

THE RELATIVE EFFECTIVENESS OF
PROSE TEXT, LINEAR PROGRAMMED
INSTRUCTION AND BRANCHING
PROGRAMMED INSTRUCTION IN
TEACHING COUNSELING THEORIES

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This is to certify that the

thesis entitled

THE EFFECTIVENESS OF PROSE TEXT, LINEAR PROGRAMMED
INSTRUCTION AND BRANCHING PROGRAMMED INSTRUCTION
IN TEACHING COUNSELING THEORIES

presented by

AVRAHAM SCHERMAN

has been accepted towards fulfillment
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ABSTRACT

THE RELATIVE EFFECTIVENESS OF PROSE TEXT, LINEAR PROGRAMMED INSTRUCTION AND BRANCHING PROGRAMMED INSTRUCTION IN TEACHING COUNSELING THEORIES

By

Avraham Scherman

The purpose of this study was to assess the differential effects which prose text, linear programmed instruction and branching programmed instruction may have on measures of retention of information, application of information, time spent in study, and finally on motivation and attitudes of counselor trainees toward each of the three types of instruction. It was suggested that programmed instruction was a promising method of improving instruction in a Counseling Theories Course at the graduate level and that a systematic investigation should be made of this instructional procedure.

Ninety one master's degree candidates in counseling at Michigan State University, enrolled in a Counseling Theories Course being taught at three locations (East

Lansing, Grand Rapids and Pontiac), were randomly assigned to one of the three instructional conditions: prose text, linear programmed instruction and branching programmed instruction. Pre- and post-tests covering the content of the entire course, post-tests that followed each instructional unit, and a questionnaire concerning attitudes and motivation of students were administered to each of the subjects.

No significant differences were found in terms of overall treatment effect; however, a significant location effect was found. In addition, a significant difference between treatments over repeated measures was found. The prose text group performed consistently lower than the other two groups. Differences in attitudes were found mainly between the sexes with regard to amount of time needed for study, effectiveness of the course, references included in the material, concentration, and interest and stimulation.

The reported results could be attributed to a number of possible contributory factors such as theory, sampling, design and statistics, instrumentation and treatments. Each of these factors were discussed and their possible influence was presented.

Differences between sexes appeared to be one of the primary variables that should be further investigated.

Avraham Scherman

Programmed instruction appeared to be a promising mode of instruction and further research should be conducted to identify its major effects in counselor training programs.

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LINEAR PROGRAMMED INSTRUCTION AND
BRANCHING PROGRAMMED INSTRUCTION
IN TEACHING COUNSELING
THEORIES

By

Avraham Scherman

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CHAPTER I

THE PROBLEM, RATIONALE, AND RELATED RESEARCH

Need

Educational technology has grown in importance during the past decade as psychologists and educators have wrestled with the task of improving instruction and learning. Educational television, instructional games, different types of audio-visual aids, teaching machines, programmed instruction and computer assisted instruction have, slowly but steadily, come to be perceived as important elements in the design of instructional strategies and programs. Multi-media instructional programs are to be found with increasing frequency in elementary and secondary schools, community colleges, and in undergraduate programs of higher education. In graduate courses, however, educational technology has not had the same impact. The principal mode of instruction in graduate classes continues to be the lecture-recitation method.

Counselor education, which is usually classified as graduate study, has continued to be dominated by the traditional methods of instruction. While there have been

some studies reporting the use of audio-visual aids, audio and video tapes, micro-counseling, and simulation techniques in counselor education (Landsman and Lane, 1963; Kagan and Krathwohl, 1967; Dunlop, 1968; Poling, 1968; and Ivey, Normington, Miller, Morril and Haase, 1968), many of the dimensions of the educational technology currently available have yet to be investigated. One of these dimensions is programmed instruction. As yet, there are no reports of the experimental use of programmed instruction in counselor education. There are no reports of the effectiveness, efficiency, motivation and attitudes of students or the cost of such a mode of instruction when compared to traditional methods.

Purpose

The primary purpose of this study was to assess the retention and application of information concerning counseling theories learned by use of linear and branching programmed instruction as opposed to the same material presented in prose text. Retention and application were assessed both immediately after students completed their study of individual instructional units and as an overall gain upon completing the entire course.

An additional purpose was to investigate the amount of time spent on learning for each of these forms of instruction. Finally, an attempt was made to assess

differences in motivation and attitudes of students toward each of the three types of instruction.

The objective of this study was to determine if any of these three types of instruction produced a significant effect on the measures that were administered to counseling trainees in the Michigan State University M.A. Counselor Training Program during a course entitled "A Seminar in Counseling Theories."

Theory and Related Research

The history of programmed instruction began with the research of Pressey (1926, 1927, 1932). Initially, he was interested in the scoring of tests and built a machine that did not move to the next question until the student correctly answered the question he was currently studying. Thus, the student knew immediately whether he was correct or not; he received immediate feedback. Pressey found that students using this machine and getting feedback actually learned the material on which they were being tested. His machine scoring can be considered the first teaching machine of our time. But Pressey had no real influence on educational theory or practice at the time he published his results. His work was ignored by educational institutions for a number of years.

Programmed instruction did not reach general attention and influence until the publication of Skinner's

article in 1954, "The Science of Learning and the Art of Teaching." According to Skinner, a child performed learning tasks in order to escape aversive stimuli. He suggested that principles of learning theory should be employed in teaching. Later, Skinner (1954, 1958) described a machine in which the important features were immediate reinforcement for the right answer and individually self-paced learning. The material is presented in sequential order, and the student responds overtly to the material. There is an interaction between the student and the material to be learned. On the basis of reinforcement theory, the student is rewarded immediately on each correct response. Such a program usually consists of small steps or frames, each containing 20 to 30 words. This is a stimulus-response pattern with immediate feedback of results. Skinnerian programs are called linear programs because of their step-by-step presentation. Skinner's ideas were accepted by many people who were interested in improving practical aspects of education.

Crowder (1959, 1960) developed what is termed branching programmed instruction. He believed that people in everyday life are confronted with situations in which they have to make decisions. In these circumstances they make mistakes. When a learner makes a mistake he should be branched. The term "branched" means that the material to be learned is explained to the learner in a new way or

he is directed to a remedial sub-routine. Thus, a branching frame usually has more material than a linear frame. Answers to the frames determine how the student is branched through the different parts of the program and how many frames he will have to study.

What are some characteristics of programmed learning that seem to be common to all methods? Macdonald-Ross (1969) in summarizing the research on programmed instruction in the 1960's listed several important characteristics of programmed learning. First of all, programmed learning requires clearly stated objectives. They are needed in order to define precisely what is going to be taught (what the student is supposed to know at the end of instruction) and to make it possible to develop ways of measuring whether learning has in fact taken place (criterion test). The objectives (Macdonald-Ross, 1969) should be behavioral objectives, written in observable and measurable terms.

Another characteristic is the feedback controls made available in programmed instruction. The immediate checking of the right answer serves as a reinforcer. Anderson, Kulwavy and Andre (1971) in a recent article, report a study of 356 subjects who completed a computer-based instructional lesson which insured that the subject responded before he received knowledge of the correct response (KCR). Students who received KCR after every frame performed better on the criterion test than students who

were tested on the same criterion without receiving KCR. It was suggested that students attempting to read the KCR before responding performed poorly on the criterion test.

An additional common characteristic of programmed instruction is the fact that it is essentially an individualized method of instruction. Each individual progresses at his own pace in making responses and getting feedback, or in the case of branching programs, follows a unique path through the learning process according to his responses.

To this point the theory and assumptions underlying linear and branching programmed instruction and the general characteristics of these types of instruction have been presented. Another vital question is: Do students learn from programmed instruction? Schramm (1964) in his review of the research on programmed instruction mentioned 36 experiments comparing different types of programs with conventional classroom instruction. Sixteen of these experiments were done in colleges, four in secondary schools, five in primary schools, 10 with adults and one with retarded children. Of the 36 experiments, 18 showed no significant differences when the two groups were measured on the same criterion test. Seventeen showed a significant increase for classroom students working with programmed instruction, and only one showed a favorable significant increase for students taught in a conventional way. In addition, a number of studies have shown that programmed

material is more effective or efficient for retention of information, time spent on learning and application of learned material than are prose text and conventional ways of instruction (Pressey, 1963; Hough, 1962b).

Roe (1962) reported on research conducted with 189 freshman engineering students. The program consisted of an introduction to certain probability concepts written in linear and branching forms. Significant learning took place with both programs. But when considering programs separately, there were no significant differences between any of the simple branching methods and the linear program when measured by the amount of learning that took place. However, it was determined that a logical sequenced program resulted in more learning than did a random sequenced program.

On the other side, Shull (1969) in a recent study reported a difference between branching and linear programmed instruction. One hundred and twenty students from Ohio University, registered in Industrial Arts and Technology, were assigned to one of three groups: control, linear and branching. The control group received only a post-test. The linear group received the linear programmed instruction and the post-test, and the branching group received the branching programmed instruction and the post-test. The findings indicated a significant difference at the .05 level of significance in favor of the branching group.

An additional issue relevant to the topic of this study is the attitudes and motivation of students learning a course through programmed instruction. Nauman (1962) described the performance reactions of about 40 college students who worked the first third of the Holland-Skinner psychology program written in 1961. Seventy-five percent of the students indicated that without a teaching machine they would have learned much less from the course. The use of self-instructional programs was favored by 64 percent of the group, and 59 percent of the group preferred such a type of instruction. Other reactions of students reported in this study include: (1) about one-fourth of the students felt that at some point during the course they were treated like experimental organisms. A small minority felt that the use of teaching machines reflected adversely upon their dignity as human beings. (2) About two-thirds of the group stated that they thought the instructor was trying to teach as much as possible within the limits of basic reality consideration. (3) The final point was a statement about the possible lack of opportunities to reflect on the material learned and to consider its implications.

Programmed instruction should not be judged solely on how well students learn from this method when compared to other types of instruction. Other variables are also important and should therefore be taken into consideration.

For example, how much time does a student require to learn a certain amount of information? Is programmed learning more effective concerning retention and/or application of information? Do students learning through programmed instruction differ in attitudes and motivation when compared to students learning the same material through conventional ways? How effective is programmed instruction in teaching the types of students who enroll in counselor education programs?

In view of the above analysis, the present study was designed to investigate linear and branching programmed instruction as an approach to teaching counseling theories. This experimental study investigated (a) retention of information, (b) application of information, (c) time spent studying, and (d) motivation and attitudes toward learning with each of the methods used.

Hypotheses

To investigate the questions raised by the investigator, the following hypotheses were developed.

1. Students receiving linear programmed instruction and students receiving branching programmed instruction will score significantly higher than students receiving prose text instruction on the same objective post-test when compared with scores

on a parallel objective pre-test that assesses retention and application of counseling theories information.

2. Students receiving linear programmed instruction and students receiving branching programmed instruction will score significantly higher on the same immediate criterion tests concerning retention and application of counseling theories information than students receiving prose text.
3. There will be no significant difference in time spent in learning the same material taught by means of linear programmed instruction, branching programmed instruction and prose text instruction.
4. There will be no significant difference in motivation and attitudes of students taught counseling theories by prose text, by linear programmed instruction or by branching programmed instruction.

Overview

In Chapter I the problem was introduced, theory and related research were reviewed and hypotheses were stated. In Chapter II the subjects, treatments, procedures, and instruments will be described; the research design identified, and the hypotheses, statistical analysis and level of significance presented. In Chapter III the results of

the data analysis will be reported. Chapter IV will conclude the study with a discussion of the results and some suggestions for further research.

CHAPTER II

EXPERIMENTAL DESIGN AND METHODOLOGY

After reviewing the literature, stating the hypotheses and describing the purpose of the study as presented in the previous chapter, an experimental study was planned and conducted.

Subjects

Students enrolled during the Fall term of 1971 for the late afternoon section of the Master's program in Counseling at Michigan State University and in night classes at two off-campus extension centers in Grand Rapids and Pontiac, Michigan, served as treatment subjects for this study. Of the 98 students initially available, 91 students became subjects for the study. Seven students who failed to take either (a) the pre-test, (b) the post-test, or (c) two or more measures given immediately after studying an instructional unit were excluded from the study. It was assumed that predicting more than one score, or one of the overall measures can introduce an uncontrolled error effect. The scores of seven students failing to take only

one test given after a unit were predicted using a multiple regression computer program (Appendix A).

No descriptive information was available for three subjects who dropped the program. Thus, the resulting group of experimental subjects for which information was available consisted of 45 male and 43 female counselor trainees. Thirty-four males and 35 females were specializing in a school counselor program. Eleven males and eight females were specializing in a rehabilitation counseling program. The subjects ranged in age from 21 to 47 years, with a median age of 26 years and a mean age of 28.6 years. Sixty-one of them were married and 27 were single.

Twenty-five subjects received their bachelor's degrees from Michigan State University, 39 received their degrees from other colleges or universities in Michigan, and 24 from colleges or universities outside the state. The most common undergraduate major, with a variety of major fields represented, was Secondary Education (28 Ss). Other areas strongly represented were Psychology (14 Ss), Elementary Education (12 Ss) and Social Sciences (12 Ss). Less common majors were Art (5 Ss), Business (2 Ss), Foreign Language (1 Ss), and Speech Therapy (1 Ss). Fifty-seven subjects were currently employed as teachers, with a mean experience of 4.73 years (25 Ss had three years experience or less and 32 Ss had four years or more of

experience). Thirteen Ss were full-time students, and the remaining 18 Ss were employed in a number of different occupations.

Instructors

Two faculty members of the department at Michigan State University conducted the classes at the three sites. Both held the rank of associate professor and both had taught counselor education courses for several years.

Treatments

A course in Counseling Theories consisting of eight units was designed by the investigator. Each unit was written in three forms: prose text, linear programmed instruction and branching programmed instruction. These instructional units served as the three treatment conditions.

The units were developed in stages. First, the topics of the units were identified and an outline of each unit was developed. Review of available literature was conducted and the prose text instructional materials were written. Professors and students in the department read the units and their comments were incorporated in the revisions. The units were then administered to two students with similar academic status to the students to be used in the study. Attention was given to time necessary for

completion of reading assignments and clarity of the information provided. A post-unit measure followed in which attention was given to clarity of questions and analysis of items students marked wrong. Then a final form of the unit was prepared. On the basis of the prose text units, the linear and branching programmed instruction units were developed. These were also tested with students and revised.

The content of this course was presented in the following order:

- Unit I : From a General Concept of Theory to Counseling Theories.
- Unit II : Review of Counseling Theories, Learning and Classical Conditioning.
- Unit III : Operant Conditioning.
- Unit IV : Social Learning.
- Unit V : Joseph Wolpe - Reciprocal Inhibition.
- Unit VI : John D. Krumboltz - Behavioral Counseling.
- Unit VII : Ayllon & Azrin - The Token Economy
- Unit VIII: How the Systems Approach and Learning Principles Integrate into Behavioral Counseling.

The differences between the three treatments, concerning directions given to students prior to beginning work on a unit, and the presentation of the same material in the three different ways are illustrated by the

following examples taken from instructional units developed for this investigation.

Treatment N - Prose Text

DIRECTIONS

1. Read carefully the following material.
2. You are allowed to take notes for future use.
3. When you feel you know the material, hand it back to the instructor.
4. You will be asked to answer 20 multiple choice questions on this material.

Unit V: JOSEPH WOLPE - RECIPROCAL INHIBITION

Wolpe was educated in South Africa, where he received his M.D. from the University of Witwatersrand, Johannesburg in 1948. He served at this university as a lecturer in the years 1949-1959, except for the years 1956-1957 when he was at Stanford. From 1960 to 1965 he was a professor of clinical and research psychiatry at the University of Virginia, and since 1965 he has been professor of psychiatry at the School of Medicine at Temple University.

Dissatisfaction with psychoanalytic methods of treating anxiety led Wolpe to search for more effective ways to deal with it. He turned to the experimental works of Pavlov, Jones, Watson and Masserman on developing experimental neuroses in animals. In the years 1947 and 1948, Wolpe carried out experiments that produced anxiety in cats. Anxiety, as demonstrated in the experiments, is not a product of damage or disruption in the nervous system due to a conflict, but a product of learning. Cats were conditioned to approach food at the sound of a buzzer. After the response to the buzzer-conditioned stimulus was stable, a change occurred. After the buzzer sounded, the animal moved toward the food, but before the food was reached a shock was delivered to the cat. Shocks were repeated until the cat ceased to respond to the buzzer. As a consequence of this treatment the cats were resistant to being put into the experimental cage. They showed signs of anxiety when being in the cage, and they refused to eat anywhere in the cage even after two or three days of starvation.

Wolpe found that he could eliminate these anxiety reactions by feeding the cats in places that were not similar to those that produced the shock and anxiety.

Then, as the animal appeared to be less anxious, Wolpe gradually approximated the original situation until at the end the cat could eat in the cage without any disturbance. These experiments are reported in Wolpe's presentation of a systematic application of learning theory in his book Psychotherapy by Reciprocal Inhibition (1958).

Treatment L - Linear Programmed Instruction

DIRECTIONS

1. Read carefully the following material.
2. Use the card provided to expose only one frame at a time. Answer what you are asked before looking at the correct answer which appears at the beginning of the next frame.
3. When provided with _____, insert the correct word.
4. When provided with _____, (true/false), choose one correct answer from the two, and insert it in the provided blank.
5. When a multiple choice question appears, decide which is the correct answer. (might be more than one)
6. When you finish, turn your material in to the instructor.
7. You will be asked to answer 20 multiple choice questions on this material.
8. You may take notes for future use.

Unit V: JOSEPH WOLPE - RECIPROCAL INHIBITION

Wolpe was educated in South Africa, where he received his M.D. from the University of Witwatersrand, Johannesburg in 1948. He served at this university as a lecturer in the years 1949-1959, except for the years 1956-1957 when he was at Stanford. From 1960 to 1965 he was a professor of clinical and research psychiatry at the University of Virginia, and since 1965 he has been professor of psychiatry at the School of Medicine at Temple University.

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Wolpe found that he could eliminate these anxiety reactions by feeding the cats in places that were not similar to those that produced the shock and anxiety. Then, as the animal appeared to be less anxious, Wolpe gradually approximated the original situation until at the end the cat could eat in the cage without any disturbance. These experiments are reported in Wolpe's presentation of a systematic application of learning theory in his book Psychotherapy by Reciprocal Inhibition (1958).

_____ works of Pavlov, Jones, Watson and Masserman on developing neuroses in animals and _____ with the psychoanalytic methods of treating anxiety led Wolpe to search for more effective ways to deal with fears and phobias.

experimental, dissatisfaction

According to the experiments, anxiety is a product of

learning

Wolpe found that he could eliminate anxiety reactions in cats by feeding them in places which were _____ (similar to/different from) those that produced the shock and anxiety.

different from

Then, as the animal was less anxious, Wolpe _____ the original situation until at the end the cat could eat in the cage without disturbance.

gradually approximated

Treatment B - Branching Programmed InstructionDIRECTIONS

1. Read carefully the following material.
2. Use the card provided to expose only one frame. Answer what you are asked before looking at the correct answer. According to your answer go to the frame which you are directed to.
3. When provided with _____, insert the correct word.
4. When provided with _____, (true/false), choose one correct answer from the two, and insert it in the provided blank.
5. When a multiple choice appears, decide which is the correct answer.
6. When you finish, turn your material in to the instructor.
7. You will be asked to answer 20 multiple choice questions on this material.
8. You may take notes for future use.

Unit V: JOSEPH WOLPE - RECIPROCAL INHIBITION

Wolpe was educated in South Africa, where he received his M.D. from the University of Witwatersrand, Johannesburg in 1948. He served at this university as a lecturer in the years 1949-1959, except for the years 1956-1957 when he was at Stanford. From 1960 to 1965 he was a professor of clinical and research psychiatry at the University of Virginia, and since 1965 he has been professor of psychiatry at the School of Medicine at Temple University.

Dissatisfaction with psychoanalytic methods of treating anxiety led Wolpe to search for more effective ways to deal with it. He turned to the experimental works of Pavlov, Jones, Watson and Masserman on developing experimental neuroses in animals. In the years 1947 and 1948, Wolpe carried out experiments that produced anxiety in cats. Anxiety, as demonstrated in the experiments, is not a product of damage or disruption in the nervous system due to a conflict, but a product of learning. Cats were conditioned to approach food at the sound of a buzzer. After the response to the buzzer-conditioned stimulus was stable, a change occurred. After the buzzer sounded, the animal moved toward the food, but before the food was reached a shock was delivered to the cat. Shocks were repeated until the cat ceased to respond to the buzzer. As a consequence of this treatment the cats were resistant to being put into the experimental cage. They showed signs of anxiety when being in the cage, and they refused to eat anywhere in the cage even after two or three days of starvation.

Wolpe found that he could eliminate these anxiety reactions by feeding the cats in places that were not similar to those that produced the shock and anxiety. Then, as the animal appeared to be less anxious, Wolpe gradually approximated the original situation until at the end the cat could eat in the cage without any disturbance. These experiments are reported in Wolpe's presentation of a systematic application of learning theory in his book Psychotherapy by Reciprocal Inhibition (1958).

(GO TO FRAME 2)

FRAME 2

Which of the following led Wolpe to develop his method?

- a) dissatisfaction with psychoanalytic methods of treating anxiety.
- b) discovering that anxiety is a product of damage in the nervous system.
- c) influence of Skinner and Azrin.
- d) experiments on developing experimental neuroses in animals.

If your answer is a, d (GO TO FRAME 3)

If your answer is b, c (GO TO FRAME 4)

If your answer is b, d (GO TO FRAME 5)

FRAME 3

You said that dissatisfaction with psychoanalytic methods of treating anxiety and experiments on developing experimental neuroses in animals influenced Wolpe in developing his method. You are right! Good job!

(GO TO FRAME 6)

FRAME 4

No one of your choices is correct! Read the information again carefully.

(GO TO FRAME 1)

FRAME 5

You were right in saying that experiments like those of Pavlov, Jones, Watson and Masserman, on developing experimental neuroses in animals influenced Wolpe. But your second choice was incorrect; neuroses are not a

product of a damage in the nervous system, but rather a product of learning. Why don't you try to identify the correct answer?

(GO TO FRAME 2)

FRAME 6

According to the experiments, anxiety is a product of
 damage in the nervous system

(GO TO FRAME 7)

learning

(GO TO FRAME 8)

FRAME 7

No, anxiety is not a product of damage in the nervous system. It is a product of learning.

(GO TO FRAME 9)

FRAME 8

Correct! Anxiety is a product of learning!

(GO TO FRAME 9)

FRAME 9

Wolpe found that he could eliminate anxiety reactions produced in cats by feeding them in _____ places to those that produced the shock and anxiety. Then as the animal was less anxious Wolpe _____ the original situation.

similar, counter conditioned (GO TO FRAME 10)

different, gradually approximated (GO TO FRAME 11)

FRAME 10

You are not clear about the process. Read the following:

Wolpe found that he could eliminate these anxiety reactions by feeding the cats in places that were not similar to those that produced the shock and anxiety. Then as the animal appeared to be less anxious, Wolpe gradually approximated the original situation until at the end the cat could eat in the cage without any disturbance.

(GO TO FRAME 9)

FRAME 11

You were right! Feeding the cats in a different place and then gradually approximating the original situation is the way to eliminate anxiety reactions.

(GO TO FRAME 12)

Procedures

Within each of the three classes each individual student was randomly assigned to one of the three experimental treatments. Thus, in each class there were students representing each of the treatment groups which were part of the experiment.

In the first class meeting the following instructions were distributed to the students:

Education 882

SEMINAR IN COUNSELING THEORIES
Fall 1971

- I. Course Description. An introduction to counseling theories, with emphasis on approaches derived from principles of learning.
- II. Text. Patterson, C. H., Theories of counseling and psychotherapy. New York: Harper & Row, 1966.
- III. Purposes.
 - A. One of the principal aims is to describe and explain the theoretical basis of the M.A. training program for counselors at Michigan State University. First, a general concept of theory will be presented, and the relationship of this general concept to theories of counseling will be explained. General concepts of learning will then be presented, and theories or programs of research which utilize these concepts will be described. In the final unit the learning concepts and the related theories will be integrated,

and their relationship to the M.S.U. program will be explained.

- B. A second purpose is to acquaint students with major theoretical approaches to counseling which are not closely tied to principles of learning.
- C. A third purpose is to evaluate and improve the instructional methodology through which counseling theory is presented in the M.S.U. program. Your cooperation in this endeavor is earnestly requested and will be much appreciated.

IV. Procedures. Except for the first and last sessions, each class meeting will consist of two segments. In segment 1, the first part of each meeting, you will receive a written unit dealing with an aspect of counseling theory. Although the format of your unit will differ from that presented to some of your classmates, the content will be the same for everyone. You will be asked to learn this material in accordance with the directions provided. You will have a maximum of 75 minutes in which to complete this task. However, you may stop prior to the time limit if you are confident that you have learned the material. You may take notes on the material for future use if you wish. When you have completed the unit, or at the expiration of 75 minutes, you will be asked to take a short objective test. The test will be scored immediately, and you will receive feedback on your performance.

In segment 2, the concluding portion of each meeting, you will engage in a class discussion on a theory not covered by the written units. You will be asked to complete outside readings in preparation for each of these discussions.

It is important to note that only the written instructional units were included in the experimental study. The class discussions mentioned in the above paragraph were not a variable to be studied in this experiment.

After a short discussion on the content of the course description a pre-test consisting of 160 objective questions was administered. This concluded the first class meeting.

In the next eight weekly meetings the subjects were each given an instructional unit corresponding to the experimental group to which they had been assigned. The unit was in one of three forms: prose text, linear programmed instruction or branching programmed instruction. The subjects were told that they had 75 minutes to work on the unit, that note-taking was permitted and that they could stop at any time they felt they had learned the material. When they finished, the subjects were required to report the amount of time spent in studying the unit and were requested to return their units to the instructor. Each subject was then given a short objective test on the material presented in the unit just studied. Immediate feedback was provided and subjects of all three treatment groups were given the prose text form of the instructional unit and the test to take home for further study.

In the last weekly meeting (tenth meeting) the subjects were asked to evaluate the course through a questionnaire (Appendix B). Then, a post-test consisting of 160 questions (a parallel form of the pre-test) was administered.

Instruments

The instruments for assessing the retention of factual information and the application of this information to new situations were developed in the following

manner. A multiple-choice test consisting of 30 retention questions and 30 application questions was developed for each of five instructional units. The same procedure was used for the other three instructional units except that the content of these units was such that only 45-55 questions could be written.

The following are examples of questions designed to measure retention:

1. The first step in shaping is to
 - a) stop every reinforcing activity in order to raise motivation of client.
 - b) increase reinforcement of every activity.
 - c) wait and reinforce only the desired behavior.
 - d) reinforce an existing response which has some relation to the target behavior.
2. Krumboltz developed what is termed
 - a) systematic counseling.
 - b) psychological counseling.
 - c) counseling and therapy.
 - d) behavioral counseling.
3. A discriminative stimulus (S_D) is a(an)
 - a) unconditioned stimulus.
 - b) stimulus that sets the occasion for making a response.
 - c) stimulus that leads to nonreinforcement.
 - d) none of the above.
4. According to Wolpe, while taking the history of the client special attention is given to
 - a) early childhood experiences.
 - b) events that can serve as reinforcers during treatment.
 - c) precipitating events that appeared to aggravate the symptoms.
 - d) personality development of the client.

The following are examples of questions designed to measure application:

1. A client centered researcher will probably concentrate on
 - a) activities measured in audible or observable terms.
 - b) attitudes, views and values of the client.
 - c) bodily reactions to different situations the client encounters.
 - d) systematic desensitization and its effects on phobias.
2. Many couples are facing problems in their marriage. A program has been devised to acquaint seniors in a high school with financial, social, sexual, and individual problems faced by couples in marriage. The counseling goal is probably
 - a) altering maladaptive behaviors.
 - b) learning the decision making process.
 - c) socio-emotional counseling.
 - d) preventive counseling.
3. A football player found that every time he wore red sweat socks, his team would win. This is an example of
 - a) Premack's Principle.
 - b) classical conditioning.
 - c) fading.
 - d) superstitious behavior.
4. A student was told that if he would work on his math during study, he could use his free time period for gym. This is an example of
 - a) time out.
 - b) Premack's Principle.
 - c) classical conditioning.
 - d) superstitious behavior.

For the units for which 60 questions were devised, 30 retention and 30 application questions were randomly divided into three equal groups. In the units for which fewer than 60 questions were constructed, the procedure was as follows for both retention and application: (a) 10 questions were randomly selected to form one group. (b) From the remaining questions, 10 additional questions were selected and formed a second group. (c) The remaining

questions were part of the third group. To make this group consist of 10 questions, the 20 questions from the other two groups served as a pool of questions from which the missing ones were selected. Thus, it was possible for a questions to appear in two groups. Three groups of questions resulted which are represented in Table 2.1.

Table 2.1. Graphic representation of assigning questions to the different measures.

group	type of question	unit							
		I	II	III	IV	V	VI	VII	VIII
A	retention	10	10	10	10	10	10	10	10
	application	10	10	10	10	10	10	10	10
B	retention	10	10	10	10	10	10	10	10
	application	10	10	10	10	10	10	10	10
C	retention	10	10	10	10	10	10	10	10
	application	10	10	10	10	10	10	10	10

Group A consisted of 160 questions, 80 retention and 80 application, covering all the eight units. The questions were randomly ordered. This group served as the pre-test. The same procedure was used with group B, but these questions served as the post-test.

The questions in group C were divided into eight groups of 20 questions. Each group of questions measured retention and application for one instructional unit.

The 20 retention and application questions in each group were randomly ordered. These eight groups of questions served as immediate measures of each of the units presented in the weekly meetings.

A questionnaire was developed in order to assess attitudes and motivation of the subjects (Appendix B). The attitudinal questions concerned the amount of time to complete the reading of a unit, the material presented in a unit, references included in the material, general feelings about the course, and comparison of this type of instruction with the traditional lecture type course. Other questions were asked about attitudes toward repetition within units and about feelings as to the efficiency of the course.

Motivational questions were asked about the subject (Counseling Theories), the degree to which instruction stimulated outside class thinking, the willingness of students to take another course in this area and overall stimulation from the course.

Testable Hypotheses

In order to assess the difference between the three treatments employed as represented by the measures used, and on the basis of the hypotheses developed and described in Chapter I, the following testable hypotheses were formulated:

$$1. \quad M_{T1} = M_{T2} = M_{T3}$$

There will be no difference in post-test scores between the three treatment groups when the pre-test scores are serving as covariates.

2. There will be no interaction between time of testing and the factors of location and experimental treatments.

3. There will be no interaction between the immediate scores of retention and application and the factors of location and treatments.

4. There will be no interaction between repeated measures (including time, retention scores and application scores) and the factors of location and experimental treatment.

$$5. \quad \underline{M}_1 = \underline{M}_2 = \underline{M}_3$$

There will be no significant difference in motivation and attitudes, as measured by a questionnaire at the end of the three treatments.

Design and Statistical Analysis

The design, using the notation of Campbell and Stanley (1966), can be graphically represented as shown in Table 2.2.

The statistical analysis for overall gain in the course (post-test versus pre-test) was a multivariate

Table 2.2. Graphic representation of the research design.

Group		Time 1	Time 2	Time 3	.....	Time 9	Time 10
N	R	O_{pre}	$X_{11}O_1$	$X_{12}O_2$	.....	$X_{18}O_8$	O_{post}
L	R	O_{pre}	$X_{21}O_1$	$X_{22}O_2$	.....	$X_{28}O_8$	O_{post}
B	R	O_{pre}	$X_{31}O_1$	$X_{32}O_2$	.....	$X_{38}O_8$	O_{post}

Key: R - random assignment of subjects to groups.
 O_i - measure.
 O_{pre} - pre-test (covering the entire course).
 O_{post} - post-test (covering the entire course).
 X_{ij} - treatments.
 $i=1$ =treatment 1 = prose text.
 $i=2$ =treatment 2 = linear programmed instruction.
 $i=3$ =treatment 3 = branching programmed instruction.
 j =unit number

example: $X_{21}O_1$ means - linear programmed instruction for unit I followed by a measure on unit I (objective test).

analysis of covariance in which pre-test scores served as covariates. Time, and immediate retention and application were analyzed using a multivariate repeated measures Finn program. Attitudes and motivation were analyzed using Chi-Square tests. The five possible answers for each question on the questionnaire were ordered so that a weight

of one was given for the most negative attitude or motivation and a weight of five was given for the most positive one. Each question was tested separately on differences between treatments, between sexes, within each treatment and within sexes.

Summary

Counselor trainees enrolled at Michigan State University in East Lansing (afternoon), Grand Rapids and Pontiac were randomly assigned to one of three instructional conditions:

1. Prose text instructional material.
2. Linear programmed instruction.
3. Branching programmed instruction.

Pre- and post-tests on the content of eight instructional units in counseling theories, short post-tests following each unit, and a questionnaire dealing with attitudes and motivation were administered to each of the subjects.

Five hypotheses were stated in testable form concerning overall gain from instruction, time spent by students to study the units, immediate gain, attitudes of students and motivation of students. A repeated measures design including pre- and post-testing was adopted and the dependent variables were tested by multivariate and

univariate analysis of covariance and by multivariate and univariate repeated measures analysis. Attitudes and motivation were analyzed using Chi-Square tests.

CHAPTER III

ANALYSIS OF RESULTS

The Control Data 3600 computer system at the Computer Center at Michigan State University was utilized in calculating the statistical analyses. For each set of data reported, the program used to analyze the data will be described. The level of significance for all the tests was .05.

Retention and Application - Overall Gain

Cell means, variances and standard deviations for pre- and post-testing of retention and application of the information provided in the course entitled "Seminar in Counseling Theories" are reported in Tables 3.1 and 3.1.1.

Inspecting Tables 3.1 and 3.1.1, it appears that there is a difference in performance of the treatment groups on pre-tests in the different locations. The variance of the pre-tests and the variance of the post-tests are similar. Thus, a multivariate analysis of covariance was used to equalize initial differences and to detect any differences across treatments and/or locations.

Table 3.1. Cell means of retention and application according to location and treatment group.

group	location	East Lansing (n=24)		Grand Rapids (n=35)		Pontiac (n=32)	
		pre	post	pre	post	pre	post
N* (n=31)	ret.	26.25	70.50	25.75	63.17	34.55	66.55
	app.	27.50	69.87	30.83	66.50	34.55	65.45
L* (n=33)	ret.	32.50	69.25	30.36	66.14	31.73	62.64
	app.	37.00	72.00	33.21	69.71	36.82	64.82
B* (n=27)	ret.	34.50	70.12	29.67	68.33	34.10	63.90
	app.	34.62	72.37	37.67	69.67	36.90	65.80

*N=prose-text instruction. L=linear programmed instruction. B=branching programmed instruction.

Table 3.1.1. Variance and standard deviation of pre-tests (covariates) and post-tests for retention and application of information.

variable	variance	standard deviation
retention; pre-test	71.16	8.44
application; post-test	74.40	8.63
retention; pre-test	47.31	6.87
application; post-test	38.10	6.17

The initial step in the analysis was to check and determine if the covariate employed was in fact significantly related to the set of dependent variables. The

Chi Square Test for the hypothesis of no association between dependent variables (retention and application scores), and the independent variables (prose-text material, linear programmed instruction and branching programmed instruction) equalled 9.2783. With four degrees of freedom, the probability level was less than .0546 that the relationship which was found could occur by chance alone. This probability was quite low. It was decided that it was a sufficiently improbable occurrence to warrant the employment of the covariate in the further analysis. This decision did, however, cause a loss of two degrees of freedom to the researcher.

Table 3.2 contains the correlation coefficients between the covariate and the dependent variable.

Table 3.2. Regression analysis portion of the design with two covariates.

variable	multiple corr. with covariates	F	P less than
retention post-test	.2780	3.3505	.0401
application post-test	.3248	4.7161	.0116

There appears to be a significant correlation between post-test retention and application scores and the covariates (pre-tests). Thus, it was appropriate to conduct a multivariate analysis of covariance test for

treatments, locations and interaction between treatments and locations effects. Table 3.3 gives the results of such a test.

Table 3.3. Multivariate test for treatments, locations and interaction effects.

source	multivariate F value	degrees of freedom	P less than
location	4.9286	4,158	.0010
treatment	.4660	4,158	.7606
interaction	.4463	8,158	.8915

It is clear from Table 3.3 that there were no interaction effects ($p < .8915$). Thus, the main model did fit the data collected in this experiment. The next logical step in the analysis was to investigate the main effects for treatments and locations. Table 3.3 shows that there was no significant treatment effect ($p < .7606$), but there was a location effect ($p < .0010$).

In an attempt to identify the location differences, contrasts for location effects were performed. The results of the contrasts are reported in Table 3.4.

It is clear from Table 3.4 that the groups at East Lansing and Grand Rapids performed better than the group at Pontiac.

Table 3.4. Contrasts for location effects.

Contrast	Least square estimate of retention	Standard error of estimate	Least square estimate of application	Standard error of estimate
East Lansing - Pontiac	7.09	1.83	6.54	1.61
Grand Rapids - Pontiac	3.48	1.70	4.48	1.51

Retention and Application for
Repeated Measures

An orthonormalized K matrix was used to transform the 16 original (raw) scores to 16 new variables which reflect the design for the repeated measures. In this case, the design for repeated measures involved eight testing times and two types of tests (retention and application). Thus, the K matrix was employed to change the original scores into 16 new scores which reflect various contrasts within the 2x8 design over repeated measures.

With the transformed data, univariate tests for the grand mean effects of the design over repeated measures were conducted. The transformed variable called "grand mean effect" served to indicate if there were any overall effects across all the repeated measures. Table 3.5 reports the univariate tests for the grand mean effects.

Table 3.5. Univariate tests for overall effects.

effects across all measures	between mean squares	degrees of freedom	Univariate F	P less than
treatment	73.4787	2,82	12.1236	.0001
location	12.6278	2,82	2.0835	.1311
interaction	2.2648	4,82	0.3737	.8268

From Table 3.5 it is clear that there was no interaction across all the measures ($p < .8268$). Given this result, it was decided to determine whether any location or treatment effects were present in the data. While there was no significant location effect ($p < .1311$), there was a significant treatment effect ($p < .0001$).

Since the study did not have equal cell sizes and since interaction between treatment and repeated measures was found significant, it will not be necessary to further examine the location repeated measures interaction. Location was a minor factor in this study, since the experimenter was primarily interested in the treatment effect.

The univariate tests revealed a significant treatment effect. It was appropriate to determine whether this effect was significant using multivariate tests. Table 3.6 reports the results of multivariate tests for interaction and treatment effects.

Table 3.6. Multivariate tests for interaction and treatment effects over repeated measures.

source	multivariate F value	degrees of freedom	P less than
treatment	1.6419	30,136	.0300
interaction	1.0130	60,268	.4576

The multivariate test showed no interaction effect ($p < .4576$), but there was a clear treatment effect ($p < .0300$). The next step was to locate where the cause of this effect lay. Three causes may result in a significant treatment effect:

- a) Interaction between retention and application and time of presentation with the treatments.
- b) Interaction between the retention and application dimensions and the treatments.
- c) Interaction between time of presentation and treatments.

The first analysis performed was the test of interaction between retention and application and time of presentation with the treatments. The results of these tests are reported in Table 3.7.

From Table 3.7 it is clear that there was no interaction effect ($p < .2651$), and there was no interaction within the treatments ($p < .2780$). Thus, this possibility

Table 3.7. Multivariate test for overall interaction and interaction within treatment effect.

source	multivariate F value	degrees of freedom	P less than
Interaction within treatment	1.2038	14,152	.2780
Interaction	1.1642	28,275	.2651

may be excluded as a cause of the treatment repeated measures interaction effect.

The next analysis performed was a univariate test of retention-application and treatment interaction effects. The results of this test are reported in Table 3.8.

Table 3.8. Univariate test for retention - application and treatment interaction effects.

source	univariate F	degrees of freedom	P less than
ret. - appl.	0.9865	2,82	.3773

Table 3.8 shows that there was no significant difference between retention-application over repeated measures and treatment interaction effects. Thus, by eliminating the other two potential causes for the treatment effect over repeated measures, the cause of the effect may be

expected to be found in the interaction between time of presentation and treatments.

The next logical step was to examine the mean performance and standard deviation of each treatment over repeated measures. This information is reported in Table 3.9, and is presented graphically in Figure 1.

From Figure 1 it is clear that the prose text group consistently performed lower than the other two groups. There was, however, an interaction between the linear and branching programmed instruction. When Table 3.9 is studied, it can be seen that students instructed by means of branching programmed instruction performed better than students who learned from linear programmed instruction in six out of the eight repeated measures.

Time Spent Studying and Repeated Measures

Again, an orthonormal K matrix was employed to transform the original variables (the amount of time spent to study each unit) to a new set of variables which reflected the design over repeated measures. The design over repeated measures in this case is an eight-level, one-way design.

With the transformed data, univariate tests for the grand mean effects on time over repeated measures were conducted. Table 3.10 reports the results of these tests.

Table 3.9. Cell means and standard deviations of scores on immediate tests as an effect of interaction between time of presentation and treatments.

unit group	unit 1	unit 2	unit 3	unit 4	unit 5	unit 6	unit 7	unit 8
N* mean	13.452	14.161	12.871	15.290	17.097	16.323	16.419	15.097
s.d.	2.919	2.115	3.232	2.019	2.560	1.796	1.910	2.119
L* mean	14.484	15.645	13.678	15.709	19.096	17.806	17.128	16.677
s.d.	2.562	2.497	2.364	1.772	0.983	1.243	1.756	2.195
B* mean	15.778	16.408	13.370	16.593	18.778	17.852	17.741	17.704
s.d.	2.242	1.782	2.306	2.080	1.717	1.537	1.534	1.728

*N = prose text instruction; L = linear programmed instruction; B = branching programmed instruction.

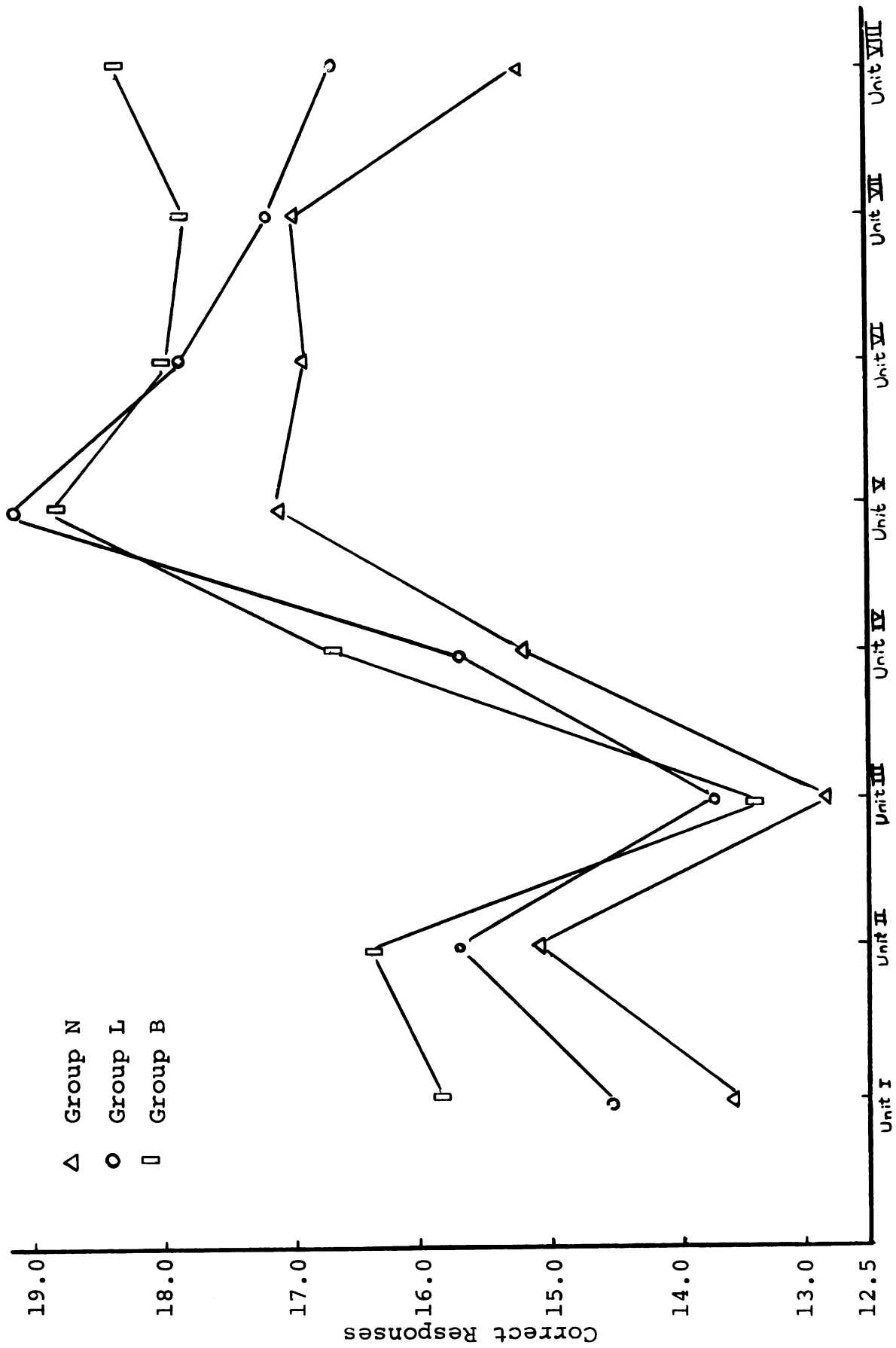


Figure 1. Graphic presentation of mean scores according to treatments over repeated measures.

Table 3.10. Univariate tests for overall effects on time.

effects across all measures	between mean squares	degrees of freedom	univariate F	P less than
location	1860.8358	2,82	15.6162	.0001
treatment	1328.3119	2,82	2.4230	.0950
interaction	570.6397	4,82	1.0409	.3913

Table 3.10 shows no interaction effect ($p < .3913$). Thus, the main class model did fit the collected data. Considering main effects, there was no treatment effect ($p < .0950$), but there was a location effect ($p < .0001$).

The next step was to conduct a multivariate test for interaction in order to see if the data fit the main class model on a multivariate level. The results are reported in Table 3.11.

Table 3.11. Multivariate tests for interaction.

source	multivariate F value	degrees of freedom	p less than
interaction	1.8949	28,275	.0054

From Table 3.11 it is clear that there was time, location and experimental-treatment interaction. The test shows interaction on a multivariate level which indicated

that there was an influence of several factors at the same time. Thus, the main class model did not fit in this case, and no further tests could be conducted.

Attitudes and Motivation Toward the Different Treatments Employed

Attitudes and motivation were tested using Chi Square Tests. Each question on the questionnaire was tested separately, and the five possible answers for each question were ordered so that a value of one was given for the most negative attitude or motivation and a value of five for the most positive one. Only significant results at the .05 level of confidence will be reported.

Question 6 was concerned with the amount of time to complete the assignment in class. It was considered an attitudinal question. Reactions of females to the three treatment conditions are reported in Table 3.12.

The only difference found was for females. The calculated $\chi^2=15.680$ exceeds the table values of $_{.05}\chi^2_8=15.51$; thus there was a significant difference. When Table 3.12 is inspected, it seems that the majority of females felt they had enough time to complete the linear program. However, 14.28 percent of the females in the prose-text and 23 percent in the branching program felt they did not have enough time.

Table 3.12. Chi Square Test of different treatment effects on females (question 6).

	1	2	3	4	5
group N*	1	1	0	6	6
(n=14)	(7.14%)	(7.14%)	(0.00%)	(42.86%)	(42.86%)
group L*	0	0	4	8	3
(n=15)	(0.00%)	(0.00%)	(26.67%)	(53.33%)	(20.00%)
group B*	0	3	0	4	6
(n=13)	(0.00%)	(23.08%)	(0.00%)	(30.77%)	(46.15%)

*N = prose-text instruction; L = linear programmed instruction; B = branching programmed instruction.

Were references included in the material distracting? Tables 3.13 and 3.14 report reactions to this question. The results of the two tests will be interpreted together.

Table 3.13. Chi Square Test on sex differences across all treatments (question 9).

	1	2	3	4	5
males	2	6	6	21	4
(n=39)	(5.13%)	(15.38%)	(15.38%)	(53.85%)	(10.26%)
females	3	3	21	15	0
(n=42)	(7.14%)	(7.14%)	(50.00%)	(35.71%)	(0.00%)

Table 3.14. Chi Square Test on sex difference in the linear group (question 9).

	1	2	3	4	5
males (n=12)	1 (8.33%)	2 (16.67%)	0 (0.00%)	7 (58.33%)	2 (16.67%)
females (n=15)	0 (0.00%)	0 (0.00%)	7 (46.67%)	8 (53.33%)	0 (0.00%)

Taking all treatments into consideration from Table 3.13, it was clear that while females were neutral toward this question (50.00%), males were more positive toward references included in materials (64.11%). This was a significant difference, since the calculated $\chi^2=14.442$ exceeds the $.05\chi^2_4=9.49$. Table 3.14 attributes this difference to attitudes of the linear programmed instruction group ($\chi^2=11.888>9.49$).

Question 14 asked the subjects to react to the following statement: "I frequently found my mind wondering while completing class assignments." Results of testing this question are reported in Table 3.15 and 3.16.

There was a significant difference between males and females ($\chi^2=10.798>9.49$) across all treatments. Table 3.15 shows that while males were mostly positive (64.11%), females varied in their attitudes from negative (50.00%) to positive (33.33%). From Table 3.16 it is clear that

Table 3.15. Chi Square Test on sex difference across all treatments (question 14).

	1	2	3	4	5
males (n=39)	2 (5.13%)	5 (12.82%)	7 (17.95%)	21 (53.85%)	4 (10.26%)
females (n=42)	4 (9.52%)	17 (40.48%)	7 (16.67%)	13 (30.95%)	1 (2.38%)

Table 3.16. Chi Square Test on sex differences in the branching group (question 14).

	1	2	3	4	5
males (n=13)	1 (7.69%)	0 (0.00%)	1 (7.69%)	10 (76.92%)	1 (7.69%)
females (n=13)	0 (0.00%)	7 (53.85%)	3 (23.08%)	3 (23.08%)	0 (0.00%)

this difference was due to the attitudes toward the branching programmed instruction in which males clearly appeared to have a positive attitude (84.61%), while females had a more negative attitude (53.85%). The differences were significant ($\chi^2=13.769>9.49$).

Table 3.17 reports attitudes toward efficiency of self instruction as used in this course.

Table 3.17. Chi Square Test on sex difference across all treatments (question 18).

	1	2	3	4	5
males (n=39)	0 (0.00%)	4 (10.26%)	4 (10.26%)	21 (53.85%)	10 (25.64%)
females (n=42)	2 (4.76%)	10 (23.81%)	10 (23.81%)	13 (30.95%)	7 (16.67%)

What were the attitudes toward efficiency of self instruction as used in this course? Although the results were only close to being significant ($\chi^2=9.459<9.49$), it is important to report these results. There was no difference between treatments, but there was a difference between sexes. Again, males were more positive (79.49%), while females varied in their opinions.

Table 3.18 reports the differences between sexes in the branching group concerning interest and stimulation the course elicited.

Interest and stimulation in the branching group as compared to other courses were clearly positive (38.46% and 46.15%) in the case of the males. The females, however, varied in their opinion. This was considered a motivational question and, again, was significant ($\chi^2=11.200>9.49$).

Table 3.18. Chi Square Test on sex difference in the branching group (question 19).

	1	2	3	4	5
males (n=13)	0 (0.00%)	0 (0.00%)	2 (15.38%)	5 (38.46%)	6 (46.15%)
females (n=13)	0 (0.00%)	5 (38.46%)	3 (23.08%)	5 (38.46%)	0 (0.00%)

Question 13 was a general question that took into consideration treatments as well as the discussion part of the course. Table 3.19 and Table 3.20 report the results of testing reactions to this question.

Table 3.19. Chi Square Test of different treatment effects (question 13).

	1	2	3	4	5
group N* (n=28)	1 (3.57%)	2 (7.14%)	14 (50.00%)	7 (25.00%)	4 (14.29%)
group L* (n=27)	0 (0.00%)	3 (11.11%)	4 (14.81%)	19 (70.37%)	1 (3.70%)
group B* (n=26)	0 (0.00%)	1 (3.85%)	9 (34.62%)	15 (57.69%)	1 (3.85%)

*N = prose-text instruction; L = linear programmed instruction; B = branching programmed instruction.

Table 3.20. Chi Square Test of sex differences across all treatments (question 13).

	1	2	3	4	5
males (n=39)	0 (0.00%)	2 (5.13%)	7 (17.95%)	26 (66.67%)	4 (10.26%)
females (n=42)	1 (2.38%)	4 (9.52%)	20 (47.62%)	15 (35.71%)	2 (4.76%)

There was a clear indication of a neutral response from the prose text group, while the linear and branching groups were positive (Table 3.19, $\chi^2=16.667>15.51$). This is the result of the difference in the reactions of males and females. Males were more positive (76.93%); females were neutral (47.62%) and only slightly tending toward positive reactions (40.47%). This difference between sexes was significant at the .05 level ($\chi^2=11.200>9.49$).

Summary

A significant correlation was found between the covariates and the dependent variables, thus supporting the use of ANCOVA to test the overall gain in the course. No evidence of significant differences between treatments were found, but subjects in all treatments performed better on the post-test. A significant location effect, however,

was found: the groups at East Lansing and Grand Rapids performed better than the group at Pontiac.

When repeated measures were considered, a significant difference was found that indicated a consistently better performance of the linear and branching groups over the prose text group. An interaction was found between linear and branching groups, with the branching group scoring higher on six of eight measures administered. No significant difference was found in the time spent by each group in studying the material.

Attitudes and motivations were tested using Chi Square tests. Few significant effects were found. Most of the differences were between sexes, males being more positive toward written material while the females were neutral or negative. A discussion of these results will be presented in the next chapter.

CHAPTER IV

SUMMARY AND DISCUSSION

Summary

The purpose of this study was to assess the differential effect which prose text, linear programmed instruction and branching programmed instruction may have on measures of retention of information, application of information, time spent in study, and finally on motivation and attitudes of counselor trainees toward each of the three types of instruction. It was suggested that programmed instruction might be a promising way of improving instruction in a Counseling Theories Course at the graduate level and that a systematic investigation should be made of this instructional procedure.

Ninety-one master's degree candidates in counseling at Michigan State University enrolled in a Counseling Theories course being taught at three locations (East Lansing, Grand Rapids and Pontiac), were randomly assigned to one of the three instructional conditions:

- a) Prose text instructional material.
- b) Linear programmed instruction.
- c) Branching programmed instruction.

Pre- and post-tests covering the content of the entire course, post-tests that followed each instructional unit, and a questionnaire concerning attitudes and motivation of students were administered to each of the subjects.

Five hypotheses were stated in testable form. These hypotheses were constructed to examine the following variables of interest: overall gain, time, immediate gain, attitudes and motivation. A repeated measures design including pre- and post-testing was utilized. The dependent variables were tested in the following way: pre- and post-tests by means of a univariate and multivariate analysis of covariance, repeated measures (immediate gain) by a univariate and multivariate repeated measures analysis using a Finn multivariate program, and the motivation and attitudes of students to the course by a series of chi square tests.

Discussion

The results of the present study can be summarized as follows:

a) No overall significant difference was found between the treatment groups. A location effect, however, was found. Students taking the course at the Pontiac site scores significantly lower on the post-test than did students at East Lansing or Grand Rapids.

b) A significant difference between treatments over repeated measures was found. The prose text group consistently scored significantly lower than the other two groups on the repeated measures administered. There was also an interaction between the linear and the branching groups. Thus, no ~~con~~clusion can be drawn about differences between those two groups. The branching group, however, performed better than the linear group on six of the eight measures administered.

c) No significant difference was found between the treatment groups for time spent in study of instructional units over repeated measures.

d) There was a significant difference between treatments among females when they were asked whether there was enough time for study. All the subjects in the linear group reported they had enough time, while 14.28 percent in the prose text group and 23.08 percent in the branching group reported they did not have enough time for study.

Across all treatments males appeared to consider the self instructional material presented in the course to be effective, while females varied in their reactions. Differences were also found between sexes in the linear and branching groups. In the linear group males were positive toward the references included in the material. Females, on the other hand, were only neutral or tended toward a positive attitude. In the branching group males

did not find it difficult to concentrate while completing class assignments, and they thought the material was stimulating and interesting. Females reported that concentration was difficult, and they varied in their opinions about interest and stimulation produced by the material.

The course as a whole, including self instructional material as well as the discussion format, evoked different reactions from the sexes. Males were again positive, while females were more neutral and only slightly tended toward positive reactions.

The reported results may be attributed to a number of possible contributory factors: theory, sampling, design and statistics, instrumentation and treatments. Each of these factors will be considered below.

Theory

The literature concerning programmed instruction suggests that programmed instruction has the potential to be more effective than other traditional ways of instruction (prose text or lecture). This hypothesis was not supported by this study when only the overall gains between pre-tests and post-tests are considered. However, certain procedures used in conducting the investigation might account for lack of overall differences between treatments.

The potential power of the linear and branching programmed instructional units may have been reduced since all subjects involved in the study were given copies of the prose text instructional units after each class to take home with them for review purposes. The students felt they needed some material to take home in order to be able to prepare for the final exam. The instructors and the investigator, as well as the chairman of the guidance committee, wanted to avoid feelings of antagonism toward the material which might influence performance and introduce an uncontrolled variable. Thus, it was decided to give each student at the end of each session the prose text unit. This procedure started at the second meeting of the classes.

The possible interaction caused by students having the same material for review may have equalized treatment differences. This possibility is supported by the finding of significant differences (programmed instruction groups scored higher) when immediate gains following instruction were tested by repeated measures. If the opportunity for review of materials had not been provided, significant differences in overall gains might have been obtained.

While overall gains were not obtained, the programmed instruction (linear and branching) was more effective than the prose text on short term measures (repeated measures). Students' success on an individual instructional

unit can be used, therefore, as a reinforcer and a motivational factor in programmed instruction. This is in accordance with Skinner's and Crowder's point of view that immediate knowledge of correct responses is a reinforcing event.

Little has been reported in the literature about sex difference. It seems from the results of this study that the sexes differ in their attitudes toward prose text and programmed instruction. It is probable that this difference is a significant factor in affecting performance, and it should be further explored.

Sampling

A question of interest in the interpretation of the results is whether the subjects in this study differ systematically from subjects in other studies when comparing their characteristics. It is known that Michigan State University had no special criteria beyond undergraduate grade point average for selecting counseling candidates for the counselor training program. Although no direct comparison can be made because not every study reports sampling characteristics, a comparison with an earlier class of counselor trainees at Michigan State University reported by Rowe (1971) revealed that the subjects in this study were older by three years when means were compared (25.6 versus 28.6). Another distinctive

characteristic was that 57 out of 91 subjects of this study were currently employed as teachers whose average experience was 4.73 years. Although there are no data with which to compare these facts, it seemed to the experimenter to be a common characteristic of a beginning class in the Michigan State University Counselor Training Program. Because of these reasons, generalizations from this study should be made either to differences in sexes among counselor trainees who have been accepted to this particular program, or to counselor trainees having the same characteristics as those described in Chapter II.

The location effect found when overall gains were examined raised the following question: did the groups at East Lansing and Grand Rapids perform better than the group at Pontiac on the measures administered because this group was distinctive in some characteristics when compared to the two other groups? Investigation of this problem did indeed reveal some differences. The mean age of the Pontiac group was 30.03 years when compared to the mean age of 28.6 years for the entire experimental population. An additional distinctive characteristic is that 26 out of 31 subjects (83.9%) in Pontiac were currently employed as teachers, while in the total experimental group the corresponding numbers were 57 out of 91 subjects (62.6%). Finally, this location difference might be attributed to differential influence of instructors. The

two groups at East Lansing and Grand Rapids were taught by one of the instructors, while the group at Pontiac was taught by the other. From written comments found on the questionnaires filled out by subjects at Pontiac, it can be concluded that they felt they would have benefited more by having the instructor lecture or use other instructional methods without the restrictions imposed by using only the instructional units and procedures developed for this investigation.

Two other sampling variables which might have contributed to the outcomes of this study involve (1) the expectations of students who enter counselor training programs, and (2) graduate students' acceptance of educational technology (programmed instruction) as a viable means of instruction. As no data were collected for the investigation of these variables, logic is the only tool for use in discussing their possible influence.

Blocher (1967) reported that a mantle of mysticism lies over the development of counseling as a professional field. He suggested that Messianic figures in counseling translate "deeply moving personal experience into universal terms" which attract a group of disciples. These disciples generalize the experiences of such a leader into the "most widely applicable terms." Students who may expect deeply moving or conversion-like experiences from their counselor training programs could reject or find programmed

instruction to have negative connotations for learning. Expectations for a highly personal experience might cause programmed learning to be perceived as mechanical, cold, and manipulative. Also supporting this possibility is the current popularity of the view of those who blame technology for creating a dehumanized, mechanistic world.

As pointed out in the introduction to this study, no research concerning use of programmed learning has been reported in the literature of counselor education. Little use has been made of educational technology in graduate courses. It is conceivable that being unfamiliar with this method of instruction had a negative influence on the subjects of this study.

Design and Statistical Analysis

The concern here is whether the results of this study were caused by inadequacies in research design or statistical analysis. There are at least two considerations that should be discussed.

First, seven subjects were eliminated from the study, and the scores of seven others were predicted. It could be that the seven who did not attend two or more class meetings and were eliminated have certain attitudes toward this type of instruction. Had they been part of the study, they might have influenced the results in a certain direction. The scores of seven subjects predicted

by a regression equation are only approximations of their missing scores.

Second, in interpreting the chi-square tests, one should take into consideration that all the tests were performed on the same sample and thus violate the requirement of independence. It was possible that by chance alone some of the chi-square tests showed statistical significance, while in reality they may not be significant.

These two considerations, however, do not seem powerful enough to influence the results of the treatments main effects. Thus, it is concluded that the design and the statistical analysis were adequate. But, if possible, it is desirable to avoid these factors or control them in research conducted in the future.

Instruments

The measures used in this study were devised by the experimenter. Thus, there were no reports on reliability and validity of the instruments. However, the questions included in the instruments were reviewed by the instructors and other professors in the department and were found adequate. For this reason we might say that there was content validity in the instruments. In classroom situations this is often the only type of validity available.

Lack of reliability may very well account for an unexplained variance or an error variable. If this in fact happened, it might have reduced the possibility of finding significant results.

Treatments

Was there an adequate presentation of the treatments? Were there uncontrolled variables that might have affected the treatment conditions? These questions will be considered under this rubric.

The treatments were administered at the end of a three-hour period, and only in the late afternoon or evening hours. The students were tired at that hour and tried to finish as quickly as possible and go home. For these reasons, it might be that real effects of the treatments were not reflected in the scores obtained.

An additional factor that should be discussed is the format and printing of the material. Because of budget considerations, the format was that of a handout and not a formal programmed instruction book. Factors related to attractiveness of material, prestige, influence of a book and readability may have been introduced.

The format of the branching programmed instruction made it difficult to locate the correct frames in some instances. Also, it was possible for students to see the correct answers to several frames before attempting to

answer questions. Another factor which could not be controlled due to pressures of time was printing and grammatical errors.

It seems possible that problems associated with the format, time, and editing may have affected the results of this study. Therefore, an attempt to control these variables should be made in studies conducted in the future.

Conclusions

The purpose of this study was to assess the differential effects of prose text, linear programmed instruction and branching programmed instruction on overall gain, immediate gain, time spent in study, and finally on motivation and attitudes. The results provided information on new aspects of using programmed instruction with counselor trainees which should be investigated in the future.

The conclusion to be drawn from this study is that these three types of instruction have an effect on immediate scores over repeated measures. The scores of Ss receiving the prose text were, on all the repeated measures, lower than the other two groups (linear and branching programmed instruction). However, no conclusions can be drawn on differential effects of linear and branching

programmed instruction although the branching group performed better on six out of the eight measures administered.

Differences in attitudes and motivation across treatments were found among females. Only females receiving the linear programmed instruction felt they had enough time to complete their class assignment. A few in the other two treatments felt that they did not have enough time. Across all treatments males appeared to consider self instructional material, as presented in the course, effective, while females varied in their reactions.

Differences between sexes were found in the linear and branching groups. In the linear group, males were more positive toward the references included in the material. Females were mostly neutral, with a trend toward a positive attitude. In the branching group, males were able to concentrate while completing class assignments and thought the material was stimulating and interesting. Females reported that their minds wandered while completing class assignments and varied in their opinions about the amount of interest and stimulation produced by the material.

In general, males appeared to be more positive toward programmed instruction, while females tended to be somewhat hostile toward this type of instruction. The question to be investigated seems to be: Do males really benefit more from programmed instruction than females?

In view of problems encountered during the investigation, the following recommendations are suggested:

a) An effort should be made to have equal cell sizes in the design. This precaution will enable flexibility in analysis and interpretation.

b) The time of administering the treatments should be changed to morning or early afternoon so that the fatigue factor might be better controlled.

c) The effects of pre-test and knowledge of results on pre-test on final performance should be explored.

d) Varying the sex of the instructor might have an effect on performance or attitudes. This variable should also be further explored.

e) The immediate treatment effects should be investigated as potential possible reinforcers and incentives for segments of a larger course.

In conclusion, the results of the present study indicated new aspects of using prose text, linear and branching programmed instruction in a course. Differences between sexes appeared to be one of the primary variables that should be further investigated. Programmed instruction appeared to be a promising mode of instruction, and further research should be conducted to identify its major effects.

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APPENDIX A

PREDICTION OF MISSING SCORES

PREDICTION OF MISSING SCORES

Several scores on the weekly instruments on retention, application and time spent on study were not available for reasons of illness or absence from class. For these students who missed only one session it was felt that rather than discard data, a prediction could be made on the missing scores based on the remaining scores that the students attained in the other sessions. It was decided that the best prediction method available would be a multiple regression analysis (Graybill, 1961). Thus, in each case of missing data, the regression equation weighted each of the obtained scores to predict the absent scores. These predicted scores were employed in the further analysis.

APPENDIX B

QUESTIONNAIRE FOR ASSESSMENT OF ATTITUDES AND MOTIVATION

Counseling Systems Research
and Training Project
Michigan State University
College of Education

COURSE EVALUATION

Counseling Theories
ED 882

Dear Student:

We are gathering data of student opinions and impressions of the Counseling Theories course, in order to improve the organization and teaching of the present materials.

Please react to the following statements to the best of your knowledge and judgment. Your reactions will help us design a better and more effective learning experience for future students. In your answers refer only to the written material presented to you throughout the course.

Do not put down your names. Just answer by circling the letter corresponding to your chosen answers.

Thank you for your cooperation.

Counseling Research Project

1. Where did you take the course?
 - a. East Lansing
 - b. Grand Rapids
 - c. Oakland
2. Your group was:
 - a. N
 - b. L
 - c. B
3. What is your sex?
 - a. Male
 - b. Female
4. The units were too long and presented too much material!
 - a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
5. The self tests at the end of each unit were very helpful.
 - a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
6. There was always enough time for me to complete reading the assignment in class.
 - a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree

7. I find the subject of Counseling Theories very interesting.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
8. I frequently found myself thinking about material presented, outside of class.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
9. Frequent references included in the material were very distracting.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
10. Circle each of the words that tell how you generally feel about the subject of Counseling Theories as presented in the written units:
- | | | |
|-------------|----------------|-----------|
| interesting | boring | worthless |
| dull | useful | cool |
| fun | useless | square |
| too hard | too easy | groovy |
| exciting | very important | up tight |
11. The course was better organized than a traditional lecture-type course.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree

12. If it was an elective course, I would not take the course again.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
13. Overall, taking everything into consideration, I would rate this course as:
- a. excellent
 - b. good
 - c. fair
 - d. poor
 - e. very poor
14. I frequently found my mind wondering while completing class assignments.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
15. I was stimulated by this course and would like to take another course in Counseling Theories and/or develop my knowledge by self reading.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
16. Getting immediate results of the tests was an effective way to point out what parts of the material should be read again carefully.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree

17. The repetition within units and between units was very objectionable.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
18. Self instruction as used in this course results in less efficient use of students time.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree
19. This has been one of the most interesting and stimulating courses I've had in college.
- a. strongly agree
 - b. agree
 - c. neutral
 - d. disagree
 - e. strongly disagree

Thank you for your cooperation!

