AN EXPERIMENTAL STUDY OF CRITICAL THINKING
IN STUDENT-CENTERED TEACHING

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AN EXPERIMENTAL STUDY OF CRITICAL THINKING
IN STUDENT-CENTERED TEACHING

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By

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CHAPTER I

INTRODUCTION

Educators are continually seeking ways to improve the educative process. Improvement of critical thinking is considered to be a goal in education. This study was planned to test the effectiveness of student-centered teaching in producing changes in critical thinking when compared to teacher-centered classes.

The introductory phase of this study is presented in the following divisions: statement of the problem, hypotheses, limitations of the study, major assumptions, background and significance of the study, definition of terms, methods of teaching, procedures for collecting data, and procedure for treating data.

Statement of the Problem

The problem of this study was to determine the effectiveness of student-centered teaching in producing significant changes in certain critical thinking abilities among selected freshmen students at North Texas State College.

The development of this problem was primarily concerned with a comparison of two groups of students enrolled for their first semester in college. The experimental group
was considered to be "student-centered" and the control group was "teacher-centered." The instrument used to determine the degree of differences in thinking abilities was the Watson-Glaser Critical Thinking Appraisal (20).

Hypotheses

The major hypothesis of this study was that students in student-centered classes will show no significant changes in the selected aspects of critical thinking when compared with students in teacher-centered classes.

Subhypotheses tested in this study were:

1. A group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Inference thinking when compared with a group of students in teacher-centered classes.

2. A group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Recognition of Assumptions when compared with a group of students in teacher-centered classes.

3. A group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Deduction when compared with a group of students in teacher-centered classes.

4. A group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy
of Interpretation when compared with a group of students in teacher-centered classes.

5. A group of freshman students enrolled in student-centered classes will not differ significantly in adequacy of Evaluation of Arguments when compared with a group of students in teacher-centered classes.

Limitations of the Study

This study was limited to the application of certain selected dimensions of teaching as located on a teaching continuum, the amount of separation being determined by the Schuman Student-centeredness Scale (12).

The study was limited to the specified variables established in the Watson-Claser Critical Thinking Appraisal (20).

The study was limited to freshman students enrolled in Education 161, "Psychology of Personal and Social Development," at North Texas State College.

Conclusions drawn from this study are applicable only to the subjects examined or to similar groups in similar situations.

Major Assumptions

1. It was assumed that the instructor could carry out the part demanded in a "student-centered" class and the required role in a "teacher-centered" class.
2. Any variations occurring within the experimental group, such as socio-economic background, existed to approximately the same extent in the control group.

3. It was assumed that any measured increase in critical thinking was a result of the differences in the activities within the classes. Furthermore, it was assumed that the outside activities of these students, including their other classes, were approximately the same.

4. It was assumed that students could change their concept of the teacher's role in student-centered situations and could react differently to the method when compared to teacher-centered classes.

Background and Significance of the Study

During the past decade, several studies have been conducted to determine the effect of "centeredness" on the individual and on groups. From a philosophical standpoint, these studies seem to be attempting to determine the influence necessary to reach specific goals. Lynn (14) agreed with Kelly (11), Rogers (17), Cantor (5), and others in his theory of "The Organism As a Manufacturer of Theories." Lynn pointed out that "man in nonscientific pursuits also attempts to master the environment." Rogers (17, p. 20) claimed that the human organism has the "capacity and right to self-direction." Rogers (17, p. 142) also pointed out
that movement in learning is "essentially an increased differentiation" of the perceptual field.

This philosophy appears to point out a difference in opinion, concerning individual goals, from that being practiced in many classrooms. McKeachie (15, p. 143), in 1952, recognizing the influence of this philosophy on educators, attempted to define the dimensions of student-centered versus instructor-centered teaching. He states:

One of the most prominent is the dimension of goal setting. The instructor-centered teacher believes that he is ultimately responsible for determining goals. To quote the report of a study group which met at Cornell last year, "If the teacher merits the responsibility placed in his hands, he knows more than do the students about the subject, about the world in which we live, and of the ways in which a knowledge of psychology can enrich the world." The student-centered instructor, on the other hand, believes that the group, including both students and instructor, should determine the group goals.

Colleges and universities consider academic achievement as a primary reason for their existence. Therefore, it is important to educators to know the effect of "goal setting" or relatedness of the individual and the subject.

Several studies in this area have revealed several things. Faw's students (6, p. 309) felt that they would have gained more intellectually from a teacher-directed class. Another study conducted by Asch (1) found improvement in areas of personal adjustment as measured by the Minnesota Multiphasic Personality Inventory (9). However, he failed
to find improvement in social distance or any difference in achievement of subject knowledge.

Landsman (12), in 1950, conducted an experimental study on student-centered teaching at Syracuse University and found that:

Improvement in knowledge of objective facts and principles, improvement in personality adjustment changes, and attitudes of approval toward the course do not differ for the students in the two types of classes after the close of the semester.

The approach to this problem has varied according to the person carrying out the experiment and the immediate situation. Specific directions and descriptions of the approach to student-centered teaching have been incomplete. For example, Paw did not say whether students in his study participated in their own evaluation. Rogers claimed it is important for the person to evaluate himself. Asch, on the other hand, did allow student evaluation and suggested that he would allow "part" student evaluation if he were to repeat the experiment. Paw found significant gains in subject matter learning. Asch did not find any significant difference in the two approaches. Both of these studies revealed gain in personal adjustment by student-centered methods.

McKeachie (15, p. 149) reports:

The research of Gibb and Gibb \( \sqrt{7} \) indicates that students from group-centered classes which possessed many of the characteristics ordinarily called "student-centered" actually produced a growth in social skills in experimental situations outside the classroom.
Furthermore, evidence from most of these studies indicates a problem in giving the student the opportunity to feel able to influence his own grades. McKeachie (15) pointed out that it seems significant that almost everyone who tries student-centered teaching methods finds the problem of grades to present the greatest obstacle to success. Three of the studies reported—Asch (1) in 1951, Gibb and Gibb (7) in 1952, and Johnson and Smith (10) in 1953—have indicated positive changes in their students. These experimenters allowed student evaluation. McKeachie (15, pp. 149-150) reports:

Our own research at the University of Michigan supports our notion that the student's feeling of freedom is an important variable. In an earlier paper reported that students made higher scores on examinations when they were given the opportunity to write comments about test items. More recent experimentation indicates that the effect of this opportunity is reduced if the student is directed to write comments. Apparently, the important thing is that the student feel free to do so if he wishes to.

In addition, it was found in another study that students preferred a directive method of teaching which made clear what the student had to do in order to pass the course. Again, we would interpret this as meaning that the student felt better able to determine his fate [grades].

Data are available and rather consistent on several variables existing in student-centered teaching. Among others, these include positive findings in student participation and personal adjustment. Some of these studies include those of Paw (6), Smith and Dunbar (13), Wispe (21), Bills (2), Landsman (12), and Asch (1). Most of these studies reveal no
significant difference in achievement of knowledge between the teacher-directed and student-directed classes.

Johnson and Smith (10) list their findings:

1. Students evaluate democratic classes more favorably than lecture classes.
2. Students accept decisions they make themselves more readily than decisions made by the instructors.
3. Students develop more democratic attitudes in the democratic class than in the lecture class.

Furthermore, another variable tested by the same authors—"students learn more in a democratic class than in a lecture class"—resulted in "no significant difference." The authors pointed out that students in the democratic class were "un-easy" about their evaluation and were afraid they were not gaining as much in the democratic class as students in the lecture classes.

These studies seem to indicate that students should be allowed to evaluate themselves in student-centered situations. This may be the crucial point in these studies. Rogers (17, p. 414) states:

There seems to be only one answer to this question which is thoroughly consistent with the approach itself. If the purposes of the individual and the group are the organizing core of the course; if the purposes of the individual are met and if he finds significant learnings, resulting in self-enhancement, in the course; if the instructor's function is to facilitate such learnings; then there is but one person who is in a position to evaluate the degree to which the goal has been achieved, and that is the student himself;
self-evaluation appears to be the logical procedure for discovering those ways in which the experience has been a failure and those respects in which it has been meaningful and fruitful. This is, indeed, the fitting climax of an "education for rulers."

There are other possible outcomes of student-centered teaching which remain to be tested. Rogers (17, p. 142) believes that movement in learning is "essentially an increased differentiation" of the perceptual field. He theorizes that this movement could have been called "the development of a more adequate process of thinking," or "change in the direction of a more soundly based reasoning."

Rogers goes on to say that "as yet there is too little research in this field. . . ." A review of the literature has revealed no studies that attempt to determine the effects of student-centered teaching on critical thinking.

Definition of Terms

The definitions of the first three terms listed below are quoted from the Dictionary of Education (8). The definitions of the last five terms are quoted from the Manual, Watson-Glaser Critical Thinking Appraisal (19).

1. Student-centered teaching.

   . . . instructional methods or procedures developed with considerable regard for the interest, needs, meaningful problems, and learner participation of the learners involved as well as the objectives of the school; logical organization of subject-matter and teacher-dominated activities are supplemented or replaced by psychologically appropriate, useful, and meaningful activities with respect to problems in which the learners are interested; examples are laboratory method,
specialized discussion, pupil-teacher planning, cooperative procedures in learning.

Henceforth, the student-centered classes will be known as the experimental group.

2. Teacher-centered teaching. "... a method of teaching in which the teaching-learning situation is controlled primarily by the teacher, his ideas, his interest, and his plans." Henceforth, the teacher-centered classes will be known as the control group.

3. Critical thinking. "... thinking that proceeds on the basis of careful evaluation of premises and evidence and comes to conclusions as objectively as possible through the consideration of all pertinent factors and the use of valid procedures from logic."

This general statement of critical thinking requires specific statements of operation or processes in terms of which differences in performances can be measured. These are as follows:

1. Inference. "... ability to discriminate among degrees of truth or falsity or probability of certain inferences drawn from given facts or data."

2. Interpretation. "... ability to weigh evidence and to distinguish between unwarranted generalizations and probable inferences which, though not conclusive or necessary, are warranted beyond a reasonable doubt."
3. **Recognition of Assumptions.** "... ability to recognize unstated assumptions in a given assertion or proposition."

4. **Deduction.** "... to recognize the relation of implication or necessary inference between one proposition and another is indeed such."

5. **Evaluation of Arguments.** "... ability to distinguish between arguments which are strong and important to the question at issue and those which are weak and unimportant or irrelevant."

**Methods of Teaching**

Experiments conducted in methods of teaching usually involve a situation where one or more teachers use a control method and other teachers use an experimental method. According to Landsman (12, p. 16), "This probably also represents the most prevalent pitfall in methods studies, since the very design of the study acts to vitiate success."

Furthermore, "... such a design does not offer the possibility of separating the effects of the methods from the effects of the teachers."

In order to eliminate the personality effects of different teachers, this study was conducted by one instructor, who taught both the student-centered classes and the teacher-centered classes.
Bolden (3, pp. 20-23) set up a list of points which indicate differences in the two methods of teaching. When these actions are applied to the classroom, differences in critical thinking, if they exist, can be determined. The points suggested by Bolden were used as a basis for this study and were adapted to local conditions. These are implied by the following statements in which the roles of teacher and pupil in the two classes were delineated.

**Student-centered Classes**

**Role of the students.**—The role of the students in student-centered classes was as follows:

1. The students proposed problems or topics on which to focus the work of the course.

2. The students determined the content and sequence of the course by selecting and scheduling for study the proposed problems or topics.

3. The students determined the course activities, classroom and related outside work, by planning methods by which problems or topics would be studied. These included committee work, panel discussions, and individual student leadership.

4. Each student owned a copy of the textbook.

5. Each member of the student-centered class used the textbook in the manner agreed upon by the class.
6. Students in the experimental classes completed an evaluation questionnaire that was used for class evaluation.

7. The semester grade for each student was determined by the class as a group.

8. Each student took all objective instruments as administered by the instructor.

Role of the teacher.—The role of the teacher in the student-centered classes was as follows:

1. The teacher encouraged the students to assume the responsibilities of their role by accepting all comments, reflecting feelings, redirecting questions to students and/or to the class, and by refusing to usurp students' responsibilities.

2. The teacher gave help when requested, by providing information or sources of information which students obviously could not assume.

3. The teacher provided for continuity of class activities from session to session and offered, as would any group member, an occasional general question, suggestion, or interpretation regarding the activity of the class.

4. The teacher participated in individual and group conferences.

5. The teacher provided directions for the student's assumed responsibility when requested.
6. The teacher was responsible for the administration and scoring of all objective instruments as set up for this study.

**Teacher-centered Classes**

**Role of the students.**—The role of the students in the teacher-centered classes was as follows:

1. The students studied readings assigned by the instructor.

2. The students prepared and submitted written assignments as directed by the teacher.

3. The students took the scheduled tests and final examination.

4. The students participated in classroom activity by answering, or attempting to answer, the instructor's questions on assigned readings and on course lectures, and by asking questions for clarification of lectures and assignments.

5. Each student owned a copy of the textbook for the course.

**Role of the teacher.**—The role of the teacher in the teacher-centered classes was as follows:

1. The teacher provided for each member of the class a course outline which included a schedule of the units of subject matter, a calendar of tests and final examination, a schedule of written assignments, and a statement of general course requirements.
2. The teacher made assignments and administered tests, and graded and returned the written assignments and tests after grading.

3. The teacher lectured on the subject matter of the course.

4. The teacher raised questions concerning the lectures and assignments.

5. The teacher answered questions asked by the students.

6. The teacher provided sources of information and materials.

7. The teacher was available for individual conferences when requested.

8. The teacher determined the final grades, which resulted from a weighing of performances on tests, quizzes, the final examination, and other written assignments.

Procedures for Collecting Data

1. One group of forty freshmen students comprising two student-centered classes was matched with one group of forty freshmen students comprising two teacher-centered classes. The bases for matching were:
   a. The ages of the students ranged from seventeen to twenty years, inclusive.
   b. The range of brightness, based on Otis I. Q., was from 91 to 129, inclusive.
c. The students in this study were in their first semester of college.

2. The Watson-Glaser Critical Thinking Appraisal, Form Am (20), was administered to each of the four classes involved in this study, between September 27 and September 29, 1960, inclusive. This same test was readministered during a regular class period at the end of the semester, on January 12 and January 13, 1961.

3. The Otis Quick-scoring Mental Ability Test: Gamma Test (16) was administered during the class period following the period which was used for administering the Watson-Glaser Appraisal.

4. The students were administered the Schuman Student-centeredness Scale (12) during the regular class period following the last administration of the Watson-Glaser Appraisal.

5. In order to eliminate the personality effects of different teachers, this study was conducted by one instructor.

Procedure for Treating Data

After the data were collected, they were assembled and prepared to test the hypotheses of this study in the following manner:

1. The major hypothesis and each of the stated sub-hypotheses were tested by the t technique (13). The differences between test and retest scores made by the experimental
group on the selected parts of the Watson-Glaser Critical Thinking Appraisal were compared with those made by the control group.

2. Summary, conclusions, and recommendations were based on the findings of this study.
CHAPTER BIBLIOGRAPHY


14. Lynn, David B., "The Organism As a Manufacturer of Theories," Psychological Reports, III (September, 1957), 353-359.


CHAPTER II

A REVIEW OF THE RELATED LITERATURE

A review of the related literature is presented under five major divisions. A philosophical viewpoint is presented in the first division to establish the foundation for the study. The second, third, and fourth divisions are used to present a very brief review of the results from other related studies. These studies are concerned with knowledge of the subject, personal adjustment, and student attitude. The fifth section is used to present a brief survey of the literature that is specifically related to "student-centeredness" and the thinking process. A summary is presented to review briefly the outcomes of experimentation in student-centered classes.

Philosophical Framework

The fundamental theory of student-centered teaching provides the philosophical framework for this study. It is claimed by Rogers (13) and others that the individual has the capacity and right to be responsible for dealing constructively with his life situation. It is pointed out by Rogers that if this capacity can be properly released through client-centered therapy, then learning in the classroom
may be improved through student-centered teaching (13, pp. 384-423).

The capacity for dealing constructively with a life situation generally involves some sort of mental activity. Educators believe that one outcome of education should be a more effective process of thinking. It is believed by Rogers that student-centered classes will provide gains in critical thinking (13, p. 142).

The process of moving toward the goals of education may have different meanings in the minds of teachers and students. However, the method or teaching process, according to Cantor (8), will have several common elements. The teacher's working responsibilities are to understand human behavior and social relations, primarily with understanding and not judging the student. The student's problems and feelings should be the focal point of the teaching process. It is then recognized that the teacher is in a position to aid the student in the subject matter as it relates to the broad objectives of the college. Cantor then claims the most important common element of all is "... the teacher will realize that constructive effort must come from the positive or active forces within the individual student" (8, pp. 83-84).

In furthering the educative process, Kelley believes the role of the teacher is to facilitate growth by providing the stage for growth to take place. He points out, "The
role of authority delimits learning and is untenable" (13, p. 75). This places the teacher as a resource person whose answers do not imply finality. The teaching process then becomes a real educative process. If the product is to be democratic, the process should be organized in a democratic manner. Kelley states, "Probably the greatest robbery that it is possible to perpetrate on any human being is to rob him of freedom of thought, that which is often referred to as freedom of the mind" (13, p. 106). Once more, Kelley emphasizes this by saying, "If we are to have a free America or a free world, we must have people who have had their sense of freedom exercised" (13, p. 115).

It then becomes the task of the teacher to provide space for freedom exercises. Snygg and Combs emphasize "the phenomenological concept of the student as a real person, as an active, purposive individual with goals and motives of his own . . ." (20, p. 233). This implies differences among a group of learners in the classroom. The goals of the teacher are not necessarily the goals of the students. The organism will continue moving toward a self-objective as long as he lives. Snygg and Combs picture the individual as a living organism with a tremendous drive toward growth and self-enhancement, requiring only practical and socially acceptable opportunities for growth and development to take place (20, p. 238).
If each individual student is driving toward self-enhancement in a democratic society, the educative process should be democratic in the classroom. Rogers (13, pp. 337-388) believes that the goal of democratic education is to assist students to become individuals with the following characteristics:

1. They should be responsible for actions that are self-initiated.
2. The individual should maintain self-direction that is based on intelligent choice.
3. The students should become critical learners who effectively evaluate the contributions of others.
4. The product should have acquired knowledge that is pertinent to the solution of problems.
5. He should adapt flexibly and intelligently to new problem situations.
6. The individual should possess the ability to use experience freely and creatively.
7. Each person should effectively cooperate with others for their own socialized purposes.

In contrast to the democratic characteristics described by Rogers, the authoritarian personality is exemplified, according to Maslow (16), by insecurity, hatred, hostility, prejudice, striving for power through prestige and status over others, and generalization of others as being either superior or inferior to himself. The authoritarian person
lives in a world conceived as some sort of jungle. His world consists of man against man, threatening, dangerous, challenging, and one that is primarily selfish or evil or stupid. The strength of the individual provides the source for his personal safety. The authoritarian individual identifies kindness as weakness and never loves or respects others any more than a lower animal loves or respects other animals (16).

The democratic class is necessarily operating in a climate or atmosphere that is referred to by some as the democratic climate or atmosphere. Among those comparing the autocratic and democratic climate is Lewin (14). He predicts that "it is possible to determine, in a geographically precise manner, the position, direction, and distance within the life space" of the individual, even if it is social rather than physical (14, p. 24). The classroom group is considered, from this view, as a social atmosphere. The success of a teacher in this learning situation is largely dependent on the atmosphere he creates. Lewin reviewed an experimental study on the effect of democratic and autocratic atmosphere, pointing out that democratic groups choose their activities freely, whereas autocratic groups are told what to do.

The atmosphere of autocratic situations produces a dominant, aggressive leader, and contains a narrowing down of the free movement of the members and a weakening of their power fields. In the autocratic situation the members are more hostile,
demand more attention, and are very personal or "i-centered."
The results also revealed that children in the autocratic
group were less submissive to each other and more submissive
to their leader than children in the democratic group. It
was further revealed that "... every child became a potential
enemy of every other one and the power fields of the children
weakened each other, instead of strengthening each other by
cooperation" (14, p. 24).

Lewin said:

There have been few experiences for me as im-
pressive as seeing the expression in children's faces
change during the first day of autocracy. The friendly,
open, and cooperative group, full of life, became with-
in a short half hour a rather apathetic-looking gather-
ing without initiative. The change from autocracy to
democracy seemed to take somewhat more time than from
democracy to autocracy. Autocracy is imposed on the
individual. Democracy he has to learn (14, p. 31).

The only way the individual can function effectively in
a democracy is to learn his role and become an active partici-
pant. Participation in a student-centered class situation
will exert a real influence toward the development of self-
insight (11). Lewin believes that self-insight will enlarge
the psychological space and thereby improve the thinking
abilities (14).

Participation is the functional core for student-centered
classes and is also a major factor for membership in a democ-
racy. Activity alone is not participation. The human is
often a cog in many systems without engaging his own ego.
Allport (1) claims that when the ego is not effectively engaged the individual becomes reactive. The individual's life is then one of ugly protest. He finds outlets in strikes, complaints, and scapegoating. When man is in this condition, it is easy for others to use and exploit "the aggressive outbursts of nonparticipating egos" (1, p. 126). If man is not ego-engaged and participating in some areas, his life is crippled and his existence is a blemish on democracy (1, p. 127).

Problems of group discussion are the very core of social psychology, and educators should seize the opportunity now offered for investigation and social action in this field (1, p. 128).

Participation, as opposed to peripheral motor activity, sinks a shaft into the inner-subjective regions of the personality, tapping central values. A study of participation is an approach to better understanding of the whole person (1, p. 130). When educators and psychologists focus on problems of participation, they will be advancing democracy (1).

Knowledge of the Subject

Practically all who have investigated student-centered teaching have considered learning of facts and principles of the subject. The results have been summarized by Birney and McKeachie (4), McKeachie (17), Bolden (5), and others. The
majority of those investigating this phase of student-centered teaching report that students do not differ significantly in terms of scores on examinations which measure knowledge of facts and principles when compared with students in teacher-centered classes (5, p. 6).

Personal Adjustment

Several investigators have found significantly positive changes in terms of personal adjustment. Faw (10) reports that students in student-centered classes receive greater emotional and social growth than students in teacher-centered classes. In an explanation of this outcome, Faw stated:

"The feeling of greater responsibility on the part of students may have generated greater activity and a greater need to pursue text materials in an effort to find answers to significant problems raised in the discussion" (10, p. 109).

An experiment similar to that conducted by Faw was reported by Asch (2). The statistical results of his study "... show that the nondirective group improved to a significantly greater degree than the control group in the area of emotional adjustment" (2, p. 19). Asch believes that self-understanding and adjustment are the major objectives of an undergraduate course in general psychology taught by a nondirective process.

Another study, conducted by Holden (5, p. 75), provides data which indicate that students in student-centered classes
made more improvement in social-emotional adjustment than the students in the teacher-centered classes. Bolden points out that a significantly lower percentage of unsolved problems, among those identified by students, are in evidence in the student-centered class when compared with his teacher-centered classes.

Student Attitude

Since the attitude of the student is an important factor in the conduct of the class, most studies in student-centered classes have either directly or indirectly considered this aspect. For purposes of clarification, consideration is herein given to (1) attitude toward the subject, and (2) attitude toward other students.

Attitude toward the Subject

In the experiment conducted by Faw (10), students expressed doubt about the amount of information and knowledge gained in the student-centered class; however, the majority expressed preference for the student-centered classes, believing they had more interest and social-emotional value than teacher-centered classes. Even though the students expressed doubt about the amount of information and knowledge gained, their scores on the achievement test were higher than the scores of the control classes.

In a 1951 study, Wispa (21, p. 134) reported: "The directive sections were preferred by most of the students,
because they were clearly defined and for their presumed value in preparing for examinations, although the permissive sections were enjoyed more."

A major hypothesis of a study conducted by Bolden (5), "... that the attitudes of students in the student-centered class are more favorable toward aspects of the classroom learning situation than the attitudes of the teacher-centered class," was not supported. The results of Bolden's study gave "a significant trend in the direction of less favorable attitudes" by students in the student-centered class toward the method of teaching the course (5, pp. 75-76).

An investigation conducted by Bills (3) produced evidence that students in student-centered classes have more positive attitudes toward the course in general psychology than students in teacher-centered classes. The students in the student-centered class believed the course was of personal value.

Another study in this area was conducted by Asch (2), who reported that his "experimental subjects believed their class situation to be more helpful to them in learning the subject matter of the course than did members of the control group" (2, p. 20).

Attitude toward Other Students

Most studies dealing with student-centered classes indicated a more favorable attitude of students toward their class
members than was found in teacher-centered classes. Those finding positive attitudes among students toward others in the class include Wispe (21), Bills (3), Bovard (6), and Johnson and Smith (12). The results of Bolden's study (5) showed a significant trend in the direction of less favorable attitudes by the student-centered class toward fellow students.

Process of Thinking

Many educators believe that a major outcome of education should be an improvement in thinking abilities. Those who advocate student-centered teaching claim that improvement in the process of thinking is an essential outcome. However, the research in this area is limited.

Smith and Dunbar conducted a study at Michigan State College, with a part of the major hypothesis stated as follows: "Students who participate in class discussion improve their critical thinking . . ." (19, p. 66). In this study, 118 students were divided about equally in four sections under two instructors with two sections each. Both instructors encouraged student participation in class discussions. The students were rated according to the amount of participation. Twenty-seven per cent of the students were rated as participants and compared, by matched pairs, with 35 per cent of the students who were rated as nonparticipants. In an effort to determine the effect of participation on critical thinking,
the instructors administered the Watson-Glaser test in October and again in May. There was over-all improvement in their discussion classes on all measured areas of thinking ability. However, significant changes were reported only in Generalizations and Assumptions. Neither of their sections was considered to be nondirective.

It was reported by Holden that his study provided evidence that "students in the teacher-centered class made more improvement in the Analytical Thinking scale of the Weston Personal Adjustment Inventory" (5, p. 75).

A more recent experiment in critical thinking was reported by Lyle (15) in 1958. Lyle's study, "An Exploration in the Teaching of Critical Thinking in General Psychology," consisted of two sections in general psychology taught by one instructor. The control section was labeled "conventional," using lectures and discussions of the lectures and textbook. The experimental section was said to be "permissive," using several procedures that are purported to be effective in stimulating abilities in critical thinking. Lyle used A Test of Critical Thinking, Form G, a development of the American Council on Education, Cooperative Studies of Evaluation in Education, as the instrument for determining the degree of change in critical thinking. The statistical results of the group comparison failed to reveal any difference. However, it was interesting to note brighter students in the experimental
group made more improvement in critical thinking than their counterparts in the control class. The lower-rated students, in terms of brightness, in the control section did better than their counterparts in the experimental class (15).

There have been many studies conducted relating to factors and processes in thinking. In a recent publication, *Education for Effective Thinking* by Burton, Kimball, and Wing (7), it is stated that research indicates thinking is influenced by several factors. They group these factors into four divisions: (1) intellectual, (2) personal-emotional, (3) experimental, and (4) procedural. It is pointed out that intelligence is a factor in thinking, and thinking can be improved on all intelligence levels. In terms of personal-emotional factors affecting thinking, the most important are rigidity, emotional stress, biases, and attitude toward the problem (7, pp. 240-268). It is stated that a rote, mechanistic, subject-centered approach will increase rigidity, while a problem-centered program based on flexibility and imagination will produce diversity and creativity, yielding a reduction of stereotyped behavior (7, p. 251). This will place the individual in a position to enlarge his psychological space and set the stage for improvement of critical thinking.

If thinking abilities are improved in the life activities of the individual, these abilities can be measured.
It appears that striving to improve critical thinking is a valid objective of the educative institute. With this objective in view, it becomes important to evaluate or measure the gains in thinking abilities. The results of a study conducted by Edwards (9), in 1949, indicated that it is possible to isolate techniques of critical thinking and then test for acquisition of skill in the use of these techniques. The available evidence indicates that there is very little improvement in thinking abilities in successive grades in school. This implies that the experiences of the maturing individual should be examined with an objective view of providing a program that will provide experiences in critical thinking (9).

Summary

A review of previous research in student-centered classes and related studies has produced evidence of some consistencies, as well as some differences, in terms of outcomes.

A majority of the studies has revealed that students taught by either method learn facts and principles of the course equally well. When objective tests, dealing with the subject matter of the course, are used as the measuring instrument for determining differences in groups when influenced by either of the two methods, the outcome is consistently one of no difference.
Several studies have shown that students in student-centered classes, and to a lesser degree in some democratic classes, have made positive gains in personal adjustment. It seems warranted, then, to summarize by stating that the investigations to date give evidence supporting the conclusion that student-centered classes, when compared with teacher-centered classes, show more favorable changes in personal, social, and emotional adjustment and growth.

The studies have been inconsistent and conflicting in describing the attitude of students toward the method, the teacher, and fellow students in the class. It seems unwarranted to form a conclusion about student attitude toward aspects of the learning situation.

A review of the literature reveals a belief that an improvement in the thinking process should be one of the outcomes of education. The studies conducted in student-centered classes have mostly been concerned with learning of facts and principles, personal and social adjustment and growth, and attitudes. None of the studies reviewed, concerned with student-centered teaching, has attempted to measure several abilities in critical thinking. Those studies that are related have, thus far, failed to produce evidence for warranting a conclusion at this time.
# CHAPTER BIBLIOGRAPHY


CHAPTER III

PROCEDURE AND ILLUSION

The primary objective of this study was to evaluate the effectiveness of student-centered teaching in the development of several abilities of critical thinking. Secondary concerns were students' attitudes toward the method, toward the teacher, and toward other students in the class.

Procedure

The description of the procedure includes aspects of the college setting, the subjects used, the instructor of the classes, the experimental group, and the control group.

College Setting

The experiment was conducted in the School of Education at North Texas State College, Denton, Texas, during the fall semester of the academic year 1960-61.

Arrangements were made for the experimenter to teach four classes of Education 161, a first course in education catalogued as "The Psychology of Personal and Social Development" (3, p. 217). Two sections of the course met on Tuesdays, Thursdays, and Saturdays. Two other classes met on Mondays, Wednesdays, and Fridays. Each class met three hours per week. The four classes used for the study were selected from the
twenty-three classes of Education 161 offered by the School of Education during the fall semester of the academic year 1960-61. Registration of students in the classes were "free choice" on the part of the students as they registered in alphabetical sequence.

Education 161 is normally required for first-term college freshmen majoring in education. First-term freshmen in other areas may enroll in the course. The students in all classes of Education 161 participate in the testing and counseling provided by the Counseling and Testing Services of North Texas State College.

Arrangement was made for the testing and individual counseling to be conducted with the four classes involved in this study, during the same area of time at the early part of the semester. It was also required that all students in all classes of Education 161 own a copy of the text, Successful Adjustment in College (4).

Testing and Counseling

It is customary that all classes of Education 161 be asked to participate in a standard testing program conducted by the college's Counseling and Testing Services. The objective is to provide assistance to students with vocational and personal problems.
When the testing phase was completed, individual counseling interviews were arranged between the students in Education 161 and a counselor-in-training. These individual interviews were by agreement between the counselor and the student. The interview time did not interfere with the student's previously scheduled program.

The testing phase was conducted during the regularly scheduled class periods. The complete battery required nine class hours for each class and included the following tests: Schrammel-Gray High School and College Reading Test (15), School and College Ability Test, Form 1A (14), Kuder Preference Record--Vocational Form GM (8), Guilford-Zimmerman Temperament Survey (7), Mooney Problem Check Lists (10), General Aptitude Test Battery (5), and a Personal Data Inventory (12).

In addition to the instruments listed above, the four classes of Education 161 used for this study took the following tests: Watson-Glaser Critical Thinking Appraisal (17), Otis Quick-scoring Mental Ability Test: Gamma Test, Form Am (11), Schuman Student-centeredness Scale, a development of Howard Schuman reported by Landsman (9, p. 72), and an Attitude Questionnaire developed by Bolden (2, pp. 149-158).

A final examination relating to the material content of the text was administered to all classes used in the study, on the date scheduled for the respective final examinations.
Each class used in the study was taught by the same instructor in different classrooms. Each classroom contained table-chairs, chalkboard, individual table or desk for the instructor, and a lectern.

Administrative policy is permissive toward classroom procedure. Flexibility is permitted in terms of resources, methods, procedures, arrangement, evaluation, and general techniques. Administrative pressure prevails in very limited areas. These include no smoking in the room and reporting of excessive absences to the appropriate dean, Dean of Men or Dean of Women.

In the college setting, all students in all classes of Education 161 were invited to participate in the guidance and counseling services, own a copy of the textbook, register in alphabetical sequence in the class best suited for the individual schedule, meet with the scheduled class three hours per week, and refrain from smoking in the classroom. The only differences known to exist in the college setting between the groups used in this study and other classes of Education 161 were teachers' personalities, classroom procedures, and additional testing instruments used for collecting the necessary data for use in this study.

The Instructor

The study was designed and conducted by one instructor through consultation and guidance of members of the doctoral
The instructor's previous experience included: fifteen years of teaching experience in vocational agriculture in Texas secondary schools, five years of activity coordination in educational workshops of underdeveloped areas of Pakistan, two years on the School of Education instructional staff as a part-time instructor and counselor, and sixty graduate semester hours in education and psychology. These courses included clinical and theoretical aspects of education and psychology. The instructor had previously received training in nondirective counseling techniques and had participated as a student in a nondirectively constructed course at North Texas State College.

A pilot study was conducted in the spring semester of the academic year 1959-60. This provided an experience situation that aided in final preparation and actual conduct of the experiment.

The personality of the instructor indicates a permissive attitude toward others, social service interest, and a somewhat uncomfortable feeling in highly authoritarian situations. If the teaching continuum is considered in terms of pupil-teacher relationship, with pupil-centered aspects on the one end and complete teacher domination on the other end, the instructor in this experiment is more at ease toward the student-centered side of the continuum.
The Experimental Group

There were not any discriminating factors involved in the registration of students for the Education 161 classes. The instructor was given the four-class assignment several weeks in advance of registration, along with the regular assignments of other instructors. Registration occurred in alphabetical sequence, and Education 161 classes were closed when twenty-five students were enrolled. However, during the last day of registration some classes were reopened and again closed, with thirty students as the maximum allowed for each class.

When classes began, three of the classes used in this study had thirty students each and one class had nineteen students registered on the unofficial roll. Two weeks after registration, when official rolls were closed, the instructor had one class with thirty-one students, two with twenty-nine students, and one with eighteen students.

The instructor had two classes meeting twice a week for one and one-half hour periods, and two classes meeting for one-hour periods three times per week. The plan was to use one class meeting twice per week, and one class meeting three times per week, for the experimental group and to use similar classes to form the control group.

In the formation of the experiment, the groups were selected as follows: a class meeting on Tuesday and Thursday
afternoons between the hours of 2:30 and 4:00, with thirty-one students, was combined with the class meeting on Tuesday, Thursday, and Saturday mornings between the hours of 9:00 and 10:00, with eighteen students, to form the experimental group. A class meeting on Tuesday and Thursday mornings between the hours of 11:00 and 12:30, with twenty-nine students, was combined with the class meeting on Monday, Wednesday, and Friday mornings between the hours of 11:00 and 12:00, with twenty-nine students, to form the control group.

The criteria for determining which subjects would be involved in the experiment were as follows: (1) ages must range from seventeen to twenty years, inclusive; (2) Otis I. Q.'s must range from 91 to 129, inclusive; and (3) students must be enrolled in their first semester of college. Another predetermined criterion was that a minimum of forty subjects would be included in the experimental group, while the control group would contain an equal number of subjects.

The plan was to conduct the experimental classes as much as possible on a student-centered basis, as described by Rogers (13, Ch. 9), operating within the framework of the college setting.

In order to establish rapport and create a feeling of group security as early as possible, the first periods were devoted toward this objective. At the beginning of the first class hour, the instructor introduced himself and gave a few
personal experiences which he believed were shared by many of the students. The students were then asked to talk about themselves, registration problems, housing problems, and things of common interest. After about fifteen minutes of discussion, the instructor requested the group to sit in a circle. After the circle was formed, each member of the group introduced himself and told something of personal interest to aid in establishing his identity.

The second class hour was an extension of the introductory meeting on the first class day. During this period each student in the class was given the opportunity to introduce every other person in the room. The last half of the second hour was given to "free movement" of students to try to talk personally with every other student in the room. When the class period ended, the instructor stood by the door and gave each student a previously prepared invitation to meet at his house for a "do-it-yourself" barbecue and "acquaintance" party. The invitation stated that limited choice of foods and drinks would be provided. They were told that preparation, arrangements, and games were to be initiated and carried out through the effort of the group.

The third class hour followed the party. When the instructor entered the classroom, it was noted that students were in buzz sessions engaged in conversation. This continued for about one or two minutes after the instructor was seated
in the circle with the students. A relaxed atmosphere seemed to prevail in the classroom.

The students were then asked to discuss what they considered to be the objectives and purposes of Education 161. After several minutes of discussion, it was decided to list student responses on the board. Near the end of the class period the group was asked to summarize, from previous student responses, what they considered to be the over-all objectives of the course.

At the beginning of the fourth period, the instructor reviewed the objective conclusions discussed during the previous period. For all practical purposes, their conclusions were similar to the objective as stated in the college bulletin: "Designed to orient the student to college life and to help him to understand his personal problems, such as separation from family, study habits, use of time, vocational choices" (3, p. 217).

The students were then told that services of the guidance department were available and were asked how they felt about using these services. There was considerable discussion before the group agreed to participate in the program, with the testing phase to begin at the following class period.

The instructor explained to each of the experimental classes the method to be used in these classes after the testing phase was completed, including procedure and evaluation.
Procedural instructions were very similar to those described by Asch (1, p. 2). There were two general exceptions. Asch required his experimental subjects to write one reaction report each week, evaluate himself at the end of the semester, and defend the final grade in a personal conference with the instructor. The reaction report and self-evaluation used by Asch were not used in this study.

The students were given the opportunity to decide how their final grade would be determined. They were told that regulations required final grades to be submitted to the registrar’s office at the end of the term. It was explained that final grades would be determined by decision of the students in the experimental classes. The students discussed self-evaluation, instructor evaluation, part self-evaluation and part instructor evaluation, and group evaluation. They decided that, at the end of the semester, each student would evaluate all students in the class, including himself. All grades provided for each student were averaged to arrive at his final grade.

After rapport, procedure, and evaluation technique were established, the testing phase of the experiment was begun at the fifth class hour. This phase continued through the fourteenth class hour. At the beginning and end of the testing periods, students were often engaged in conversation about the course and about personal problems. At the end
of the class hour, students from the experimental classes would frequently group in threes and fours and go to the student center for coffee or other refreshments.

The initial testing program was completed on the fourteenth class hour. At the beginning of the following class period, the students were told that the first testing phase was completed and counseling sessions would be scheduled at the convenience of the students. Each member of the class submitted to the instructor a schedule of available hours. Arrangements were then made for personal interviews with a counselor-in-training. The instructor briefly summarized the operational procedures, the agreed objectives, and evaluation technique. They were further informed that there would not be a daily roll check, no quizzes, and no assignments made by the instructor. Finally, it was explained to the experimental classes that the following twenty-eight class hours would be used to discuss any problem of concern and that any plan, organization, method, or technique for resolving the problem would be acceptable.

The last two class hours and two hours set aside by the administration for final examination were used for collecting data about the study.

The Control Group

The control group was enrolled in two classes of Education 151, with fifty-seven students. These classes
were taught by the same instructor as the experimental classes.

The students in each class were provided with duplicated material setting forth the course requirements (Appendix A). They were also provided a dated class schedule of activities for the semester (Appendix B). This class schedule was followed throughout the term. Both duplicated materials were prepared in advance by the instructor.

The seating arrangement was formal, with each student facing the front of the room. The instructor used the lectern in presentation of the prepared lecture.

The testing phase of the control group, begun on the fifth class hour, continued through the fourteenth period. The tests used in the control group were the same as those given in the experimental group, and the same area of time was used. The students were told that all tests and a minimum of one hour of counselor interpretation were required of each student.

The class hour was opened by roll call and followed by a statement which the instructor believed would summarize the material covered during the previous period. Then a statement was made, designed to make connection to the lecture which was to follow. The remaining part of the period was utilized in lecture and instructor-directed discussions. Leading questions, intended to stimulate discussion, were
usually prepared in advance by the instructor. Questions raised by the students, being few in number, were answered briefly by the instructor.

There were three objective tests and a final examination given during the semester. There were two term papers, evaluated by the instructor, each of which was given the same weight toward the final grade as a test. One of the required papers was a research project exploring the vocational choice of the individual student. The second paper was a philosophical development of personal beliefs and values of the student.

The textbook used in this course contained several pages to be filled in by the student, instructions to underline key and topic sentences, questions to be answered, and suggested reading references for the material being studied (4). A grade on this phase of the course was given by the instructor. The weighting of this grade was the same as a single test.

**Design**

The design of the study included a description of the measurements involved in testing the hypotheses of the experiment. A discussion of the evaluation techniques and the reason for their use in this study is presented.

**Critical Thinking Abilities**

It is claimed by Rogers (13, p. 142) that learning during the process of therapy is a development of the process of
thinking. Rogers also believes the process is essentially the same in the classroom as in therapy and can be developed best through student-centered teaching (13, p. 384). Whether student-centered teaching is an asset in the development of thinking abilities has been experimentally neglected (1, p. 3; 13, p. 142). The primary hypothesis under consideration in this study was this aspect of student-centered teaching.

Subjects used in this study were first-term freshmen, male and female, between the ages of seventeen and twenty, inclusive, with an Otis I. Q. between 91 and 129, inclusive. All forty experimental class members meeting these qualifications were utilized. A corresponding number of students meeting the qualifications were selected from the control classes.

Instruments used.—Each class used in this study was administered the Watson-Glaser Critical Thinking Appraisal during the fifth period and again on the forty-fourth class hour. The directions for administration of the test, given in the manual, were followed, including the suggestions relating to time factor (16, pp. 3-4). Several investigators have found that with the use of the Watson-Glaser Critical Thinking Appraisal it is possible to measure several abilities in thinking and secure measured changes after applications of techniques designed to affect thinking (6, 18). It is stated by the designers of the Watson-Glaser test that the
test results are useful to evaluate "the relative efficacy of different methods of instruction which are intended to develop the ability to think critically" (16, p. 2).

The test, consisting of ninety-nine items, is divided into the following subtests: Inference, Recognition of Assumptions, Deduction, Interpretation, and Evaluation of Arguments (16, p. 1).

**Student Attitude**

In a study of this type it is important to understand the attitude of the subjects involved in the experiment. This becomes increasingly important when the experimenter is placed in the position of promoting student-centeredness with one group and then reversing the situation by conducting a teacher-centered class.

Landsman's study involved a similar situation with a teacher's changing instructional roles from the student-centered situation to a syllabus-centered class (9, p. 25). By using the Schuman Student-Centeredness Scale (9), Landsman was able to determine the students' perceptions of differences between the two teaching processes from the students' ratings of the teaching procedure used in the classroom (9, pp. 72-72).

An experimental study, comparing student-centered classes with those controlled by a teacher-centered process, was conducted by Bolden (2). One of the things Bolden wanted to
find out was the attitude of students toward aspects of the classroom learning situation. The following aspects were included: the instructor, the method of teaching, fellow class members, and the course in general. To secure the information needed, Bolden used five open-ended questions; this is discussed in detail in the manual of directions (2, p. 64). The results are interesting in that "a significant trend in the direction of less favorable attitudes was shown by the student-centered class toward the method of teaching the course and toward fellow students" (2, p. 76).

Instruments used.—In an effort to re-examine the attitude of students' perception of the teaching process and aspects of the learning situation, instruments used in previous studies were administered to the subjects in this study.

1. Schuman's Student-centeredness Scale contains eighteen items, with five choices under each item. The choice range is from student-centered situations to those entirely teacher-directed. A complete description is given by Landsman (9, pp. 72-74). This instrument was administered to both groups involved in the present study, on the forty-fifth class period, the last class period of the semester.

The attitude study conducted was not an hypothesis of the present study. Its aim was to re-evaluate certain phases of studies conducted by Landsman (9) and Bolden (2), and to assist in determining differences in the two situations when viewed from the student's viewpoint.


CHAPTER IV

RESULTS AND ANALYSIS OF THE DATA

The results of this study will be presented in five major divisions. Results obtained from the Watson-Glaser Critical Thinking Appraisal and its subtests will be given in the first section. This instrument was used to measure changes in certain specified aspects of critical thinking. Results of the student-attitude questionnaire and a comparison in major interest areas will be presented in the second and third sections. Evidences of differences between methods of classroom procedures between the two groups used in the study will be presented in section four. A brief summary of the over-all results will be presented in the fifth section.

Critical Thinking

The major hypothesis that "students in student-centered classes will show no significant changes in the selected aspects of critical thinking when compared with students in teacher-centered classes" was tested by comparing the results of the differences between pre-test and end-test raw scores obtained on the Watson-Glaser Critical Thinking Appraisal.

The groups used for the comparison were matched by pairs on intelligence as measured by the Otis Test of Mental Ability.
The raw score was converted to the Otis I. Q. The mean I. Q. of the two groups used in this study is presented in Table I.

**TABLE I**

**COMPARATIVE OTIS I. Q. OF STUDENT-CENTERED AND TEACHER-CENTERED GROUPS**

<table>
<thead>
<tr>
<th>Groups</th>
<th>Number of Subjects</th>
<th>Total Otis I. Q. Scores Per Group</th>
<th>Mean Otis I. Q. Scores Per Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student-centered group</td>
<td>40</td>
<td>4,371</td>
<td>109.275</td>
</tr>
<tr>
<td>Teacher-centered group</td>
<td>40</td>
<td>4,372</td>
<td>109.3</td>
</tr>
<tr>
<td>Difference between groups</td>
<td>..</td>
<td>1</td>
<td>.025</td>
</tr>
</tbody>
</table>

The mean I. Q. difference of .025 was not large enough to establish any major difference between the two groups. Therefore, in terms of Otis I. Q. there was no significant difference between the two groups.

The pairing of the subjects by intelligence permitted the paired measures to be correlated and the differences for each pair to be obtained. This was the basis for determining the mean difference and finding out if the mean of the groups differed from zero. This method of determining the value of t is described by Lindquist (3, pp. 58-59).
Over-all Results in Critical Thinking

Does level of intelligence have an effect on change of critical thinking when influenced by student-centered or teacher-centered situations? Students with an Otis I. Q. between 93 and 106, inclusive, were selected and the two groups were compared on the raw scores of the Watson-Glaser Critical Thinking Appraisal. The results are given in Table II.

**TABLE II**

COMPARATIVE MEAN CHANGE BETWEEN PRE-TEST AND END-TEST WATSON-GLASER CRITICAL THINKING APPRAISAL IN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS WITHIN AN OTIS I. Q. RANGE OF 93 TO 106, INCLUSIVE

(N = 13 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>61.31</td>
<td>59.30</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>64.23</td>
<td>56.61</td>
<td>..</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of difference</td>
<td>2.92</td>
<td>-2.69</td>
<td>5.61</td>
<td>2.104</td>
<td>&lt;.05</td>
</tr>
</tbody>
</table>

There was a mean difference of 5.61 between the two groups. The student-centered group produced a gain of 2.92, while the teacher-centered group had a negative mean difference between pre-test and end-test of -2.69. The significance
of the difference was slightly less than the 5 per cent level in the direction of the student-centered group.

Students within an Otis I. Q. range of 112 to 127, inclusive, were grouped in the student-centered and teacher-centered classes. A comparison was made on the outcome of the raw scores of the Watson-Glaser Critical Thinking Appraisal. The results are presented in Table III.

**TABLE III**

**COMPARATIVE MEAN CHANGE BETWEEN PRE-TEST AND END-TEST WATSON-GLASER CRITICAL THINKING APPRAISAL IN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS WITHIN AN OTIS I. Q. RANGE OF 112 TO 127, INCLUSIVE**

*(N = 14 students in each group)*

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>69.71</td>
<td>65.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>71.71</td>
<td>63.65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of difference</td>
<td>2.00</td>
<td>-1.65</td>
<td>3.65</td>
<td>1.56</td>
<td>*</td>
</tr>
</tbody>
</table>

*Non-significant.*

There was a mean difference of 3.65 between the two groups. The student-centered group had a gain of 2, while the teacher-centered group had a negative mean difference of -1.65. Although the gain was positive toward the student-centered group, the difference was not within the 10 per cent level of significance.
The outcomes of testing the hypothesis concerning five aspects of critical thinking, as measured by the Watson-Glaser test, are presented in Table IV.

**TABLE IV**

**COMPARATIVE MEAN CHANGE BETWEEN PRE-TEST AND END-TEST WATSON-GLASER CRITICAL THINKING APPRAISAL IN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS**

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>63.92</td>
<td>62.02</td>
<td>1.90</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>66.45</td>
<td>60.15</td>
<td>6.40</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of difference</td>
<td>2.52</td>
<td>-1.87</td>
<td>4.398</td>
<td>3.02</td>
<td>.01</td>
</tr>
</tbody>
</table>

The experimental group was significantly higher than the control group in terms of the differences between the scores. Therefore, the null hypothesis was rejected at the 1 per cent level of significance. It seems warranted to conclude that subjects in the student-centered classes made higher gains in critical thinking, as measured by the Watson-Glaser test, than students in the teacher-centered classes.

**Inference**

The outcomes of Inference scores as a subtest of the Thinking Appraisal are presented in Table V.
TABLE V

COMPARATIVE MEAN CHANGE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS IN INFRINGEMENT, A SUBTEST OF WATSON-GLASER CRITICAL THINKING APPRAISAL

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>10.87</td>
<td>10.82</td>
<td>.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>11.3</td>
<td>11.2</td>
<td>.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of difference</td>
<td>.425</td>
<td>.35</td>
<td>.05</td>
<td>.0569</td>
<td>*</td>
</tr>
</tbody>
</table>

*Non-significant.

Although there was a very slight gain in the student-centered group when compared to the teacher-centered group, the difference did not approach the 10 per cent level of significance. Therefore, the hypothesis of "no difference" between the groups was accepted.

Recognition of Assumptions

The results of Subtest No. 2, Recognition of Assumptions, are presented in Table VI. There was a slight gain in the student-centered group when compared to the teacher-centered group, but since the significance of the difference was slightly less than the 10 per cent level, the hypothesis was accepted.
### TABLE VI

**COMPARATIVE MEAN CHANGE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS IN RECOGNITION OF ASSUMPTIONS, A SUBTEST OF WATSON-GLASER CRITICAL THINKING APPRAISAL**

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>10.52</td>
<td>10.00</td>
<td>.57</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>11.82</td>
<td>10.35</td>
<td>1.47</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of difference</td>
<td>1.25</td>
<td>.35</td>
<td>.95</td>
<td>1.63</td>
<td>&lt;.1</td>
</tr>
</tbody>
</table>

**Deductions**

The fourth hypothesis, concerning deductive thinking, was rejected at the 10 per cent level of significance. The difference was in the direction of the student-centered group. The results are presented in Table VII.

### TABLE VII

**COMPARATIVE MEAN CHANGE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS IN DEDUCTION, A SUBTEST OF WATSON-GLASER CRITICAL THINKING APPRAISAL**

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>17.3</td>
<td>16.32</td>
<td>.93</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>17.45</td>
<td>15.62</td>
<td>1.33</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of difference</td>
<td>.15</td>
<td>- .7</td>
<td>.85</td>
<td>1.69</td>
<td>.1</td>
</tr>
</tbody>
</table>
Interpretation

The outcomes of the ability to make interpretations, as measured by the Watson-Glaser test of thinking, are presented in Table VIII.

**TABLE VIII**

**COMPARATIVE MEAN CHANGE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS IN INTERPRETATION, A SUBTEST OF WATSON-GLASER CRITICAL THINKING APPRAISAL**

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>14.37</td>
<td>14.42</td>
<td>.45</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>15.17</td>
<td>12.7</td>
<td>2.47</td>
<td>..</td>
<td>..</td>
</tr>
<tr>
<td>Mean of difference</td>
<td>.3</td>
<td>-1.72</td>
<td>2.025</td>
<td>2.41</td>
<td>&gt;.05</td>
</tr>
</tbody>
</table>

The student-centered group made greater gains, when compared with the teacher-centered group, in this area of critical thinking than any of the other subtests. The significance of the difference was greater than the 5 per cent level in the direction of the student-centered group. Therefore, the hypothesis was rejected and conclusions made that student-centered classes will produce an improvement of the thinking ability to make interpretations.
Evaluation of Arguments

The results of Evaluation of Arguments, as presented in Table IX, showed a slight favor to the student-centered group.

TABLE IX

COMPARATIVE MEAN CHANGE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS IN EVALUATION OF ARGUMENTS, A SUBTEST OF WATSON-GLASER CRITICAL THINKING APPRAISAL

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>10.3</td>
<td>10.45</td>
<td>-.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>10.7</td>
<td>10.27</td>
<td>.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of difference</td>
<td>.4</td>
<td>-.17</td>
<td>.575</td>
<td>1.50</td>
<td>.1</td>
</tr>
</tbody>
</table>

Even though the difference was in the direction of the student-centered group, the increase was not large enough to reach the 10 per cent level of significance; therefore, the hypothesis was accepted.

While some of the subtests did not reach the 10 per cent level of significance, each part did show a difference in the direction of the student-centered group. The over-all difference in critical thinking between the two groups gave positive advantage to students in student-centered classes, as measured by the Watson-Glaser Critical Thinking Appraisal. The over-all
difference was greater than the 1 per cent level of significance.

**Student Attitude**

An important aspect of a study of this type was to obtain an understanding of the feelings or attitudes of the subjects involved in the experiment. A questionnaire previously developed and used by Bolden (1, pp. 148-159) was used in this study. The questions were designed to secure the students' attitudes toward the instructor, the method of teaching, other class members, attitudes of others toward self, and attitude of instructor toward student's self. (See Appendix C.)

The method used to analyze and score the responses is described by Bolden (1, pp. 148-159). It simply involved judging whether the statement expressed a positive, negative, or neutral attitude and correspondingly assigning to the statement a score of plus, minus, or zero. Then, by adding all of the like signs under a single category, a raw score was obtained for that phase.

**Attitude toward the Teacher**

The outcomes of the question, "How do you feel toward the instructor of this class?" are presented in Table X. The results indicate that 90 per cent of the statements in the student-centered group were positively directed toward
TABLE X

COMPARATIVE DIFFERENCE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUP RESPONSES ON ATTITUDE TOWARD THE TEACHER

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Amount of Difference in Direction of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student-centered</td>
</tr>
<tr>
<td>Positive responses</td>
<td>119.0</td>
<td>99.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Negative responses</td>
<td>13.0</td>
<td>53.0</td>
<td>..</td>
</tr>
<tr>
<td>Neutral responses</td>
<td>0.0</td>
<td>2.0</td>
<td>..</td>
</tr>
<tr>
<td>Total responses</td>
<td>132.0</td>
<td>154.0</td>
<td>..</td>
</tr>
<tr>
<td>Per cent positive</td>
<td>90.15</td>
<td>65.59</td>
<td>24.56</td>
</tr>
<tr>
<td>Per cent negative</td>
<td>9.85</td>
<td>34.41</td>
<td>..</td>
</tr>
<tr>
<td>Per cent neutral</td>
<td>0.00</td>
<td>1.33</td>
<td>..</td>
</tr>
</tbody>
</table>

The teacher. The statements made by the teacher-centered group were 65.59 per cent positive, while 34.41 per cent were negative. It is noted that 24.56 per cent more favorable statements were made toward the teacher by the student-centered group than were made by the teacher-centered subjects.

None of the statements made by the student-centered subjects were rated as neutral, while 1.33 per cent of the
teacher-centered group responses were considered to be neutral.

From an analysis of the responses to the question, "How do you feel toward the teacher of this class?" it seems warranted to conclude that students tend to view the teacher of student-centered classes more favorably than they do the teacher of teacher-centered classes.

**Attitude toward Teaching Method**

The outcomes of the question, "How do you feel about what has happened in this course during the semester?" are presented in Table XI. The results indicate that subjects in the student-centered classes projected more positive, fewer neutral, and slightly fewer negative responses toward the method of teaching than the teacher-centered group. However, the differences are not as great as they were in their attitude toward the teacher.

In Table XI it is noted that 9.56 per cent of the responses made by the teacher-centered group were neutral, while 2.01 per cent of the total responses made by the student-centered group were neutral. The student-centered group made 16.59 per cent more positive responses toward the classroom situation than did the teacher-centered group. It appears that freshmen students in Education 161 at North Texas State College prefer the student-centered method.
TABLE XI

COMPARATIVE DIFFERENCE BETWEEN STUDENT-CENTERED AND
TEACHER-CENTERED GROUP RESPONSES ON ATTITUDE
TOWARD THE METHOD

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Amount of Difference in Direction of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student-centered</td>
</tr>
<tr>
<td>Positive responses</td>
<td>114.00</td>
<td>81.00</td>
<td>35.00</td>
</tr>
<tr>
<td>Negative responses</td>
<td>32.00</td>
<td>42.00</td>
<td>..</td>
</tr>
<tr>
<td>Neutral responses</td>
<td>3.00</td>
<td>13.00</td>
<td>..</td>
</tr>
<tr>
<td>Total responses</td>
<td>149.00</td>
<td>136.00</td>
<td>13.00</td>
</tr>
<tr>
<td>Per cent positive</td>
<td>76.51</td>
<td>59.56</td>
<td>16.59</td>
</tr>
<tr>
<td>Per cent negative</td>
<td>21.48</td>
<td>30.38</td>
<td>..</td>
</tr>
<tr>
<td>Per cent neutral</td>
<td>2.01</td>
<td>9.56</td>
<td>..</td>
</tr>
</tbody>
</table>

Attitude toward Other Class Members

The results of the responses made to the question, "How do you feel toward other students in this class?" are tabulated in Table XII.

The subjects in the student-centered classes tend to feel in a position to make either positive or negative evaluation of others in their class more easily than do students in the teacher-centered classes. There were only 1.61 per cent of the student-centered responses labeled as
TABLE XII
COMPARATIVE DIFFERENCE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUP RESPONSES ON ATTITUDE TOWARD OTHER CLASS MEMBERS  
(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Amount of Difference in Direction of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student-centered</td>
</tr>
<tr>
<td>Positive responses</td>
<td>91.00</td>
<td>89.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Negative responses</td>
<td>31.00</td>
<td>25.00</td>
<td>6.00</td>
</tr>
<tr>
<td>Neutral responses</td>
<td>2.00</td>
<td>10.00</td>
<td>...</td>
</tr>
<tr>
<td>Total responses</td>
<td>124.00</td>
<td>124.00</td>
<td>...</td>
</tr>
<tr>
<td>Per cent positive</td>
<td>73.39</td>
<td>71.78</td>
<td>1.61</td>
</tr>
<tr>
<td>Per cent negative</td>
<td>25.00</td>
<td>20.16</td>
<td>3.84</td>
</tr>
<tr>
<td>Per cent neutral</td>
<td>1.61</td>
<td>8.06</td>
<td>...</td>
</tr>
</tbody>
</table>

Neutral, while 8.06 per cent of the teacher-centered responses were considered to be neutral. However, this is to be expected in a class where students are limited on amount of classroom communication. The student-centered group made slightly more positive and negative responses than did the teacher-centered subjects. It is noted that each group scored an equal number of responses to the question, "How do you feel toward other students in this class?"
From the results of responses to the question, it does not seem warranted to conclude that either method caused a difference in attitude toward other students. It did seem, however, that subjects in the experimental classes were better able to make either positive or negative evaluation of others than students in the teacher-centered classes.

**Attitude of Others toward Self**

The results of responses to the question, "How do you think the students in this class feel toward you?" are presented in Table XIII.

The results did not indicate any outstanding differences between either group. There were, however, 9.47 per cent more neutral responses in the teacher-centered group than in the student-centered group. Approximately 4 more negative and positive responses were credited to the student-centered classes. This slight difference in the direction toward the student-centered class with a 9 per cent increase of neutral responses in the teacher-centered group seemed to indicate that students in the student-centered classes felt more willing to make decisions about what others thought of them than did students in the teacher-centered classes.
TABLE XIII

COMPARATIVE DIFFERENCE BETWEEN STUDENT-CENTERED AND TEACHER-CENTERED GROUP RESPONSES ON ATTITUDE OF OTHERS TOWARD SELF

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Amount of Difference in Direction of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student-centered</td>
</tr>
<tr>
<td>Positive responses</td>
<td>53</td>
<td>47</td>
<td>6</td>
</tr>
<tr>
<td>Negative responses</td>
<td>14</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>Neutral responses</td>
<td>21</td>
<td>28</td>
<td>..</td>
</tr>
<tr>
<td>Total responses</td>
<td>88</td>
<td>84</td>
<td>4</td>
</tr>
<tr>
<td>Per cent positive</td>
<td>60.23</td>
<td>55.59</td>
<td>4.28</td>
</tr>
<tr>
<td>Per cent negative</td>
<td>15.91</td>
<td>10.72</td>
<td>4.19</td>
</tr>
<tr>
<td>Per cent neutral</td>
<td>23.86</td>
<td>33.33</td>
<td>..</td>
</tr>
</tbody>
</table>

Attitude of Instructor toward Student's Self

The results of responses to the question, "How do you think the instructor of this class feels toward the students in this class?" are tabulated in Table XIV.

The outcomes were similar to those found in the first question, "How do you feel toward the instructor of this class?" The responses from the subjects in the student-centered group were 92.86 per cent positive. This indicated that they believed the instructor liked his class, accepted
TABLE XIV

COMPARATIVE DIFFERENCE BETWEEN STUDENT-CENTERED AND
TEACHER-CENTERED GROUP RESPONSES ON STUDENTS' PERCEPTION OF INSTRUCTOR ATTITUDE

(N = 40 students in each group)

<table>
<thead>
<tr>
<th>Responses</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Amount of Difference in Direction of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student-centered</td>
</tr>
<tr>
<td>Positive responses</td>
<td>104</td>
<td>77</td>
<td>27</td>
</tr>
<tr>
<td>Negative responses</td>
<td>5</td>
<td>30</td>
<td>..</td>
</tr>
<tr>
<td>Neutral responses</td>
<td>3</td>
<td>7</td>
<td>..</td>
</tr>
<tr>
<td>Total responses</td>
<td>112</td>
<td>114</td>
<td>..</td>
</tr>
<tr>
<td>Per cent positive</td>
<td>92.86</td>
<td>67.55</td>
<td>25.31</td>
</tr>
<tr>
<td>Per cent negative</td>
<td>4.47</td>
<td>26.31</td>
<td>..</td>
</tr>
<tr>
<td>Per cent neutral</td>
<td>2.67</td>
<td>6.14</td>
<td>..</td>
</tr>
</tbody>
</table>

the students, and was willing to help them with their own personal problems. In other words, it may mean that they liked the instructor more than did the students in the teacher-centered classes. It probably follows that if students are favorably impressed with their instructor, they believe that the instructor likes them.

The responses from the teacher-centered classes were 67.55 per cent positive. This indicated that subjects in the teacher-centered classes viewed the teacher as a person
who does not consider their problems or individual personalities as important. One student probably expressed it as well as anyone when he said, "My teacher sees me as another name on his roll."

The responses in Table XIV were 26.31 per cent negative and 6.14 per cent neutral from the teacher-centered group. It was also noted that 4.47 per cent negative and 2.67 per cent neutral responses were credited to the student-centered classes.

Results in Major Areas of Interest

Do students in specified major interest fields respond differently to the teaching process when measured in critical thinking? In an effort to answer this question, subgroups were established from the forty matched pairs used in this study. More than half of the subjects used in this study were majoring either in elementary education or secondary education. The remainder of the subjects were in business, physical education, engineering, art, music, law, or some phase of science.

The results of the subgroup division are presented under two major areas. The results obtained from a subgroup comparison of elementary education majors in the comparison groups are followed by results obtained from a comparison of secondary education majors in the two groups.
Elementary Education Majors

Twelve pairs of elementary education freshmen students were matched on intelligence, age, and sex. Their scores were compared. The results are presented in Table XV.

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>62.08</td>
<td>62.00</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>63.75</td>
<td>61.67</td>
<td>2.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of difference</td>
<td>1.67</td>
<td>-0.33</td>
<td>2.00</td>
<td>0.933</td>
<td>*</td>
</tr>
</tbody>
</table>

*Non-significant.

The elementary education majors in the student-centered group had a mean gain of 2 points per student more than the teacher-centered group. However, with the small number of samples, this gain was not enough to reach the 10 per cent level of significance.

Secondary Education Majors

The outcomes of a comparison of the aspects of critical thinking among nine matched pairs of secondary education majors are shown in Table XVI. They were matched on intelligence and age.
TABLE XVI

COMPARATIVE MEAN CHANGE AMONG SECONDARY EDUCATION MAJORS
IN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS
IN CRITICAL THINKING

(N = 9 students in each group)

<table>
<thead>
<tr>
<th>Tests</th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean of pre-test</td>
<td>66.777</td>
<td>65.444</td>
<td>3.333</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of end-test</td>
<td>70.355</td>
<td>62.444</td>
<td>7.909</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean of difference</td>
<td>3.556 (-1.000)</td>
<td>4.556</td>
<td>1.09</td>
<td>*</td>
<td></td>
</tr>
</tbody>
</table>

*Non-significant.

The mean gain of the secondary education majors in the student-centered group was 4.556 more than their matched counterparts in the teacher-centered group. However, with only nine matched pairs, this was not great enough to reach the 10 per cent level of significance.

Evidence of Differences in Teaching Methods

It was an assumption of this study that it is possible for a teacher to play two roles in methods of teaching. In order to produce evidence that differences did exist in the two situations, the students were administered the Schuman Student-centeredness Scale. (See Appendix D.) This scale was previously used by Landsman to secure students' perception as evidence of difference between the methods of teaching. Landsman reported evidence supporting validity.
and reliability of the instrument. He secured a reliability co-efficient of .93 for the scale by readministering the scale to one half of the subjects after one week (2, p. 73).

The Schuman Student-centeredness Scale was administered to both groups used in this study at the end of the semester. The results are given in Table XVII.

**TABLE XVII**

**COMPARISON OF STUDENTS’ RATINGS ON STUDENT-CENTEREDNESS SCALE IN STUDENT-CENTERED AND TEACHER-CENTERED GROUPS**

(N = 40 students in each group)

<table>
<thead>
<tr>
<th></th>
<th>Student-centered Group</th>
<th>Teacher-centered Group</th>
<th>Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>76.5</td>
<td>52.4</td>
<td>24.1</td>
<td>14.34</td>
<td>&gt;.001</td>
</tr>
</tbody>
</table>

There are eighteen items on the scale, with the possible score ranging from one to five points for each item. Five points represent student-centeredness, and one point represents the maximum amount of teacher-centeredness. Therefore, the lowest possible score on the instrument is 18 and the maximum score is 90.

It is noted that the mean score for the student-centered group was 76.5, while the mean for the teacher-centered group was 52.4. The mean difference between the two groups was 24.1 points. The significance was greater than the .1 per cent level. It was concluded that it was possible for the
teacher of these groups to maintain a significant difference between the classes as perceived by the students.
CHAPTER BIBLIOGRAPHY


CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter is divided into three major parts. The first section consists of an over-all summary of the problem, procedures, and results. A presentation of the conclusions drawn from this study is given in the second section. Recommendations are presented in the final section.

Summary

The primary purpose of this study was to determine the comparative effectiveness of student-centered and teacher-centered groups in producing significant changes in certain critical thinking abilities among selected freshman students at North Texas State College.

An experiment was designed with matched subjects to investigate the outcome of critical thinking when influenced by the teaching method variable. A secondary aim was to re-evaluate the attitude of students in the two situations.

The experiment was conducted during the first semester of the 1960-61 academic year in the School of Education at North Texas State College, Denton, Texas. The four classes of Education 161, "Psychology of Personal and Social Development," used in the study contained 108 students. From this
group, eighty subjects were matched in terms of intelligence, age, and first semester in college. The difference between the number of subjects in the experiment and the total number in the classes was caused by some disqualifications for failure to meet the matching requirements. The experimental and control classes were taught by the same instructor. The method used in the experimental classes followed previously established criteria for student-centered teaching as closely as possible within the limits of the college setting. The control classes were taught by a teacher-centered process. A complete schedule of assignments was presented at the beginning of the term. Lectures, tests, questions, outside reading, research assignments, and general forward movement was directed by the instructor in the teacher-centered classes.

Students of the experimental group were matched with subjects of the control group. The Otis Quick-scoring Mental Ability Test was administered at the beginning of the term to secure matching scores. The Watson-Glaser Critical Thinking Appraisal was administered to all students in the classes at the beginning of the term and again at the end of the semester. An attitude questionnaire and the Schuman Student-centeredness Scale were administered at the end of the semester.

The experimental group increased significantly in critical thinking when compared with the subjects of the control group. However, on some of the subtests the
student-centered group gain was not enough to be considered significant.

Subgroups were established among lower and upper intelligence levels and comparisons were made between the student-centered and teacher-centered groups. It was found that students in the student-centered groups in both levels of intelligence made gains in critical thinking. However, the student-centered subgroup in the upper level of intelligence did not differ significantly from the teacher-centered subgroup. The student-centered subgroup at the lower level of intelligence produced a mean gain greater than the 10 percent level of significance.

When subgroups among elementary and secondary education majors were established and comparisons made between the two teaching methods, it was found that both subgroups made gains in critical thinking in the student-centered classes. Subgroup subjects in the teacher-centered classes made slight losses in critical thinking between pre-test and end-test scores. Students majoring in secondary education made higher scores in the student-centered classes and greater loss in the teacher-centered classes than did the elementary majors. These differences, however, were not significant.

The actual mean differences in various phases of the experiment are summarized below:

1. Subgroup comparisons in elementary and secondary education majors and in levels of intelligence showed
a gain among students in the student-centered group. The lower intelligence level was the only subgroup producing a difference great enough to be considered significant. This difference was slightly less than the 5 per cent level of significance.

2. The student-centered group provided a mean difference score of 4.598 above the teacher-centered subjects in critical thinking. The significance was greater than the .01 level.

3. A slight gain was made by the student-centered subjects on each of the subtests of the Watson-Glaser test of critical thinking when compared to the teacher-centered group.

4. Subjects in the student-centered group had a more favorable attitude toward the instructor. It was noted that 90 per cent of the statements concerning the instructor were positive in the student-centered group, compared to 65 per cent positive statements in the teacher-centered classes.

5. Student-centered subjects preferred the student-centered method when compared to teacher-centered classes. Seventy-six per cent of the statements were positive in the student-centered group, compared to 59 per cent in the teacher-centered classes.

6. There appeared to be no difference in attitude toward other students in the two groups. About 70 per cent of the statements were positive in both groups.
7. Students in student-centered classes believed the teacher had a more favorable attitude toward them when compared to subjects in the teacher-centered classes. Responses from subjects in the student-centered group were 92 per cent positive, compared to 67 per cent positive responses in the teacher-centered group.

8. Student-centered subjects made more positive and fewer neutral statements than teacher-centered subjects toward each attitude investigated. This implies that student-centered subjects feel more capable of making decisions than teacher-centered subjects.

9. The same instructor teaching two groups by different methods was able to maintain a difference in the classes as perceived by the students. The significance of the difference was greater than .1 per cent.

Conclusions

The major hypothesis, "students in student-centered classes will show no significant changes in the selected aspects of critical thinking when compared with students in teacher-centered classes," was rejected at the 1 per cent level of significance. The difference was in the direction of the student-centered group.

The first subhypothesis, "a group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Inference thinking when compared
with a group of students in teacher-centered classes," was accepted as nonsignificant in terms of no difference between the two groups.

The second subhypothesis, "a group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Recognition of Assumptions when compared with a group of students in teacher-centered classes," was accepted as nonsignificant. Although the subjects in the student-centered classes made greater gains than the teacher-centered group, the gains were not enough to fall within the 10 per cent level of significance.

The third subhypothesis, "a group of freshmen students enrolled in student-centered classes will not gain significantly in adequacy of Deduction when compared with a group of students in teacher-centered classes," was rejected at the 10 per cent level of significance. The student-centered group made greater gains in deduction ability when compared with the teacher-centered group.

The fourth subhypothesis, "a group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of Interpretation when compared with a group of students in teacher-centered classes," was rejected at the 5 per cent level of significance. The student-centered group made greater gains in interpretation ability when compared with the teacher-centered group.
The fifth subhypothesis, "a group of freshmen students enrolled in student-centered classes will not differ significantly in adequacy of evaluation of arguments when compared with a group of students in teacher-centered classes," was accepted. Although the student-centered group had a higher mean score than the teacher-centered group, the difference was not significant within the 10 per cent level.

How do students feel toward certain aspects of the learning situation? An analysis of an open-ended attitude questionnaire implied the following points:

1. Subjects in the student-centered classes projected a more favorable preference for the teacher when compared to subjects in teacher-centered classes.

2. Students preferred the student-centered method. The difference was 24.66 per cent in the direction of the student-centered group.

3. Feelings toward other class members and perception of others' attitudes toward the student did not differ to any large extent between the two groups.

4. The students' perception of the attitude of the instructor toward the student was positively in the direction of the student-centered group. There was a difference of 25.31 per cent positive statements expressing a favorable attitude toward the instructor in the student-centered group.

Did the instructor maintain a difference in the teaching variable between the groups? The Schuman Student-centeredness
Scale was administered at the end of the term. The results of the two groups were compared and the significance of the difference was determined at more than the .1 per cent level.

From the results of this study it seems warranted to conclude that students in student-centered classes gain in critical thinking, are better able to make judgments about the classroom situation, believe the instructor likes them, they like the instructor, and generally prefer their classes when compared to teacher-centered classes. This seems to indicate that when improvement in thinking abilities is desired, teachers could be more effective toward this objective by providing more student-centered opportunities. Furthermore, when education and training demand a product that is better able to make either positive or negative decisions, the educative process could give further assistance toward this goal by providing more opportunities for decisions, as is the case in student-centered situations.

It is also demonstrated that teachers could be more popular with the students, thereby creating more favorable learning situations, when the classes are more student-centered and less teacher-centered. This implies that students should be placed in many student-centered situations that are especially suited to the development of thinking.
Recommendations

The results of this study provide implications for further research to test the validity of interpretations in the following areas:

1. It would be helpful to find out if the gains in critical thinking are retained.

2. It appears that further study is justified to determine if the gain in critical thinking will provide the basis for increasing academic efficiency.

3. Additional studies are needed to ascertain if students in lower levels of intelligence need more classroom freedom to produce gains in critical thinking like that provided in student-centered situations, than do students with higher levels of intelligence.

4. As previously noted, some students make more gains in critical thinking in student-centered classes than others. The educative process would be improved if research could provide a description of the type of personality that benefits most from student-centered classes.
APPENDIX A

Education 161

Procedure, Requirements, and Evaluation

1. Own a new textbook and pay for testing materials.

2. Read and study the assigned chapter before class discussion.

3. Learn the name and location of each building on the campus.

4. Learn names of the college deans, department heads, and their relationship to the student.

5. Neatly and systematically underline "key" and "important" sentences in each paragraph of the text as you study for the class discussion.

6. Fill in the pages designed for your guidance. This must be kept up to date as the course develops.

7. The research and creative papers must be developed as assigned. Three points per day will be deducted for each day late. It will not be accepted on or after the 11th day after due day.

8. Learning is facilitated through verbal discussion and daily attendance. Your participation is required.

9. All assignments of this course are required.

10. The final grade of each student will be determined as follows:

   1. Test No. 1: Campus orientation.
   2. Test No. 2: Chapters 5-10 and 17-20, inclusive.
   3. Test No. 3: Chapters 11-15 and 21-23, inclusive.
   4. Final examination: Chapters 1-23.
   5. Instructor evaluation of workbook-text.
   7. Creative paper on "My Philosophy."
APPENDIX B

Education 161

Assignments and Activities

September, 1960

Friday, 16 - Introduction of course.
Monday, 19 - Campus orientation.
Wednesday, 21 - Campus orientation.
Friday, 23 - Chapter 1 - textbook.
Monday, 26 - Chapter 2 - textbook.
Wednesday, 28 - Chapters 2 and 3 - textbook.
Friday, 30 - Chapters 3 and 4 - textbook.

October, 1960

Monday, 3 - Personal Data Inventory.
Wednesday, 5 - Schrammel-Gray Reading Test.
Friday, 7 - SCAT, Parts 1 and 2.
Monday, 10 - SCAT, Parts 3 and 4.
Wednesday, 12 - Kuder Preference Record—Vocational Form CM.
Friday, 14 - GATE, Book I.
Monday, 17 - GATE, Book II.
Wednesday, 19 - Mooney Problems Check List.
Friday, 21 - Guilford-Zimmerman Temperament Survey.
Monday, 24 - Chapter 3.

Note: Questions and activities in this chapter should be completed. This is true for all following chapters in your workbooks as assigned.

Wednesday, 26 - Chapter 3.
Friday, 28 - Examination.
(1) Building locations.
(2) College officials.
Monday, 31 - Chapter 5.

November, 1960

Wednesday, 2 - Chapter 6.
Friday, 4 - Chapter 7.
Monday, 7 - Chapter 8.
Wednesday, 9 - Chapter 9.
Friday, 11 - Chapter 10.
Monday, 14 - Chapters 17 and 18.
Wednesday, 16 - Chapters 18 and 19.
Friday, 18 - Chapter 20.
   Note: A term paper will be assigned today.
Monday, 21 - Examination.
Wednesday, 23 - Chapter 11.

Thanksgiving holidays.

Monday, 28 - Chapter 12.
Wednesday, 30 - Chapter 13.

December, 1960

Friday, 2 - Chapter 13.
Monday, 5 - Chapter 21.
Wednesday, 6 - Chapter 21.
   Note: Term paper assigned November 13 is due.
Friday, 9 - Chapter 23.
Monday, 12 - Lecture on philosophy - Dr. Roderic DuChemin.
   Note: A term paper will be assigned today.
Wednesday, 14 - Developing a personal philosophy.
Friday, 16 - Examination.
Monday, 19 - Lecture on personality development.
Wednesday, 21 - Personality development, continued.

Christmas holidays.

January, 1961

Wednesday, 4 - Lecture on love.
Friday, 6 - Chapter 14.
Monday, 9 - Chapter 15.
Wednesday, 11 - Chapter 16.
   Note: Workbook is due for grading. It is to be turned in to the instructor on this date.
Friday, 13 - Watson-Glaser Critical Thinking Appraisal.
   Note: Term paper assigned on December 12 is due.
Monday, 16 - Course evaluation.
   Note: Workbooks will be returned on this date.
Wednesday, 18 - Course evaluation.
Friday, 20 - Final examination.
APPENDIX C

Class

**Attitude Questionnaire**

Your frank reactions to these questions will be appreciated. Be as accurate and as specific as you can. The more accurately and specifically your reactions are stated, the more useful they will be. PLEASE DO NOT SIGN YOUR NAME OR IN ANY WAY REVEAL YOUR IDENTITY.

How do you feel toward the instructor of this class?

How do you feel about what has happened in this course during the semester?

How do you think the students in this class feel toward you?

How do you think the instructor of this class feels toward the students in this class?

How do you feel toward other students in this class?

*In actual use, this questionnaire allowed one-half page of space for each answer.*
APPENDIX D

Schuman Student-Centeredness Scale*

Name______________________ Class Hour____________________

Class______________________ Teacher____________________

Circle number most nearly expressing your impression of class:

1. Ideas and suggestions that are later acted on arise:
   1. Almost wholly from the students.
   2. Largely from the students.
   3. Partly from the students and partly from the teacher.
   4. Largely from the teacher.
   5. Almost wholly from the teacher.

2. Classroom procedure is determined:
   1. Chiefly by the teacher.
   2. Mostly by teacher, a little by the students.
   3. Partly by teacher, partly by students.
   4. A little by teacher, mostly by the students.
   5. Chiefly by the students.

3. The students are _______ free to criticize statements by the teacher.
   1. Almost always
   2. Often
   3. Occasionally
   4. Seldom
   5. Almost never

4. The teacher gives his ideas:
   1. Practically never.
   2. Only at the request of the student.
   3. Only after the students have expressed their ideas.
   4. Right along with the students.
   5. Before the students express their ideas.

5. The teacher directs the students' work:
   1. Never.
   2. Only after the student requests direction.
   3. When he senses that the student needs it.
4. After the student has tried for himself but before the student requests direction.
5. Before the student has chance to try for himself.

6. The amount of work the students do seems to be a function of:
   1. Chiefly what the teacher wishes.
   2. Mostly what the teacher wishes and a little of what the student wishes.
   3. Partly what the teacher wishes and partly what the students wish.
   4. A little what the teacher wishes and mostly what the students wish.
   5. Chiefly what the students wish.

7. The teacher evaluates the students' comments in class (such as good-bad, right-wrong, smart-dumb):
   1. Practically never.
   2. Seldom
   3. Occasionally
   4. Often
   5. Almost always

8. The classroom procedure is:
   1. Chiefly lecture.
   2. Mostly lecture and a little discussion.
   3. Some lecture and some discussion.
   4. A little lecture and mostly discussion.
   5. Chiefly discussion.

9. There is restriction placed on intercommunication of students with each other, even though they be in different parts of the room.
   1. Practically no
   2. Little
   3. Some
   4. Much
   5. Very much

10. Students are given the opportunity to express their ideas.
    1. Practically never
    2. Seldom
    3. Occasionally
    4. Very often
    5. Almost always
11. The use and disposition of the equipment and materials is determined:

1. Chiefly by the students.
2. Mostly by the students and a little by the teacher.
3. Partly by the students and partly by the teacher.
4. A little by the students and mostly by the teacher.
5. Chiefly by the teacher.

12. The teacher _____ requires that the students confine themselves to the subject matter in class.

1. Practically always
2. Usually
3. Sometimes
4. Very seldom
5. Practically never

13. The topics to be considered in class are determined:

1. Chiefly by the teacher.
2. Mostly by the teacher and a little by the students.
3. Partly by the teacher and partly by the students.
4. A little by the teacher and mostly by the students.
5. Chiefly by the students.

14. The activities and work of the student tends _____ to reflect his particular interests.

1. Hardly at all
2. A little
3. Somewhat
4. A lot
5. Chiefly

15. The teacher seems _____ willing to let the student arrive at his own conclusions even if the conclusions are quite different from the views held by the teacher.

1. Un-
2. Not very
3. Somewhat
4. Quite
5. Completely

16. The teacher brings _____ pressure to bear on pupils to speed their learning progress.

1. Tremendous
2. Considerable
3. Some
4. Little
5. Practically no

17. Class or group goals are:

1. Chiefly determined by the teacher.
2. Mostly determined by the teacher and a little by the student.
3. Determined partly by the teacher, partly by the student.
4. Determined a little by the teacher and mostly by the student.
5. Chiefly determined by the student.

18. The teacher tries:

1. Chiefly to impart his ideas to the student.
2. Mostly to impart his ideas and a little to understand the students' ideas.
3. Partly to impart his ideas and partly to understand the students' ideas.
4. A little to impart his ideas and mostly to understand the students' ideas.
5. Chiefly to understand the students' ideas.

COMMENTS:

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