219; "Notes on the Reliability and Validity of the Dogmatism Scale," Psychological Reports, XVI (1965), 1234-1236.

when it did not conform to their expectations of the role behavior of an authority figure.

Similar observations were obtained in the experimental settings. The authors conclude that: "In general, the high dogmatics behaved as high dogmatics would be expected to, as did the low dogmatics."⁵⁷

In summary, the formulation of the belief system theory has stimulated a great deal of research. The few studies reviewed here present substantial evidence to the validity of the theoretical framework and the validity of the measuring instrument.

As far as the writer knows, there is only one study reported in which the relationship of a student's belief system to the type of curricula he is pursuing was investigated. In his attempt to evaluate the impact of a specific curricula on personality changes among college students, Plant⁵⁸ administered the Dogmatism Scale along with other measures to two freshman groups: (1) those who elected to enroll in a special humanities program and (2) those who followed the regular education program at San Jose State College. Both groups were retested two years later. Although both groups changed significantly toward decreased dogmatism,

⁵⁷Ibid., p. 1236.

⁵⁸Walter T. Plant, "Longitudinal Evaluation of Non-intellectual Changes Associated With a Special Two-Year Humanities Program," Psychological Report, XV (1964), 225-226.

the Humanities group had the larger net gain. Plant interprets these results to indicate that:

. . . there are non-intellectual changes associated with college enrollment for initially highly promising students, and that seemingly, greater change is associated with enrollment in the Humanities program.⁵⁹

Summary of Related Research

Two types of research studies were reviewed in this chapter: (1) studies dealing with the relationship between a student's choice of a field of study and his politico-social beliefs and attitudes, and (2) studies conducted within the framework of Rokeach's belief system theory.

Investigations dealing with college curricula and students' beliefs and attitudes furnish convincing evidence of measurable attitude and belief differences among students pursuing different fields of study. Although the findings of these studies are not consistent, the majority, however, show that social science and humanities students tend to be more liberal in their beliefs and attitudes than those majoring in natural science and applied fields.

A large body of research has accumulated to support the validity of the belief system construct and the validity of its measuring instrument, the Dogmatism Scale. These research studies indicate that the individual's cognitive

⁵⁹Ibid., p. 226.

structure of the belief-system is related to critical thinking, problem solving, perceptual analysis, learning, values, behavioral change, and self-perception.

CHAPTER III

PROCEDURE

Sampling

The population of interest for the study consists of students majoring in different fields of study at the University of Oklahoma. The fields of study are grouped under four general areas: Social Science, Humanities, Natural Science, and Business and Engineering. To obtain a representative sample of students from each area, a stratified random sample of required courses was drawn in each of the four areas listed in the Class Schedule for the Fall Semester of 68-69. Courses were stratified by classifying them into three-number categories: courses number 1 to 100, courses number 101 to 200, and courses number 201 to 300. The above procedure was followed to insure better representation of the three category-levels, which is defined in Chapter I as: (1) students who have completed 1 to 5 credit hours in their majors, (2) students who have completed 6 to 18 credit hours in their majors, and (3) students who have completed more than 18 credit hours in their majors.

In each category courses were serially numbered and four numbers were randomly drawn, with the exception of the Engineering and Business category where five courses were drawn. This is because the enrollments in Engineering courses were small. A total of 13 courses were selected. The random selection was done by using a table of random numbers.¹

Instructors of the courses selected were contacted and all agreed to permit the administration of the Questionnaire to students during the regular class period. The number, title, and description of the courses along with the number of students who responded to the Questionnaire in each class are shown in Table II.

A total of 677 students responded to the Questionnaire. By initial checking 74 were eliminated. These were either graduate students, non-degree students, students who had not decided on a major or whose major was outside the defined area, or students who had not given sufficient information. Additional diagnosis showed that there were 34 students with double major across areas. These were also eliminated. The remainder totaled 569 subjects. Their distribution among the various categories is illustrated in Table III.

¹Allen Edwards, Statistical Analysis, (New York: Holt, Rinehart, and Wilson, Inc., 1958), p. 246.

TABLE II
NUMBER, TITLE AND DESCRIPTION OF COURSES AND
THE NUMBER OF RESPONDENTS IN EACH COURSE

Department and Course Number	Description	Sec.	Number of Respondents
Business Law 140	Contract Agency	2	70
Engineering 21	Intro. Engineering	8	38
Engineering 144	Engineering Analysis	5	25
Petroleum Engineering 257	Oil and Gas Law	1	18
Philosophy 3	Intro. to Logic	3	42
Speech 125	Oral Interpretation	2	34
English 221	Chaucer	1	45
Physics 51	General Physics	3	60
Zoology 112	Human Physiology	1	82
Mathematics 269	Tensor and Vector Analysis	1	51
Anthropology 110	Native People of the World	1	63
Political Science 1	Government of the United States	7	106
Sociology 201	Contemporary Social Thought	1	43
Total number of respondents			677

TABLE III

DISTRIBUTION OF THE SAMPLE BY MAJOR AREA AND LEVEL

LEVEL	M A J O R A R E A				TOTAL
	Social Science	Humanities	Natural Science	Engineering & Business	
I (1-5 C.H.*)	43	39	37	55	174
II (6-18 C.H.)	42	34	40	61	177
III (>18 C.H.)	38	48	57	75	218
Total	123	121	134	191	569

*Credit Hours

Since the statistical design of the study called for a 3×4 factorial design, it was necessary to have equal numbers of cases in the cells.² The smallest group in Table III is the Humanities Majors, Level II. This category included 34 respondents, and served as the maximum number in each cell.

In order to draw an equal number in each cell, cases in each group were serially numbered and randomly selected until an $n=34$ was obtained for each category. This is done by the use of a table of random numbers.³ With twelve cells,

²Kerlinger, 1967, op. cit., p. 333.

³Edwards, 1958, op. cit., p. 246.

a total of 408 cases were obtained which represented the net total of the sample. Table IV illustrates the distribution of the sample among the twelve categories.

TABLE IV
DISTRIBUTION OF THE SAMPLE AMONG CELLS

LEVEL	M A J O R A R E A				TOTAL
	Social Science	Humanities	Natural Science	Engineering & Business	
I	Cell #1 n=34	Cell #2 n=34	Cell #3 n=34	Cell #4 n=34	136
II	Cell #5 n=34	Cell #6 n=34	Cell #7 n=34	Cell #8 n=34	136
III	Cell #9 n=34	Cell #10 n=34	Cell #11 n=34	Cell #12 n=34	136
Total	102	102	102	102	408

The distribution of the sample by major within each area is illustrated in Table V.

Instrument

The instrument used in the study was Rokeach's Dogmatism Scale, Form E. This instrument is specifically designed and validated to assess the degree of openness and closedness of a person's belief system. It was developed deductively, by studying the characteristics of open and closed belief systems and constructing items which tap

TABLE V
DISTRIBUTION OF THE SAMPLE BY MAJOR WITHIN EACH AREA

A. Social Science						
Sociology	Political Sci.	Anthropology	Psychology	Total		
46	21	19	16	102		
B. Humanities						
English	History	M. Language	Speech	Philo.	F. Arts	Total
34	20	11	13	7	17	102
C. Natural Science						
Math.	Physics	Biology	Chemistry	Pre-Med.	Zoology	Total
34	10	6	23	13	16	102
D. Engineering						
Elect.	Petrol.	Mech.	Aerospace	Civil	Chem.	Total
13	13	7	9	4	5	51
E. Business						
Market.	Bus.Admins.	Manag.	Econ.&Stat.	Finan.	Acct.	Total
5	13	8	6	2	13	51

these characteristics. The purpose of the instrument is to measure "individual differences in openness and closedness of belief systems." It also serves "to measure general authoritarianism and general intolerance."⁴

The Dogmatism Scale is broadly based. The assumption underlying the construction of its items is that they should be general and free of specific ideological content.⁵ It contains statements dealing with egocentricity, defense against outside threats, insecurity and self-hate, the need for a framework with which to face the outside world, and identification with absolute authority.⁶

Form E of the Dogmatism Scale contains 40 items. Subjects are asked to respond to each statement indicating their agreement or disagreement on a six-point scale ranging from -3 to +3, with no zero point. For scoring purposes the scale is converted to 1-to-7 scale by adding a constant 4 to each statement score. The total score is the sum of the scores on all items. Scores range from 40 to 280; a high score indicating an extreme closed-belief system and a low score representing an open-belief system. High scorers are considered to be closed to new ideas and dogmatic; low

⁴Rokeach, 1960, op. cit., pp. 71-72.

⁵Ibid., pp. 71-80.

⁶Phillip E. Vernon, Personality Assessment: A Critical Survey, (New York: John Wiley and Sons, Inc., 1964), p. 275.

scorers are considered to be adaptive, flexible, and receptive to new ideas.⁷

Rokeach reported several reliability studies using both split-half and test-retest techniques.⁸ These studies yielded coefficients ranging from .68 to .93, with a median of .74. A recent reliability study by Zagona and Zurcher, with a sample of 517 respondents using the test-retest technique for a fifteen-week interval, "substantiates reliability studies by Rokeach with the other sample."⁹

Item analysis of the scores of subjects in the upper and lower quarter show that, ". . . high and low dogmatic subjects differ constantly and in a statistically significant manner on the great majority of the items."¹⁰ Zagona and Zurcher¹¹ reported correlations of .506 and .464 for the highest one-third and the lowest one-third of their sample, respectively. This indicates no great disparity in reliability when comparing high dogmatics with low dogmatics.

Three types of validity were reported for the Dogmatism Scale. It showed good construct validity by correlating highly with the California F Scale and the

⁷Rokeach, 1960, op. cit., Chapter 5.

⁸Ibid., pp. 89-91.

⁹Zagona and Zurcher, 1965, op. cit., p. 1235.

¹⁰Rokeach, 1960, op. cit., p. 90.

¹¹Zagona and Zurcher, 1965, op. cit., p. 1235.

California E Scale, two measures of authoritarianism and ethnocentrism. Rokeach¹² in 1956 reported two studies on English workers and English college students which demonstrate significant correlations between the three scales as shown in Table VI.

TABLE VI
INTERCORRELATIONS BETWEEN THE DOGMATISM SCALE,
CALIFORNIA F SCALE, AND THE ETHNOCENTRISM
SCALE (ENGLISH SUBJECTS)

Group	N	D, F	F, E	D, E
English Workers	60	.77	.56	.53
English Colleges	80	.62	.62	.32

Plant¹³ in 1960 replicated Rokeach's work with larger samples of American college students and obtained similar results as shown in Table VII.

All correlations reported in Table VI and Table VII indicate that the Dogmatism Scale correlates more highly with the California F Scale than with the Ethnocentrism Scale.

Plant interprets this:

¹²Milton Rokeach, "Political and Religious Dogmatism: An Alternative to the Authoritarian Personality," Psychological Monographs, LXX (1956), No. 18 (whole No. 425).

¹³Walter Plant, "Rokeach's Dogmatism Scale As A Measure of General Authoritarianism," Psychological Report, XVI (1960), 164.

TABLE VII

INTERCORRELATIONS BETWEEN THE DOGMATISM SCALE,
CALIFORNIA F SCALE AND THE ETHNOCENTRISM
SCALE (AMERICAN COLLEGE STUDENTS)

Group	N	D,F	F,E	D,E
SJSC* Freshmen, Males	1007	.75	.65	.57
SJSC Freshmen, Females	1343	.70	.70	.61

*San Jose State College

. . . as support of Rokeach's contention that the Dogmatism Scale is less loaded with prejudice than is the California F Scale, and as an indication that the Dogmatism Scale is a better measure of general authoritarianism than the California F Scale.¹⁴

Concurrent validity had been established through the use of "Known Group Method." Rokeach reported two validating studies using this method. In the first study he asked a group of college professors to select graduate students whom they judged to be open- or closed-minded. When the Dogmatism Scale was administered to the two groups it failed to differentiate between them. In the second study, he used graduate students in psychology as judges to select from among their friends persons whom they considered open- and closed-minded. The test successfully differentiated the two groups.¹⁵

¹⁴Ibid., p. 164.

¹⁵Rokeach, 1960, op. cit., Chapter 5.

Further validation of the instrument by the use of "Known Groups Method" was performed by the comparison of different political and religious groups. As predicted, Catholics and Communists scored significantly higher than Protestants and liberals. Rokeach interprets these findings as support of the validity of the Scale as a measure of general intolerance.¹⁶

A number of studies by Rokeach and his co-workers have demonstrated a relationship between dogmatism as revealed by the dogmatic scores and some cognitive processes such as memory and problem solving, perceptual analysis, and prejudice and attitude change.¹⁷ Kerlinger comments that:

While the results of these studies were not clear-cut, they furnished evidence of the validity of Rokeach's theoretical derivations and the validity of the 'D' measure.¹⁸

The construct validity of the Dogmatism Scale was further confirmed by the findings of a recent study reported by Zagona and Zurcher. The writers selected thirty highest scorers and thirty lowest scorers from a distribution of 517 scorers on the D Scale. On the basis of Rokeach's theory of the dogmatic personality, the authors made several predictions about the behavior of the two groups. In a semester-long observation and in small group experiments, each of the

¹⁶Ibid., Chapter 6.

¹⁷Rokeach, 1960, op. cit., Chapters 8, 10, 14, and 18.

¹⁸Kerlinger, 1967, op. cit., p. 453.

predictions was supported. With minor exceptions, "the high dogmatics behaved as high dogmatics would be expected to, so did the low dogmatics."¹⁹

Content validity was logically developed within each statement on the scale.

Method of Collecting the Data

The method in which the data were collected was by administering the Questionnaire to the subjects while meeting in their regular classes. The first step taken was to contact each instructor of the thirteen classes selected to ask permission in using part of the class time for the administration of the Questionnaire. All the instructors responded positively, and a schedule was worked out for the administration of the test.

The Questionnaire was administered by the researcher in all classes, with the exception of one class which had a conflict in scheduling. In this one class the questionnaire was administered by the instructor of the class, who was briefed on the standard procedures followed in the other classes. All respondents were able to complete the instrument within the first thirty minutes of the class period.

The questionnaire was titled A Survey of Student Opinion, and consisted of two parts. Part one included ten questions soliciting personal and background information

¹⁹Zagona and Zurcher, 1965, op. cit., p. 1236.

(see Appendix B). Part two contained all the 40 items of the Dogmatism Scale, Form E, and was titled Personal Opinion Survey (see Appendix B). An attached cover letter explained the general purpose and gave some information about the study.

At the presentation of the questionnaire, the researcher introduced himself and gave a brief statement asking the cooperation of the students in filling in the questionnaire and explained the standard instruction of the scale. All students present completed the questionnaire with the exception of one student. To insure unbiased responses, the students were not told the name and the exact nature of the scale until they had completed the questionnaire. In accordance with the recommendation of the scale's author, no names nor information which might reveal identity were required.

Treatment of Data

Upon receipt of all data, initial checking was made to eliminate cases which did not qualify as explained earlier. This included 108 out of 677 cases. The remainder, 569 cases, were classified in terms of the twelve assigned categories. The number in each category was equalized in the manner described earlier. This called for 408 cases which represented the net total of the sample.

Each subject's response was hand scored and the total score was summed by the use of a desk calculator. A double check was made by the investigator and an assistant.

The study has postulated two "independent variables,"* Major and Level (number of credit hours completed in the major), interacting with the "dependent variable" (Dogmatism). This called for a factorial analysis of variance design.²⁰

Since there are four Major Areas with three Levels in each Major, a 4 x 3 factorial design was necessary. The main effect for Major was determined by the "F"-ratio for among Majors. The main effect of Level was determined by the "F"-ratio for among Levels. The "F"-ratio for Major x Level determined if there is a joint effect of the two variables. Since the two "independent variables" are assigned variables, the error term used for all three "F" ratios was the within-groups mean square.²¹

In order to test significant differences between individual means after the "F"-test, Tukey's method for multiple comparison of means was employed. This method is more conservative than the "t"-test since the error rate is determined on the basis of the experiment as a whole rather than on the basis of individual comparison as is the case in the "t"-test. This would reduce the probability of

*Not truly independent variables in the experimental sense. Both variables are fixed variables and, therefore, they cannot be manipulated or randomly assigned.

²⁰Kerlinger, 1967, op. cit., Chapter 12.

²¹J. P. Guilford, Fundamental Statistics in Psychology and Education, (New York: McGraw-Hill Book Company, 1965), p. 292.

finding significant differences when they actually are not significant.²²

Tukey's procedures are based on what is called a "layer method." Means are arranged from low to high. A first test is performed to the two extreme values. If the difference turns out not to be significant, no further comparisons are made. If it turns out to be significant, then the next extreme values are compared and so on. The size of difference required for significance varies with the rank order of the compared means; the farther the rank the larger the size of difference required for significance. Pearson and Hartley have produced probability distribution tables of the "studentized range" that permit the comparison of up to 20 means in a group at either the 5 per cent or 1 per cent level.²³ The specific computational procedures of Tukey's method are described in Appendix C.

²²Tukey's method is described in detail in Thomas A. Ryan, "Multiple Comparisons in Psychological Research," Psychological Bulletin, 56 (1959), No. 1, pp. 26-47. Ryan argues at length and rather convincingly against the use of "t" after "F". He describes alternative tests and among them he prefers Tukey's methods "because of convenience, because of their control of experiment-wise error rate for all null hypotheses, and because of their special suitability for simple comparisons of means," p. 41.

²³E. S. Pearson and H. O. Hartley, Biometrika Tables for Statisticians, Vol. I, (Cambridge: Cambridge University Press, 1962), pp. 176-177.

CHAPTER IV

RESULTS AND DISCUSSION

Belief System as Related to Sex

For the purpose of determining if there is any significant sex differences, initial comparisons were made in the total group and in each area of Social Science, Humanities, and Natural Science. The Business and Engineering group included only three girls, and no comparison was made. The statistical method used for the comparisons was the "t"-test for noncorrelated groups.¹ The comparison and the results of statistical analysis for the total group is presented in Table VIII.

It may be observed from Table VIII that there is no significant difference in dogmatism as measured by the D-Scale between male and female students. Comparisons between the two sexes in each area of Social Science, Humanities and Natural Science also revealed no significant sex difference. Tables IX, X, and XI present the comparisons and the results of the statistical analysis.

¹Guilford, 1965, op. cit., p. 184.

TABLE VIII

MEANS, STANDARD DEVIATIONS, AND t-VALUE COMPARISON
OF THE TOTAL MALES AND FEMALES ON THE D-SCALE

	Male	Female	"t"	P
N	175	131		
M	146.9314	141.8015	1.7995	N.S.*
SD	23.2194	25.4362		

TABLE IX

MEANS, STANDARD DEVIATIONS, AND t-VALUE COMPARISON
OF MALE AND FEMALE SOCIAL SCIENCE MAJORS

	Male	Female	"t"	P
N	53	49		
M	143.8490	137.1224	1.2507	N.S.*
SD	27.2248	26.5337		

TABLE X

MEANS, STANDARD DEVIATIONS, AND t-VALUE COMPARISON
OF MALE AND FEMALE HUMANITIES MAJORS

	Male	Female	"t"	P
N	46	56		
M	145.8043	142.5714	.6745	N.S.*
SD	18.7442	28.8803		

*Not significant at the .05 level.

TABLE XI

MEANS, STANDARD DEVIATIONS, AND t-VALUE COMPARISON
OF MALE AND FEMALE NATURAL SCIENCE MAJORS

	Male	Female	"t"	P
N	76	26		
M	149.7631	144.8076	.8294	N.S.*
SD	22.7703	26.8261		

*Not significant at the .05 level.

It is clear from Tables IX, X and XI that no "t"-ratio revealed any significant sex difference in dogmatism as measured by the D-Scale. Thus, it was concluded that sex is an unimportant variable in this study, and, in subsequent analyses, both male and female subjects were treated jointly.

Belief System as Related to Major Area

The research hypothesis of this study predicts significant differences in belief system between Social Science and Humanities students and Natural Science and Business and Engineering students. Social Science and Humanities students were predicted to be more open in their belief systems (less dogmatic), and Natural Science and Business and Engineering students were predicted to be more closed in their belief systems (more dogmatic). In order to test the research hypothesis, nine null hypotheses were

developed for testing differences between Majors, between Levels (defined by the number of credit hours a student has completed in his major), and interaction between Major and Level. Hypothesis 1 tests for difference between Majors; hypothesis 2 tests for difference between Levels; hypotheses 3 through 5 test for difference between Majors within Levels; and hypotheses 6 through 9 test for differences between Levels within Majors.

A two-way analysis of variance was used as the statistical test for treatment of data. Tukey's procedures (see Appendix C) were used to test significant differences between each pair of means after "F".

Table XII presents a summary of analysis of variance results.

TABLE XII
SUMMARY OF ANALYSIS OF VARIANCE FOR TESTING MAIN
EFFECT FOR MAJOR, LEVEL, AND INTERACTION

Source	df	S.S.	M.S.	"F"*	P
Between Majors	3	10,711.8895	3570.6298	6.6357	<.01
Between Levels	2	15,704.5637	7852.2818	14.5969	<.01
Interaction	6	4,338.6319	723.1052	1.3461	N.S.**
Within Groups	396	213,018.7949	537.9262	---	---
Total	407	243,773.8800			

*The error term used for all three "F"s is the within-groups mean square. This is because there is a fixed model with all categories assigned (Guilford, 1964, p. 292).

**Not significant at the .05 level.

A. An Overall Difference Among Majors

Null hypothesis 1: There is no statistically significant difference in dogmatism as measured by the D-Scale between Social Science, Humanities, Natural Science, and Business and Engineering students.

The obtained "F"-score for difference between majors is 6.6357, and it is significant at the .01 level. Therefore, the null hypothesis is rejected and the alternative hypothesis, that of a statistically significant difference, is accepted. The mean and the standard deviations for each group are given in Table XIII.

TABLE XIII

MEANS AND STANDARD DEVIATIONS OF SOCIAL SCIENCE,
HUMANITIES, NATURAL SCIENCE, AND BUSINESS AND
ENGINEERING STUDENTS ON THE D-SCALE

	Social Science	Humanities	Natural Science	Business & Engineering
M	140.676	145.127	148.559	154.706
SD	27.178	21.204	23.883	22.941

There are four means, making a possible combination of 6 pairs. To determine significant difference between each pair, Tukey's test for multiple comparison of means was used (see Appendix C). The results of the comparisons are given in Table XIV.

TABLE XIV

TUKEY'S TEST FOR COMPARISON BETWEEN MEANS OF SOCIAL SCIENCE,
HUMANITIES, NATURAL SCIENCE, AND BUSINESS AND ENGINEERING
STUDENTS ON THE DOGMATISM SCALE

	M	d ⁽¹⁾	s ⁽²⁾	SR ⁽³⁾	WSD ⁽⁴⁾	P ⁽⁵⁾
Business & Engineering	154.706					
Social Sci.	140.676	14.030	2.296	4.600	10.563	<.01
Business & Engineering	154.706					
Humanities	145.127	9.479	2.296	3.360	7.716	<.05
Natural Sci.	148.559					
Social Sci.	140.676	7.883	2.296	3.360	7.716	<.05
Business & Engineering	154.706					
Natural Sci.	148.559	6.147	2.296	2.830	6.430	N.S.*
Humanities	145.127					
Social Sci.	140.676	4.451	-	-	-	N.S.*
Natural Sci.	148.559					
Humanities	145.127	3.432	-	-	-	N.S.*

*Not significant at the .05 level.

(1) d=The difference between the two means.

(2) s=The standard error for individual means. It is computed from the square root of "mean square for error" divided by the square root of "a", where "a" is the number of cases upon which each mean is based (Ryan, 1959, p. 45).

(3) SR=Percentage point of the studentized range as read from the table.

(4) WSD=The product of multiplying s x SR. It determines the significance of individual comparisons.

(5) P=Probability.

These symbols are used throughout.

From Table XIV the following results are obtained:

- (1) There is a statistically significant difference ($p. < .01$) in dogmatism as measured by the D-Scale between Social Science and Business and Engineering students. Social Science students have a significantly lower mean than Business and Engineering students. This is interpreted to indicate that Social Science majors are less dogmatic in their belief systems than Business and Engineering majors.
- (2) There is a statistically significant difference ($p. < .01$) in dogmatism as measured by the D-Scale between Humanities students and Business and Engineering students. Humanities students have a significantly lower mean than Business and Engineering students. It is inferred that Humanities students tend to be less dogmatic in their belief systems than Business and Engineering students.
- (3) This is a statistically significant difference ($p. < .05$) in dogmatism as measured by the D-Scale between Social Science and Natural Science students. Social Science majors have a significantly lower mean than Natural Science majors. The results may be interpreted to indicate that Social Science students are less

dogmatic in their belief systems than Natural Science students.

- (4) No statistically significant difference was found between Business and Engineering students and Natural Science students; Humanities and Natural Science students; and Social Science and Humanities students.

B. Difference Among Levels for All Majors Combined

Null hypothesis 2: There is no significant difference in dogmatism as measured by the D-Scale between Level I, II, and III for all groups combined. Table XV gives an "f"-score of 14.5969 for difference between Levels. This value was found to be significant at the .01 level. Therefore, the null hypothesis is rejected and the alternative hypothesis that of a statistically significant difference, is accepted. The mean and the standard deviations for each level are given in Table XV.

TABLE XV

MEANS AND STANDARD DEVIATIONS IN THE D-SCALE
FOR LEVELS I, II, AND III OF ALL MAJORS

	Level I	Level II	Level III
M	155.868	144.470	141.463
SD	23.942	21.888	24.995

Test of significance between each pair of means is given in Table XVI.

TABLE XVI
TUKEY'S TEST FOR COMPARISON BETWEEN MEANS
OF LEVELS I, II, AND III OF ALL MAJORS

Level*	M	d	s	SR	WSD	P
Level I	155.868					
Level III	141.463	14.405	1.9887	4.120	8.1934	<.01
Level I	155.868					
Level II	144.470	11.398	1.9887	3.640	7.2388	<.01
Level II	144.470					
Level III	141.468	3.013	1.9887	2.770	5.5086	N.S.

*A Level is defined by the number of credit hours a student has completed in his major.

From Table XVI the following results are obtained:

- (1) There is a statistically significant difference ($p. < .01$) in dogmatism as measured by the D-Scale between Level I and Level III students. Level I students have been defined as those who have completed less than six credit hours in their majors and Level III students have been defined as those with more than eighteen credit hours in their majors completed. Level III students have a significantly lower mean than Level I students. This is interpreted to

indicate that Level III students are less dogmatic in their belief systems than Level I students.

- (2) There is a statistically significant difference ($p. < .01$) in dogmatism as measured by the D-Scale between Level I and Level II students. Level II students have been defined as those who have completed from 6 to 18 credit hours in their majors. Table XVI shows that these students have a significantly lower mean indicating less dogmatism in their belief systems than Level I students.

- (3) There is no statistically significant difference between Level II and Level III students.

To summarize, differences between levels indicate that Level II and III students are less dogmatic in their belief systems than students in Level I. There is no significant difference between Level II and Level III students.

C. Differences Among Majors Within Levels

The null hypotheses 3 through 5 predice no significant difference among Majors within each Level. In order to test these hypotheses, each mean was compared with the other mean in the same Level. There are four means in each Level, making a possible combination of six pairs. Table XVII gives the means and the standard deviations for the four Majors at Level I, and Table XVIII gives the comparison results.

TABLE XVII

MEANS AND STANDARD DEVIATIONS OF LEVEL I SOCIAL SCIENCE,
HUMANITIES, NATURAL SCIENCE, AND BUSINESS AND
ENGINEERING STUDENTS ON THE D-SCALE

	Social Science	Humanities	Natural Science	Business & Engineering
M	152.559	149.970	157.294	163.647
SD	26.700	21.047	23.573	21.751

TABLE XVIII

TUKEY'S TEST FOR COMPARISON BETWEEN MEANS OF LEVEL I SOCIAL
SCIENCE, HUMANITIES, NATURAL SCIENCE, AND BUSINESS
AND ENGINEERING STUDENTS ON THE D-SCALE

	M	d	s	SR	WSD	P
Business & Engineering	163.647					
Humanities	149.970	13.677	3.9775	3.820	15.2736	N.S.*
Business & Engineering	163.647					
Social Sci.	152.559	11.088				N.S.
Natural Sci.	157.294					
Humanities	149.970	7.324				N.S.
Business & Engineering	163.647					
Natural Sci.	157.394	6.353				N.S.
Natural Sci.	157.394					
Social Sci.	152.559	4.753				N.S.
Social Sci.	152.559					
Humanities	149.970	2.589				N.S.

*Not significant at the .05 level.

Table XVIII clearly indicates that there is no significant difference between the means of the four groups. The computed difference for each of the six pairs of means did not reach the .05 level of significance, thus failing to reject null hypothesis number 3 of no significant difference.

Comparison of the means of the four Major groups at Level II also showed no significant difference. The results of the comparison are included in Table XIX. The computed difference between each of the six pairs of means did not reach the .05 level of significance, thus failing to reject null hypothesis number 4, which predicts no significant difference.

The comparison of the four group means at Level III showed a significant difference at the .05 level between Social Science and Business and Engineering students and between Social Science and Humanities students. No significant difference was found between Social Science and Natural Science students; Natural Science and Humanities students; Natural Science and Business and Engineering students; and Humanities and Business and Engineering students. Table XX contains the relevant results. On the basis of these results, hypothesis number 5 was rejected.

It is interesting to note that while no overall significant difference between Social Science and Humanities majors was found, the two groups differed significantly at Level III, with the Social Science group having a

TABLE XIX

TUEKEY'S TEST FOR COMPARISON BETWEEN MEANS OF LEVEL II SOCIAL
SCIENCE, HUMANITIES, NATURAL SCIENCE, AND BUSINESS
AND ENGINEERING STUDENTS ON THE D-SCALE

Major	M	d	s	SR	WSD	P
Business & Engineering	152.147					
Humanities	138.618	13.529	3.9775	3.82	15.2736	N.S.*
Business & Engineering	152.147					
Social Sci.	139.120	13.027				N.S.
Natural Sci.	148.000					
Humanities	138.618	9.382				N.S.
Natural Sci.	148.000					
Social Sci.	139.120	8.880				N.S.
Business & Engineering	152.147					
Natural Sci.	148.000	4.147				N.S.
Social Sci.	139.120					
Humanities	138.618	0.502				N.S.

*Not significant at the .05 level.

significantly lower mean score. At Levels I and II, however, the Humanities group had lower but not significantly different means from those of the Social Science group.

To summarize, no significant difference was found between the four group Majors at Levels I and II. At Level III, the Social Science group had significantly lower

TABLE XX

TUKEY'S TEST FOR COMPARISON BETWEEN MEANS OF LEVEL III SOCIAL
SCIENCE, HUMANITIES, NATURAL SCIENCE, AND BUSINESS
AND ENGINEERING STUDENTS ON THE D-SCALE

Major	M	d	s	SR	WSD	P
Business & Engineering	148.323					
Social Sci.	130.353	17.970	3.9775	3.820	15.2736	<.05
Humanities	146.794					
Social Sci.	130.353	16.441	3.9775	3.470	13.8018	<.05
Natural Sci.	140.382					
Social Sci.	130.353	10.029	3.9775	3.470	13.8018	N.S.*
Business & Engineering	148.323					
Natural Sci.	140.382	7.931				N.S.
Humanities	146.794					
Natural Sci.	140.383	6.411				N.S.
Business & Engineering	148.328					
Humanities	146.794	1.529				N.S.

*Not significant at the .05 level.

dogmatism scores than either the Humanities or Business and Engineering groups. No other comparisons were significant.

D. Difference Among Levels Within Majors

Null hypotheses 6 through 9 tested for significant differences between levels within each Major. Means of Levels I, II, and III in each major were compared yielding the following results:

(1) Social Science Group. Table XXI gives the mean comparison results for the Social Science Group at the three Levels. There is a statistically significant difference between Levels I and III ($p. < .01$) and between Levels I and II ($p. < .05$). There is no significant difference between Levels II and III. On the basis of these results, Null Hypothesis 6, which predicts no significant differences among the three Levels, was rejected.

TUKEY'S TEST FOR COMPARISONS OF MEANS OF LEVELS I,
II, AND III SOCI ON THE D-SCALE

Level	M	d	SR	WSD	P
I	152.559				
III	130.353	22.226	3.9775	4.450	17.6998
					$< .01$
I	152.559				
II	139.120	13.439	3.9775	2.880	11.4552
					$< .05$
II	139.120				
III	130.353	8.767	3.9775	2.880	11.4552
					N.S.

(2) Humanities Group. Results of mean comparisons for the Humanities group at the three Levels revealed no significant difference, thus failing to reject Null Hypothesis number 7 of no significant difference. Table XXII contains the relevant data.

(1) Social Science Group. Table XXI gives the mean comparison results for the Social Science Group at the three Levels. There is a statistically significant difference between Levels I and III ($p. < .01$) and between Levels I and II ($p. < .05$). There is no significant difference between Levels II and III. On the basis of these results, Null Hypothesis 6, which predicts no significant differences among the three Levels, was rejected.

TABLE XXI

TUKEY'S TEST FOR COMPARISONS BETWEEN MEANS OF LEVELS I, II, AND III SOCIAL SCIENCE MAJORS ON THE D-SCALE

Level	M	d	s	SR	WSD	P
I	152.559					
III	130.353	22.226	3.9775	4.450	17.6998	$< .01$
I	152.559					
II	139.120	13.439	3.9775	2.880	11.4552	$< .05$
II	139.120					
III	130.353	8.767	3.9775	2.880	11.4552	N.S.

(2) Humanities Group. Results of mean comparisons for the Humanities group at the three Levels revealed no significant difference, thus failing to reject Null Hypothesis number 7 of no significant difference. Table XXII contains the relevant data.

TABLE XXII

TUKEY'S TEST FOR COMPARISONS BETWEEN MEANS OF LEVELS I,
II, AND III HUMANITIES MAJORS ON THE D-SCALE

Level	M	d	s	SR	WSD	P
I	149.970					
II	138.618	11.352	3.9775	3.470	13.8015	N.S.
III	146.794					
II	138.618	8.175				N.S.
I	149.970					
III	146.794	3.176				N.S.

(3) Natural Science Group. The mean comparisons of the Natural Science group at the three Levels revealed only one significant difference between Levels I and III ($p. < .05$). No significant differences were found between Levels I and II and between Levels II and III. The results of the comparisons are included in Table XXIII. Since only one out of three comparisons was found to be statistically significant, Null Hypothesis 8 predicting no significant differences among the three Levels was rejected.

(4) Business and Engineering. Results of mean comparisons of the Business and Engineering group showed that there is a significant difference between Level I and III and between I and II. Both were significant at the .05 level. There is no significant difference between Level II and III. Table XXIV illustrates the results. On the basis of these results, Null Hypothesis 9, which predicts no significant difference, was rejected.

TABLE XXIII

TUKEY'S TEST FOR COMPARISON BETWEEN MEANS OF LEVELS I,
II, AND III NATURAL SCIENCE GROUP ON THE D-SCALE

Level	M	d	s	SR	WSD	P
I III	157.294 140.382	16.912	3.9775	3.470	13.8019	<.05
I II	157.294 148.000	9.294	3.9775	2.880	11.4552	N.S.
II III	148.000 140.382	7.618				N.S.

TABLE XXIV

TUKEY'S TEST FOR COMPARISONS BETWEEN MEANS OF LEVELS I, II,
AND III BUSINESS AND ENGINEERING GROUP ON THE D-SCALE

Level	M	d	s	SR	WSD	P
I III	163.647 148.323	15.324	3.9775	3.470	13.8019	<.05
I II	163.647 152.147	11.500	3.9775	2.880	11.4552	<.05
II III	152.147 148.323	3.824	3.9775	2.880	11.4552	N.S.

Summary of the Results

The results of this study can be summarized as follows:

- (1) There is a significant difference in dogmatism as measured by the D-Scale between Social Science, Humanities,

Natural Science, and Business and Engineering students. The Social Science group has significantly lower dogmatism scores when compared with Natural Science and Business and Engineering groups, but there is no significant difference when compared with the Humanities group. The Humanities group has a significantly lower dogmatism score when compared with the Business and Engineering group, but no significant difference when compared with the Natural Science group. Natural Science and Business and Engineering groups did not differ significantly.

(2) There is a significant difference between Level I, II, and III for all groups combined. Level II and III were found to have significantly lower dogmatism scores than Level I ($p. < .01$). There is no significant difference between Level II and III.

(3) There were no significant differences among all groups at Level I.

(4) There were no significant differences among all groups at Level II.

(5) At Level III Social Science groups were found to have significantly lower scores than either Humanities or Business and Engineering groups. No significant differences were found in the other comparisons.

(6) Social Science Level II and Level III were found to have significantly lower dogmatism scores than

Level I ($p. < .05$, $p. < .01$, respectively). No significant difference between Social Science Level II and III was found.

(7) No significant differences were found between Level I, II, and III Humanities group.

(8) Natural Science Level III were found to have significantly lower dogmatism scores than Level I, but no significant difference between Levels I and II, and II and III was found.

(9) Business and Engineering Levels II and III were found to have significantly lower dogmatism scores than Level I, but no significant difference between Level II and III was found.

Discussion

The results of the investigation generally support the research hypothesis of the study, which predicts that Social Science and Humanities students are less dogmatic in their belief systems than Natural Science and Business and Engineering students. Social Science students were found to have significantly lower dogmatism scores than both Natural Science and Business and Engineering students. Humanities students were also found to have a significantly lower dogmatism score than Business and Engineering students, but not significantly different from Natural Science students.

The results also agree with the majority of previous research that compared students in different fields on a

liberal-conservative attitude dimension.² With some consistency, Social Science students came out as the most liberal, and applied fields students came out as the most conservative. Humanities and Natural Science majors were found to stand between the two extremes.

To recent studies which used the California F and E Scales and Rokeach's Dogmatism Scale found compatible results. Farewell, Warren, and McConnell³ found Engineering students to have significantly higher scores of the F-Scale than students majoring in other fields. Plant⁴ in a two-year longitudinal study found that students who followed a two-year Humanities program changed the most in the direction of decreased dogmatism, authoritarianism, and ethnocentrism as measured by the Dogmatism Scale and the California F and E Scales.

While no cause-effect relationship may be deduced from the results, some speculation about the direction of the results may be warranted. The fact that Social Science and Humanities students have significantly lower dogmatism scores may have something to do with the nature and

²Most of these studies are summarized in Bereiter and Freedman's Chapter "Fields of Study and People in Them" in N. Sanford, (ed.) The American College, Chapter 17, pp. 561-571.

³E. D. Farewell, J. R. Warren, and T. R. McConnell, op. cit., pp. 227-241.

⁴W. T. Plant, 1964, op. cit., pp. 225-226.

orientation of these fields. The goals of these fields are usually expressed in terms of normative rather than utilitarian dimension.⁵ Faculties in these fields were found to perceive of their roles in terms of both technical and moral functions. They wanted to affect their students cognitively as well as to change their beliefs and attitudes.^{6,7} Faculties in Natural Science saw their roles to "affecting students cognitively . . . changes other than this were seen undesirable or irrelevant."⁸ While the applicability of these findings to this study cannot be determined, they may suggest, however, that Social Science and Humanities students are exposed to more consistent efforts to affect their beliefs than students in the Natural Sciences and applied fields. Thus it seems reasonable to suppose that there is a self-selection process operating to discourage students with more "closed" belief systems from entering fields where their beliefs are challenged and sought to be changed.

In terms of role behavior theory, one can expect Social Science and Humanities students to be more sophisticated in their social beliefs and attitudes than their counterpart Natural Science and Business and Engineering students.

⁵Z. F. Gamson, op. cit., pp. 46-73.

⁶Ibid., p. 68.

⁷R. S. Vreeland and C. E. Bidwell, 1966, op. cit., pp. 237-254.

⁸Gamson, op. cit., p. 72.

Since the Dogmatism Scale is basically a measure of social beliefs and attitudes, students in Social Science and Humanities may be more familiar with the ideas expressed in the items of the Dogmatism Scale and consequently more able to discriminate among them than Natural Science and Business and Engineering students.

The drop in dogmatism between beginning and advanced students for all majors combined (Levels I and II, and I and III) may be attributed to: (1) further general maturation, (2) impact of the total college program, and (3) other cultural and social factors. But the fact that the largest drop in scores occurred in the Social Science group may suggest that greater decrease in dogmatism is associated with enrollment in the social science program.

CHAPTER V

SUMMARY, CONCLUSIONS, AND IMPLICATIONS

Summary

The purpose of this study was to compare the degree of "openness" and "closedness" of belief systems of college students majoring in different fields of study. Previous studies in the areas of students' beliefs and attitudes have indicated that students in certain fields of study tend to be more liberal, while students in other fields tend to be more conservative. But the primary concern of most of these studies has been the comparison of single beliefs and single attitudes with major emphasis on their contents.

The present study was conducted within the framework of Rokeach's belief system theory. This theory was constructed as a descriptive model to account for the underlying cognitive structure of all beliefs, without regard to their specific contents. A belief system refers to the total network of a person's religious-social-philosophic-scientific beliefs. It refers to the way in which the individual views the world he lives in. This definition is

comprehensive in its scope, and emphasizes the cognitive structure of all beliefs, irrespective to their contents.

The cognitive structure of a belief system is determined by its "openness" or "closedness." This refers to the degree of dogmatism in one's belief system. To the extent that a person is able to receive and evaluate information in terms of its intrinsic merits, he is said to have an "open" or less dogmatic belief system. To the extent that he rejects or resists information without regard to its intrinsic merits, he is said to have a "closed" or more dogmatic belief system.

The Dogmatism Scale was designed to measure the degree of openness and closedness of belief system. It was developed deductively by studying the characteristics of closed belief systems and constructing statements which tap these characteristics. The items were assumed to be general and relatively free of any specific ideological content. The continuing research has supported the reliability and validity of the Scale. Responses to the items included in the Scale are scored by the method of summated ratings, the higher the score, the greater the degree of "closedness."

Field of study was defined as the formal academic program which a student selects as his undergraduate major at the University of Oklahoma. Students majoring in different fields were grouped under four general areas: Social Science, Humanities, Natural Science, and Business and Engineering. Within each area students were divided into

three Levels: Level I were designated as the students who have completed from one to five credit hours in their majors; Level II are those who have completed between six to eighteen credit hours in their majors; and Level III are those who have completed more than eighteen credit hours in their majors.

On the basis of Rokeach's theory of belief system,¹ Getzels and Guba's descriptive model of social behavior,² and empirical research,³ the study predicted that Social Science and Humanities students are less dogmatic in their belief systems than Natural Science and Business and Engineering students. In order to test the basic research hypothesis of the study, nine null hypotheses were formulated, testing for significant difference between Areas, between Levels for all Areas combined, between Areas within Levels, and between Levels within Areas.

The sample for the study consisted of 408 students attending the University of Oklahoma during the Fall semester of 1968-69. They were given the Dogmatism Scale, Form E, along with a background information questionnaire while meeting in their regular classes.

¹Milton Rokeach, 1960, op. cit.

²J. W. Getzels and G. E. Guba, 1957, op. cit., pp. 423-434.

³Z. F. Gamson, 1966, op. cit., pp. 46-73; Bidwell and Vreeland, 1966, op. cit., 237-254.

Two-way analysis of variance with a 4 x 3 factorial design was used as the major statistical test. The F-ratios for difference between Areas and difference between Levels were both found to be significant at the .01 level. Tukey's test for multiple comparisons of means was used to determine significant difference between each pair of means. Out of 39 comparisons performed, 12 proved to be statistically significant and 27 were not significant.

Conclusions

From the results presented and within the limitations of the study, the following conclusions appear to be warranted:

(1) The findings generally support the basic research hypothesis that Social Science and Humanities students are less dogmatic in their belief systems than those majoring in Natural Science and Business and Engineering. The "F" test was found to be significant beyond the one per cent level of confidence. The mean comparison of each group with the other group has shown that the Social Science group had significantly lower dogmatism scores than did either the Natural Science group or the Business and Engineering group ($p. < .01$, and $p. < .05$, respectively). The Humanities group had significantly lower dogmatism mean scores than did the Business and Engineering group ($p. < .05$), but not significantly different from the Natural Science group.

(2) The difference among the groups appears to be related to the number of credit hours they have completed in their majors. When each group was compared with the other group at Levels I and II, no significant differences were found. At Level III, there were significant differences between the Social Science and the Business and Engineering groups and between the Humanities and the Social Science groups ($p. < .05$).

The validity of the findings can be supported by logical and theoretical explanation. From our present knowledge of the goals, content, and structure of major areas under study, we can expect that they differ in their relationship to such personality characteristics as dogmatism. Social Science and Humanities fields are oriented toward intellectual and academic pursuit more than toward vocational and practical application. In terms of social role theory, Social Science and Humanities students are expected to be more sophisticated in evaluating social ideas and beliefs and more tolerant toward differing social and political ideology than students in other fields.

(3) There is a decrease in dogmatism with advancement in college education. The "F"-ratio for comparison by Level was significant beyond the one per cent level of confidence.

(4) The largest drop in dogmatism appears to occur at the first years in college. The results indicated that

there were significant differences between Levels I and II, and I and III ($p. < .05$, and $p. < .01$, respectively). No significant difference between Levels II and III was found.

(5) Although there was significant decrease in dogmatism for all groups with more credit hours completed (Humanities group excluded), the largest mean difference was between the Social Science groups. This may suggest that greater change in dogmatism is associated with enrollment in Social Science fields.

Implications

It appears from the results of the present study that Social Science and Humanities fields are more positively correlated with open-belief system than the Natural Science and Business and Engineering fields. If belief systems exist in a vacuum, then this relationship may have little value. But if a belief system is a predisposition to action, and if it provides indications of how the whole personality of an individual is formed, as Rokeach's theory asserts, then we have an important information describing the interaction between personality and fields of study. The implication of such information for the goals and practices of higher education is very pertinent.

Open-mindedness, as a legitimate goal of higher education, can be enhanced when college education is seen, not as a matter of acquiring skills and information and

preparing for a profession or occupation, but, as a total experience which can help the individual to broaden his mind, to free himself from prejudice, and to give him a sense of identity. This implies that a basic core of liberal education courses should be integrated in the program of each student without regard to his area of specialization. The recent students' rebellions and unrest have pointed out how college education, especially at the big universities, is becoming more irrelevant to students' needs and developments.

An understanding of the ways different personality characteristics relate to different kinds of curricula would provide a sounder basis for selecting students and helping them find fields of study that are suitable to them. The knowledge of the personality characteristics of a particular student can be helpful in clarifying the related needs of the student and can provide a guide in helping him pursue the type of curriculum that would produce in him the most beneficial growth. The implication of this is that the prediction of a student's success in a particular field is sounder when it is derived from the knowledge of the whole range of the student's personality profile rather than from knowledge of aptitude measures alone.

Recommendations for Further Research

The results of the present study are of exploratory type and need to be further examined and refined in further research.

It would be of significance for a researcher to compare the belief systems of students majoring in the same fields at different types of colleges and in different regions. This would examine the question if there is a consistent pattern of belief systems among students majoring in the same field even though they are in different college environments.

It is equally meaningful for a researcher to examine the effect of various factors such as intelligence and socio-economic status on the belief systems of students in the same field. Analysis of covariance techniques, which could control these factors statistically, are very helpful.

An investigation of the belief systems of academically successful and unsuccessful students in different fields may yield useful results for educational counseling.

The question of change in open- and closed-mindedness as a function of a particular field of study can be determined by a longitudinal study similar to that reported by Plant,⁴ but focusing on the specific majors rather than on the total educational program.

⁴W. T. Plant, 1965, op. cit., pp. 247-287.

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APPENDICES

APPENDIX A

A Letter granting permission for the use
of the Dogmatism Scale, Form E

Michigan State University East Lansing Michigan 49823
Department of Psychology Olds Hall

August 8, 1968

Mr. Abdullah N. Sharie
524 Sooner Drive, Apt. A
Norman, Oklahoma 73069

Dear Mr. Sharie:

You certainly have my permission to use the Dogmatism Scale for research purposes. All you have to do is mimeograph it yourself with the instructions from The Open and Closed Mind (New York: Basic Books, 404 Park Avenue South, New York, New York 10016). May I suggest, however, that you mix up the items well and, if possible, pad them with a few items from any other scale that you care to choose. It doesn't matter what items you use to pad them with.

I certainly hope that you will furnish me with a copy of the results of your research.

Sincerely yours,

/signed/

Milton Rokeach
Professor

MR/mlh

APPENDIX B

A SURVEY OF STUDENT OPINION

Part I - Personal and Background Information

Part II - The Dogmatism Scale, Form E

THE UNIVERSITY OF OKLAHOMA

Norman, Oklahoma 73069

Fall, 1968

Dear Student:

The attached questionnaire, after completion by you, will be a very important part of the research I am conducting in partial fulfillment for the Ph.D. degree in Education at the University of Oklahoma. It is being administered to several student groups in different major areas here at the University.

The questionnaire is composed of two parts. Part I consists of several questions soliciting personal and background information. Part II contains a number of statements relating to some important social and personal issues. You are merely asked to indicate by a series of check marks an expression of your ideas and beliefs.

I am very grateful to you for the time and effort you have given to assist me in this research endeavor.

Very sincerely yours,

/signed/

Abdullah N. Sharie

A SURVEY OF STUDENT OPINION

Part I - Personal and Background Information

Please write the answer or check the number on the left margin which corresponds to the correct answer.

I. Please list your:

A. Major(s)?

B. Minor(s)?

II. Please indicate the number of credit hours you have completed:

A. In your Major(s)?

- ☐ 1. Less than 6 credit hours
- ☐ 2. Between 6 and 18 credit hours
- ☐ 3. More than 18 credit hours.

B. In your Minor(s)?

- ☐ 1. Less than 6 credit hours
- ☐ 2. Between 6 and 10 credit hours
- ☐ 3. More than 10 credit hours.

III. What is your classification?

- ☐ 1. Freshman
- ☐ 2. Sophomore
- ☐ 3. Junior
- ☐ 4. Senior
- ☐ 5. Graduate
- ☐ 6. Non-degree student

IV. What is your grade point average?

- ☐ 1. Below 2.00
- ☐ 2. Between 2.00 and 2.50
- ☐ 3. Between 2.51 and 3.00
- ☐ 4. Between 3.01 and 3.50
- ☐ 5. Above 3.50.

V. Where do you live?

- ☐ 1. Sorority or Fraternity
- ☐ 2. University housing
- ☐ 3. Private home or with family

VI. What is your political preference?

- ☐ 1. Democratic
- ☐ 2. Republican
- ☐ 3. Others.

VII. What is your father's occupation?

- ☐ 1. Farmer
- ☐ 2. Unskilled worker
- ☐ 3. Skilled worker
- ☐ 4. Business owner
- ☐ 5. Professional (i.e., teacher, physician, minister, etc.).

VIII. What is your religious preference?

- ☐ 1. Catholic
- ☐ 2. Protestant
- ☐ 3. Jewish
- ☐ 4. Others.

IX. What is your sex?

- ☐ 1. Male
- ☐ 2. Female

(PLEASE GO ON TO PART TWO)

THE DOGMATISM SCALE, FORM E

Part II - Personal Opinion Survey

Part II includes 40 statements designed to sample what the general public thinks and feels about a number of important social and personal issues. The best answer to each statement below is your PERSONAL OPINION. The statements represent different and opposing points of view. You may find yourself agreeing strongly with some statements, disagreeing just as strongly with others, and perhaps uncertain about others. Whether you agree or disagree with any statement, you can be sure that many people feel the same as you do.

MARK EACH STATEMENT IN THE LEFT MARGIN TO HOW MUCH YOU AGREE OR DISAGREE WITH IT. PLEASE MARK EVERY ONE.

Write +1, +2, +3, or -1, -2, -3, depending on your feelings in each case. This is what the numbers mean:

+1: I AGREE A LITTLE

-1: I DISAGREE A LITTLE

+2: I AGREE ON THE WHOLE

-2: I DISAGREE ON THE WHOLE

+3: I AGREE VERY MUCH

-3: I DISAGREE VERY MUCH

- ___ 1. The United States and Russia have just about nothing in common.
- ___ 2. The highest form of government is a democracy and the highest form of democracy is a government run by those who are the most intelligent.
- ___ 3. Even though freedom of speech for all groups is a worthwhile goal, it is unfortunately necessary to restrict the freedom of certain political groups.
- ___ 4. It is only natural that a person would have much better acquaintance with ideas he believes in than with ideas he opposes.

- ___5. Man on his own is a helpless and miserable creature.
- ___6. Fundamentally, the world we live in is a pretty lonesome place.
- ___7. Most people just don't give a "damn" for others.
- ___8. I'd like it if I could find someone who would tell me how to solve my personal problems.
- ___9. It is only natural for a person to be rather fearful of the future.
- ___10. There is so much to be done and so little time to do it in.
- ___11. Once I get wound up in a heated discussion I just can't stop.
- ___12. In a discussion I often find it necessary to repeat myself several times to make sure I am being understood.
- ___13. In a heated discussion I generally become so absorbed in what I am going to say that I forget to listen to what the others are saying.
- ___14. It is better to be a dead hero than to be a live coward.
- ___15. While I don't like to admit this even to myself, my secret ambition is to become a great man, like Einstein, or Beethoven, or Shakespeare.
- ___16. The main thing in life is for a person to want to do something important.
- ___17. If given the chance I would do something of great benefit to the world.
- ___18. In the history of mankind there have probably been just a handful of really great thinkers.
- ___19. There are a number of people I have come to hate because of the things they stand for.
- ___20. A man who does not believe in some great cause has not really lived.
- ___21. It is only when a person devotes himself to an ideal or cause that life becomes meaningful.

- ____ 22. Of all the different philosophies which exist in this world there is probably only one which is correct.
- ____ 23. A person who gets enthusiastic about too many causes is likely to be a pretty "wishy-washy" sort of person.
- ____ 24. To compromise with our political opponents is dangerous because it usually leads to the betrayal of our own side.
- ____ 25. When it comes to differences of opinion in religion we must be careful not to compromise with those who believe differently from the way we do.
- ____ 26. In times like these, a person must be pretty selfish if he considers primarily his own happiness.
- ____ 27. The worst crime a person could commit is to attack publicly the people who believe in the same thing he does.
- ____ 28. In times like these it is often necessary to be more on guard against ideas put out by people or groups in one's own camp than by those in the opposing camp.
- ____ 29. A group which tolerates too much differences of opinion among its own members cannot exist for long.
- ____ 30. There are two kinds of people in this world: those who are for the truth and those who are against the truth.
- ____ 31. My blood boils whenever a person stubbornly refuses to admit he's wrong.
- ____ 32. A person who thinks primarily of his own happiness is beneath contempt.
- ____ 33. Most of the ideas which get printed nowadays aren't worth the paper they are printed.
- ____ 34. In this complicated world of ours the only way we can know what's going on is to rely on leaders or experts who can be trusted.
- ____ 35. It is often desirable to reserve judgment about what's going on until one has had a chance to hear the opinions of those one respects.

- ___36. In the long run the best way to live is to pick friends and associates whose tastes and beliefs are the same as one's own.
- ___37. The present is all too often full of unhappiness. It is only the future that counts.
- ___38. If a man is to accomplish his mission in life it is sometimes necessary to gamble "all or nothing at all."
- ___39. Unfortunately, a good many people with whom I have discussed important social and moral problems don't really understand what's going on.
- ___40. Most people just don't know what's good for them.

APPENDIX C

Tukey's Method for Multiple Comparison of Means*

*Based upon T. A. Ryan, "Multiple Comparisons in Psychological Research," op. cit., pp. 45-46.

A. SYMBOLS:

- s - The standard error of any individual means.
- v - Degrees of freedom in determining s.
- SR - Percentage point of the studentized range as read from the table. (The "studentized range" Tables are published in Pearson and Hartley [1962, pp. 176-177]). They permit the comparison of up to 20 means in a group at either the 5% or 1% level of significance experiment-wise.
- WSD - The abbreviation for "wholly significant difference".
- n - Number of means in the groups being compared.

B. PROCEDURES:

1. Determine s by dividing the square root of "mean square for error" over the square root of a, where a stands for the number of cases upon which each mean is based.
2. Determine SR from the table of the studentized range for the appropriate degrees of freedom (v) and n.
3. Determine WSD by multiplying SR by s.
4. Subtract WSD from the difference between any given pair of means. The difference between the pair of means is considered significant if it is greater than WSD value.

In the layer method upon which Tukey's procedure is based, means are arranged in order of magnitude. The difference between the two extreme means is tested. If the difference is not significant, no further tests are made, and it can be concluded that there are no significant differences between all means in the group. If the difference is significant, then each extreme mean is compared with the mean next to the other end of the array. If the difference is significant, we proceed until we find non-significant difference.