THE RELATIONSHIP BETWEEN STUDENT NOTE-TAKING DURING AN INSTRUCTIONAL TELEVISION LESSON AND STUDENT LEARNING

Dissertation for the Degree of Ph. D.
MICHIGAN STATE UNIVERSITY
WILLIAM A. ANDERSON
1976

This is to certify that the

thesis entitled

THE RELATIONSHIP BETWEEN STUDENT NOTE-TAKING DURING AN INSTRUCTIONAL TELEVISION LESSON AND STUDENT LEARNING

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Date June 24, 1976

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ABSTRACT

THE RELATIONSHIP BETWEEN STUDENT NOTE-TAKING DURING AN INSTRUCTIONAL TELEVISION LESSON AND STUDENT LEARNING

By

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The purpose of this research investigation was to determine (a) if student note-taking during an instructional television lesson helped or hindered learning, and (b) if one method of student note-taking maximized student learning from an instructional television lesson. The experimental design used was a 2 x 2 factorial design which varied the presence or absence of an overt student response and the presence or absence of a structured note-taking guide. The two dependent variables for this investigation were the immediate recall and application of the content presented in the instructional television lesson.

The treatment materials used in this investigation were (a) an instructional television lesson from the "Learning and Liking It" series, (b) a structured note-taking guide, and (c) a pretest and posttest. Subjects in this investigation were graduate and undergraduate students in the College of Education at Michigan State

University. The treatments were administered during Spring term, 1976. Treatment one viewed the instructional television lesson, was not given notes or allowed to take notes, and was given the posttest. Treatment two viewed the lesson, was instructed to take notes as they normally would, and took the posttest. Treatment three viewed the lesson, was given a structured note-taking guide requiring an overt written response, and took the post-test. Treatment four viewed the lesson, was given a structured note-taking guide and took the posttest.

Six research hypotheses were examined in this investigation. For both the immediate recall and application dependent variables, the hypotheses examined: (a) a structured notes main effect, (b) an overt response main effect, and (c) a structured notes by overt response interaction. The data were analyzed by a multivariate analysis of variance of cell mean gain scores, proportionate gain scores, and posttest-only scores at the .05 level of significance.

CONCLUSIONS

An analysis of the research data provided the following conclusions:

1. Student performance on a test of immediate recall and application of the content presented in an instructional television

lesson is not improved when those students are required to take notes during the lesson.

2. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when those students are provided with structured note-taking guides.
3. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when those students are required to make overt written responses during the lesson.
4. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when those students are provided with a structured note-taking guide requiring an overt written response.

To summarize the results of this research there was no indication that providing students with structured notes or requiring students to make overt written responses facilitated the learning of television lesson content. Also, there were no data obtained that suggested one note-taking treatment was any better than any other at improving student/ learning from the instructional television lesson.

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By

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A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Area of Instructional Development and Technology

1976

ACKNOWLEDGEMENTS

While only one name appears on the dissertation, it is nonetheless the work of many individuals. I would first like to thank the chairman of my doctoral committee, Dr. Erling Jorgensen, for his interest, support, and patience during the writing of this dissertation and during my entire doctoral program.

I would also like to express my appreciation to Dr. Thomas Baldwin, Dr. James Page, Dr. S. Joseph Levine and Dr. Paul W.F. Witt, who as members of my guidance committee, provided the standards of quality I will attempt to emulate in my professional career. Your help and interest is appreciated now more than ever.

Although not an official guidance committee member, I very much appreciate the interest and support provided by Dr. Stephen L. Yelon throughout the design and conduct of this dissertation. I would like to also acknowledge Dr. Yelon's assistant, Ms. Pat Sweet, who provided the logistical and motivational support necessary to complete the dissertation.

Finally, I would like to acknowledge my wife Sherry for her understanding, support and assistance throughout my entire graduate education.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

STATEMENT OF THE RESEARCH PROBLEM

OVERVIEW

In this first chapter of the dissertation, a general introduction to the research investigation is provided. The research problem of this investigation is stated as well as the purpose of the research study.

In brief, the problem under investigation was the relationship between student note-taking during an instructional television lesson and student learning. The purpose of this research study was to determine the effectiveness of four different note-taking treatments as measured by an achievement test of immediate recall and application of the content presented in an instructional television lesson.

Also presented in this chapter are the research questions and hypotheses of the study, the definitions of important terms, and the limitations of the research investigation.

IDENTIFICATION OF THE RESEARCH PROBLEM

In most college courses, it is generally understood that students will take their own class notes of the major facts, concepts, rules and principles presented during the various class lessons. However, research on student note-taking during classtime shows that it is a behavior which can potentially help or hinder the student's learning of course content.

Note-taking can facilitate learning by providing an opportunity for the student to process the course content; that is, interpret, infer, condense, and paraphrase the information presented. The notes also serve as an external memory storage device for use in later study. (Aiken, Thomas, and Sheunum, 1975). On the other hand, since notes are typically made while the student is required to attend to auditory and/or visual stimuli, some interference might be expected in attempting to process both the stimuli and the meaning of the lesson content (Peters, 1972).

The experienced college teacher frequently assists students in note-taking activities by repeating and emphasizing important points, by answering student questions, and by slowing up or pausing long enough to allow students to complete their notes before moving on to another point. Such activities represent an attempt on the part of the teacher to allow students to process what is said during the lesson.

When course content is presented to students through the medium of television, the conditions favorable to student note-taking are less likely to exist. Lessons produced for instructional television are generally a one-way presentation of information. Whereas the college teacher will use cues and/or requests from students to assist in the taking of class notes, no such feedback mechanism exists for the television medium. Also, few lessons produced for instructional television are tested and revised to be sure the rate of presentation, the use of pauses and the use of repetition optimizes student note-taking and learning.

Another characteristic of the television medium that affects the opportunity for the student to take class notes is television's visual nature. When information such as a chart or diagram is presented, interference in learning might be expected as students simultaneously attempt to duplicate the visual in their notes and process the content information associated with the visual. Because of possible interference in the student processing both what is said and shown, a question arises as to the efficacy of having the student attempt to take class notes during an instructional television lesson.

Given the special characteristics of course content produced for instructional television and the relationship between instructional television and student

note-taking, the purpose of this research investigation emerges: to investigate the relationship between student note-taking during an instructional television lesson and student learning. As will be shown in Chapter II, the research literature on the effects of student note-taking while viewing televised instruction presents inconclusive results. The developers of instructional television lessons and college teachers currently have contradictory evidence concerning the use of class notes to maximize the learning potential of a televised instruction.

PURPOSE OF THIS RESEARCH

This research investigated the effectiveness of different note-taking treatments as students view an instructional television lesson. The treatments involved students viewing the televised lesson and (1) not taking notes, (2) taking notes as they normally would, (3) viewing the lesson with the aid of a structured note-taking guide, and (4) viewing the lesson with the aid of a structured note-taking guide requiring an overt written response.

The effectiveness of the different note-taking treatments were measured by a test of student learning; more specifically, a test of immediate recall and application of the concepts and principles presented in the instructional television lesson. Information obtained from this research investigation provides additional data about one of the two

purposes of student note-taking: the initial processing and learning of lesson content material. This research investigation helps determine if student note-taking during a televised lesson helps or hinders learning. Also, this investigation provides information about which of the four note-taking treatments has the greatest effect on student learning with an instructional television lesson.

This research investigation is of importance for a variety of reasons. First, it contributes additional information to the body of research literature concerned with student note-taking. The research provides additional information about how student note-taking during an instructional lesson is related to learning. As will be shown in Chapter II, the current research literature on this topic is inconclusive.

Secondly, this research investigation provides information about the effectiveness of requiring an overt student response during an instructional television lesson. The current research literature on requiring an overt student response during instruction is likewise inconclusive.

Finally, this research is of practical importance to developers of instructional television and to college teachers who utilize instructional television as a delivery system. Information gained from this research assists these people in planning student note-taking activities

which maximize the learning of content presented in an instructional television lesson.

RESEARCH QUESTIONS AND HYPOTHESES

RESEARCH QUESTIONS

The primary question of this research is: Does note-taking while viewing an instructional television lesson help or hinder learning? This question is examined by comparing those treatments where students actively take or use notes to those treatments where students do not actively take or use notes while viewing the televised lesson.

A second question posed by this research is: Of the four note-taking treatments, is there one that maximizes student learning from the televised lesson? To determine the answer to this research question, the student's posttest scores on recall and application of the content presented in the televised lesson are compared across treatments to see if one note-taking treatment produces significantly better learning results.

HYPOTHESES

In an extension of the research questions, eight hypotheses are broadly stated in this section to examine the various relationships among different note-taking treatments. As suggested by Farquhar (1969), these

hypotheses are not presented in research form at this point; rather, they represent statements of the broad relationships and implications expected in the research investigation. The eight broadly-stated hypotheses are included in the six research hypotheses that are presented in Chapter III.

There are two dependent variables under investigation: immediate recall and application. For each dependent variable, there are four proposed outcomes. To assist the reader, the treatment groups can be briefly described as follows:

T_1 = pretest-view televised lesson-not allowed to take notes-posttest

T_2 = pretest-view televised lesson-instructed to take notes as they normally would-posttest

T_3 = pretest-view televised lesson-complete structured note-taking guide requiring an overt student response-posttest

T_4 = pretest-view televised lesson with structured note-taking guide-posttest

A. Dependent Variable: Immediate Recall

1. Note-taking versus no notes

Students who take their own notes, view the lesson with the aid of a structured note-taking guide, or who view the lesson and overtly respond to the structured note-

taking guide will score higher on a test of immediate recall than those students who view the lesson without using notes. (T_2, T_3, T_4 > T_1)

2. Presence or absence of overt note-taking

   Students who take notes by overtly writing their own notes or overtly responding to the structured note-taking guide will score higher on a test of immediate recall than those students who view the lesson with the structured note-taking guide or those students who did not take notes. (T_2, T_3 > T_1, T_4)

3. Structured versus non-structured notes

   Students who view the lesson with the aid of the structured note-taking guide or those students who overtly respond to the structured note-taking guide will score higher on a test of immediate recall than those students who do not take notes or who take their own notes. (T_3, T_4 > T_1, T_2)

4. Overt structured note-taking versus other note-taking treatments

   Students who overtly respond to the structured note-taking guide will score higher on a test of immediate recall than those

students who do not take notes, write their own notes, or who view the lesson with the aid of the structured note-taking guide. ($T_3 > T_1, T_2, T_4$)

B. Dependent Variable: Application

5. Note-taking versus no notes

Students who take their own notes, view the lesson with the aid of structured note-taking guide, or who view the lesson and overtly respond to the structured note-taking guide will score higher on a test of application of the content than those students who view the lesson without using notes. ($T_2, T_3, T_4 > T_1$)

6. Presence or absence of overt note-taking

Students who take notes by overtly writing their own notes or overtly responding to the structured note-taking guide will score higher on a test of application of the content than those students who view the lesson with the structured note-taking guide or those students who did not take notes. ($T_2, T_3 > T_1, T_4$)

7. Structured versus non-structured notes

Students who view the lesson with the aid of the structured note-taking guide or

those students who overtly respond to the structured note-taking guide will score higher on a test of application of the content than those students who do not take notes or who take their own notes. (T_3, T_4 > T_1, T_2)

8. Overt structured note-taking versus other note-taking treatments

   Students who overtly respond to the structured note-taking guide will score higher on a test of application of the content than those students who do not take notes, write their own notes, or who view the lesson with the aid of the structured note-taking guide. (T_3 > T_1, T_2, T_4)

DEFINITIONS OF IMPORTANT TERMS

The following are definitions of important terms that are used frequently in the reporting of this research investigation.

1. Application - the class of behavior that requires students to use abstractions in particular and concrete situations. The abstractions may be general ideas or they may be procedures, technical principles, and theories which must be

remembered and applied. Application is considered as one of six higher-order intellectual abilities by Benjamin Bloom and Associates in his Taxonomy of Education Objectives (1956). The six higher-order intellectual abilities are (in order of complexity): comprehension, application, analysis, synthesis, and evaluation. All of the six are considered more complex than knowledge--the lowest level intellectual ability. In this investigation, application is defined as the ability to take a concept presented in the lesson and use it to solve a new behavioral problem given to the student.

2. Content - the facts, rules, concepts and principles presented during an instructional lesson.
3. Covert response - a response made by the student that is not observable. The student "thinks about" the correct response without actually verbalizing, writing or performing the response. In this research investigation, one of the treatments asks the student to make a covert response while viewing the instructional television lesson. In Treatment Four, students are given a structured note-taking guide with key

work or phrases underlined. When a student comes to these key words or phrases, he is instructed to think about or say the word or phrase to himself.

4. Fixed-rate stimulus - any presentation of lesson content material that the teacher or learner cannot easily regulate, stop or control. For this investigation, the instructional television lesson could be considered a fixed-rate stimulus. Other fixed-rate stimulus materials could be on motion picture, film, or audiotape.
5. Immediate recall - the process which indicates remembering by requiring the learner to state or otherwise identify the stimuli to which he/she was exposed. In this investigation, immediate recall is measured by a multiple-choice test given immediately after the televised lesson.
6. Learning - a relatively permanent observable change in behavior which is a function of experience. Learning in this research contains the behaviors of immediate recall and application.

7. Note-taking - student initiated or directed writing activities that assist the student in condensing, paraphrasing, interpreting or inferring information given during an instructional lesson. Note-taking represents a student mediated activity which occurs between the instructional demands and the learning outcomes.
8. Overt response - a response made by the student that is observable by others. The student verbalizes, writes or performs the required task. In this investigation, the overt student response is to either write his own notes or write-in the word or phrase requested in the overt structured note-taking guide.
9. Pretest - a test of student entry behavior or knowledge of the content areas under examination prior to receiving the experimental research treatment(s).
10. Posttest - a test of student terminal behavior or knowledge of the content areas under examination after receiving the experimental research treatment(s).
11. Structured notes - notes prepared by the experimenter which provide the student with cues and prompts to assist in the learning of lesson content. For the purposes of this

investigation one experimental treatment includes structured notes that require the student to write (overtly respond) key words related to the content being presented in the blank spaces provided in the notes. Another treatment provides those same structured notes with the key words written-in and underlined.

12. Student - a subject in this research. All subjects are Michigan State University graduate and undergraduate students.
13. Treatment - the experimental variable. There are four treatments (previously described) in this research investigation.
14. Televised lesson - the fixed-rate stimulus which is a part of the experimental treatment. The televised lesson for this experiment is from the "Learning and Liking It" series on behavior modification and management, a part of the course content of ED 410, Instructional Design and Technology. The televised lessons were produced by Michigan State University Instructional Television Services, 1975.

LIMITATIONS OF THE RESEARCH

Limitations may be defined as "those aspects of the study which can be identified but not controlled"

(Doty, 1968). The following are limitations of this research:

1. The televised lesson was chosen to meet criteria for the experimental treatment, and thus may be out of context of the on-going activities of the classes chosen to participate in this research. However, because of previous high evaluations of the television lesson for both production and content excellence by similar student audiences at Michigan State University, the lesson should have been of interest to the students participating in the investigation.
2. To obtain a sufficient sample size, it was necessary to use four different classes taught at different hours during Spring Term, 1976. Treatments were randomly assigned within each class, and the data were then combined and analyzed as if one large group had been available.
3. This research investigation examines only one of the functions of note-taking: the initial processing and learning of lesson content material by the student. A measure of content retention was not administered and there was no assessment of the subjects' opinions of the efficiency of the various note-taking treatments.

4. Because the subjects may not be representative of an entire college population, the results of this study may not be generalizable beyond the characteristics of the student population and subject content area selected. It should be noted that this is a limitation faced by practically all educational researchers.

CHAPTER SUMMARY

The initial chapter of this dissertation has presented an introduction to the research problem and the framework around which this investigation has been constructed. The research problem has been identified as well as the purposes of this research investigation. The research questions and hypotheses have been presented, as have the definitions of important terms, and finally the limitations of the research investigation.

In Chapter II, literature pertinent to the topics of student note-taking and overt responses is reviewed and analyzed. Chapter III details the research design and procedures used for this research investigation, and Chapter IV reports and discusses the data obtained in the research investigation. Finally, Chapter V presents a summary of the research investigation as well as the conclusions and implications of the research investigation.

CHAPTER II

REVIEW OF RELATED LITERATURE

OVERVIEW

This chapter of the dissertation presents a brief review of the research literature pertinent to the research questions under examination in this study. The several areas of interest which relate to the research questions have been categorized and reviewed as follows: (1) Review of the literature on note-taking during a class lesson, and (2) Review of the literature on overt and covert student responses. The research studies reported in each area were selected for inclusion in the literature review because they most closely approximated the independent and dependent variables of interest in this research investigation. Each of these areas is discussed and summarized, and an overall summary is given.

STUDENT NOTE-TAKING

This section of the literature review examines those studies which (1) report the general effects of note-taking versus no note-taking during the class presentation, and (2) report the effects of note-taking versus no notes when the lesson content is presented by a fixed-rate stimulus such as instructional television.

One of the earliest studies of the effects of note-taking during a college class was reported by C. C. Crawford in 1925. Of principal interest was whether it was more effective to take notes as a lecture was being delivered or whether students should listen without taking notes. Crawford arranged three different experiments utilizing students at the University of Idaho. He measured the effects of students not taking notes, taking notes during the lecture, and note-taking plus a review by a test of immediate recall and a test of retention. Among Crawford's findings were:

1. When results are measured by a general quiz of the traditional type immediately after the lecture, the note-takers show a fairly high degree of superiority over those who do not take notes.
2. When results are measured by the general quiz after a period of days or weeks and after there has been opportunity to review the notes which were previously taken, the note-takers showed marked superiority over those who did not take notes.
3. When results are measured by the true-false test immediately after the lecture, the note-takers are slightly inferior to listeners.

In his conclusions, Crawford identifies two purposes

for note-taking: a cue encoding purpose where the student puts the content into his own words, and a recall purpose where the student can retrieve essential information for a quiz. Crawford states, "the immediate value of notes is less than the delayed-review value, but the immediate value is of sufficient importance to justify the practice of taking notes, even if there is no opportunity to use them later". (p.384)

Some thirty years later, Eisner and Rhode (1959) conducted a similar study of note-taking during a lecture. The subjects in this research either took notes during the thirty minute lecture and studied them during a fifteen minute post-lecture interval, or they viewed and listened to the lecture without taking notes and were allowed to jot down any notes they wanted during the fifteen minute post-lecture interval. Both groups were given a fifty item test and essay questions, and another fifty item test three weeks later. Eisner and Rhode found no significant differences in performance for any of the comparisons between the two groups.

In a more recent study, D.L. Peters (1972) examined the same relationship between note-taking, speed of presentation, and the learning of lecture material. Peters separated subjects into groups that were either allowed to take notes during the lecture, or were asked to simply listen and to watch the lecture. On a test of immediate

short-term memory, Peters found that note-taking had a deleterious effect on the multiple-choice test performance.

In a 1973 study by Judith Fisher and Mary Harris, a variety of different note-taking and review combinations were examined on measures of immediate recall and retention of lecture material. College students were divided into the following treatments: (a) took no notes - reviewed the lecturer's notes, (b) took no notes - mental review, (c) took notes - mental review, (d) took notes - reviewed own notes, and (e) took notes - reviewed lecturer's notes. Recall was measured by having students write down all ideas they could remember about the lecture, and by an immediate recall test of multiple choice and short-answer questions. The posttest consisted of additional multiple choice and short-answer questions. The results of their investigation are shown in Table 2.1.

Table 2.1:

Fisher and Harris (1973)
Mean Scores of Experimental Groups

Dependent Measure	Experimental Groups				
	N-Ron	NN-RLN	N-RLN	N-MR	NN-MR
Free recall	21.8	19.2	17.8	15.3	12.4
Short-term objective test	17.5	15.9	13.7	13.7	11.5
Posttest	13.6	13.9	10.7	9.1	8.1

N-RON = took notes, reviewed own notes
NN-RLN = took no notes, reviewed lecture's notes
N-RLN = took notes, reviewed lecturer's notes
N-MR = took notes, mental review
NN-MR = took no notes, mental review

The results of the Fisher and Harris study appear to support the two functions of note-taking advanced by Crawford some fifty years earlier. The group showing the best performance (the took notes - reviewed own notes group) was able to utilize both the encoding and recall functions of notes, whereas the group with the lowest recall scores (the no notes - mental review group) could neither encode data nor use notes as an external storage mechanism. The second highest group (the took no notes - reviewed lecturer's notes group) were able to use notes as a memory aid but were unable to encode the data directly; those in the second lowest group (the took notes - mental review group) were able to take advantage of the

encoding but not the external storage function of note-taking.

An interesting result of the Fisher and Harris study was that the took no notes - reviewed lectuer's notes group performed better than those in the took notes - reviewed lectuer's notes group. This result was not predicted by the authors since it was thought that those in the latter group would benefit from both functions of note-taking. In conclusion, the findings of this study do not show consistent results for encouraging students to take notes during a lesson. Under certain conditions, student achievement increases when they do not attempt to take notes during the lesson.

The research studies cited above represent a sample of the existing literature on the effectiveness of note-taking versus no notes during a class presentation. The results indicate a very mixed picture. While the research evidence generally supports the use of notes during the class presentation, the results are not always consistent. Variations in the type of notes taken, the rate of the presentation, the immediacy of the research measurement, and the type of student response requested all produce differentiating results on the effectiveness of note-taking during a class presentation. There are no consistent results that answer the questions of whether note-taking during a lesson facilitates or hinders learning.

The next series of research studies examines a subset of the notes-no notes literature; the effects of student note-taking versus no notes when the lesson content is presented by a fixed-rate stimulus such as film or television.

As was stated earlier, when lesson content is presented by the medium of television the conditions favorable to student note-taking are less likely to exist. Instructional television lessons are generally a one-way presentation of information without a feedback mechanism to accomodate the note-taking needs of students viewing the lesson. When a student attempts to take notes during a televised lesson, does it help or hinder learning? Three research studies are reviewed below which provide some answers to that question.

Ash and Carlton (1951) conducted a study which showed that note-taking during an instructional film interfered with learning. Two hundred-sixteen students were divided at random into four equal groups. One group was shown two films and tested on the film content immediately after viewing. The second group was shown the films, took notes during the films, and was tested immediately after viewing. The third group saw the films, took notes, reviewed their notes for ten minutes, turned in their notes and took the posttest. The fourth group served as the control group and only took the posttest.

The results of the treatments were that while all

students learned from the films, the film-only treatment group earned the highest average score of the three treatment groups. Table 2.2 summarizes these research results.

The authors concluded that note-taking during the instructional films actually interfered with learning. The films lacked the necessary pauses and repetitions for note-taking, and any attempt to take notes interfered

Table 2.2:

Ash and Carlton (1951)
Student Posttest Mean Scores

Group	A	B
Film only	61.8%	71.7%
Film + notes + review	60.7%	63.0%
Film + notes	57.6%	59.1%

with the students' efforts to learn from the films. Among other factors, this could be due to a division of attention. Review the notes apparently aided in reinforcing recall of the specific points written down, but did not compensate for interferences caused by taking notes.

A study by Paul McClendon (1966) attempted to determine the effect of note-taking practices on the listening comprehension of college freshman during expository lectures. The author used a random sample of 678

subjects in communication skills classes and asked them to listen to a fixed-rate stimulus, audio recordings of lectures covering different aspects of speech and speech delivery. The students were randomly assigned to the following treatments: (1) did not take notes - just listened, (2) took notes for the speaker's main point only, (3) were instructed to take notes with as many details as possible, and (4) were instructed to take notes as they normally would. Students were tested for comprehension of the lecture content immediately after the presentation and again after five weeks.

McClendon found no significant results for any of the various treatments on either the test of immediate recall or delayed recall. The author summarized his study by stating there is no justification for restricting a student from taking notes during lectures on the basis that it interferes with efficient listening, and that there is no justification for advocating one note-taking method over another on the grounds that one method is more conducive to effective learning than any other method.

A third study, conducted by Marvin Lavin (1971) examined the relative effectiveness of three different types of notes as adjunct activities to audiovisual instructional materials. The author utilized college students as subjects and assigned them to four different

treatment groups: (1) take notes with a structured note-taking outline, (2) take notes on plain paper, (3) follow the lesson with the aid of a study guide, and (4) view the lesson without notes. Instructional films were used as the fixed-rate stimulus material, and subjects were given a criterion test immediately after the lesson and another test one week later.

The results of the Lavin study were that the use of the structured note-taking outline and the study guide were superior to the plain notes and no notes treatments on both tests of immediate recall and retention. Lavin summarized that a "structured note-taking outline or a study guide can result in increased student learning and retention when used as adjuncts to instructional prsentations". Also, "if such outlines or guides are not available, learners would be encouraged to take notes on plain paper--providing the presentation is not too rapidly paced". (p. 73)

The three research studies reviewed above all show different effects of note-taking during a fixed-rate stimulus. While none of the studies specifically used the medium of television (the stimulus in two cases was an instructional film, and in one case, an instructional audio tape of a lecture), all studies used fixed-rate stimulus materials and required similar instructional tasks from the learner.

The two studies utilizing instructional film are directly applicable to television learning, and the study using audio tape provides additional information about the relationship between listening and note-taking which is of interest to television learning. Again, the research literature fails to find a consistent advantage for note-taking when instruction is presented at a fixed-rate. The three studies also suffer from a lack of common procedures, variations in the types of note-taking required, and differences in measuring procedures.

To summarize this first section of the literature review, the research on the effectiveness of note-taking versus not taking notes during a class lesson provides contradictory results for a college teacher or instructional developer who is about to use or design televised instruction for use in the classroom. The goal of this research investigation was to examine the relationship between note-taking during a televised lesson and learning, and to provide data to assist college teachers and developers in maximizing the learning potential of a televised lesson.

COVERT-OVERT STUDENT RESPONSE

This section of the literature review examines those studies which investigate the effects of overt and covert student responses during the presentation of a fixed-rate stimulus material such as televised instruction.

As defined in Chapter I of this dissertation, an overt student response is an observable response made by the student, whereas a covert response requires the student to "think about" the correct response without actually verbalizing, writing or performing the response.

When lesson content is presented by instructional television, information is transmitted through both the auditory and visual senses. The question for the college teacher and instructional television developer is how to structure the learning situation so as to maximize the impact of those two senses on the learning of lesson content. Should students make overt written responses, or should the student make the responses covertly? The following research studies address this question.

Michael and Maccoby (1953) varied student participation in an investigation of learning from a civil defense film. Approximately one thousand high school students viewed the film "Pattern for Survival". The film was stopped three times, during which the experimenter asked questions on content presented in the film. In the overt response treatment, students wrote the answers to the questions on structured worksheets. In the covert response treatment, the students were told to just think to themselves the answers to the questions. Half the students in each group were told the correct answers. A control group saw the film without interruption

for questioning, while another control group did not see the film at all. All groups took a posttest.

The authors found, that both the overt and covert treatment groups did better than the no participation treatment group on the posttest measure. They were, however, unable to detect any difference in performance between the overt and covert treatment groups. It should be noted that the authors stopped the fixed-rate stimulus in order to allow students the opportunity to either write or think about the appropriate response.

An investigation of the use of overt written responses during a television lesson was conducted by June Abbey, et. al. (1963). The author constructed four treatment groups by varying the overt-covert and feedback-no feedback variables. Half the subjects viewed the lessons at home and half viewed the lesson as a group. The overt response groups were required to respond to answer sheets during the televised lesson. All subjects took three, twenty-item multiple choice achievement tests.

The subjects in the overt response treatments had higher scores than those subjects in the covert response with feedback treatment, who in turn scored higher than the covert response-no feedback treatment. Also, those students in the overt practice-feedback group who viewed the television lesson at home had significantly higher achievement scores than those students who viewed

the lesson as a group.

Gropper and Lumsdaine (1961b) conducted a series of investigations which explored different techniques for using a student response to improve the learning potential of televised instruction. In one study, the authors compared the relative effectiveness of conventional televised lessons with lessons that were organized to facilitate an active student response. Seventh and eighth grade students viewed the lessons on science in their school classrooms. In the active response treatment, the television teacher paused for a moment to give the students either time to write their response on the worksheet or to think to themselves about the response. Performance data consisted of scores obtained from achievement tests administered after the telecast and from a delayed achievement test administered two weeks after the lesson.

The results consistently favored those treatments where overt and covert responses were elicited from students. The overt response treatments scored higher than the covert response treatments. From these results, the authors concluded, "the data tend to lend some support to the value of an active response for learning and retention, and would suggest that an active student response elicited by a televised lesson that is sequenced or programmed appears to contribute to better student learning and retention than a 'conventional' television

can produce". (p.47)

In another investigation conducted by Gropper and Lumsdaine (1961c), the authors examined the effectiveness of a nonprogrammed conventional television science lesson requiring an active student response compared to the same lesson where active student responses were not required. In the active response version, the television teacher paused at selected points in the lesson while question marks (flashed on the screen) encouraged students to either write the response on their worksheets or answer the question to themselves. The subjects in the investigation were again seventh and eighth grade students who viewed the lesson as a part of their regular science class. The test measures were two forms of an achievement test covering lesson content; one test was administered at the end of the lesson, while the other was given one week later.

The results of the investigation were that no significant differences were found favoring the active response treatments for either the immediate posttest or the retention posttest. The authors concluded that there is "little basis for believing that merely requiring or encouraging students to make active responses, without employing methods to insure that they will be capable of making correct responses, will add to the effectiveness of the instruction". (p.71)

In the second phase of the investigation, the authors prepared a programmed televised science lesson requiring an active student response and compared this treatment to a group of students who viewed the identical lesson without making active responses. The programmed lesson was sequenced in small steps allowing students to make correct responses. The subjects and test measures remained the same as in the first phase of the investigation.

The results of this investigation showed the overt response treatment group excelled in both immediate recall and retention measure when compared with the passive viewing group. These findings suggested that although "it is necessary to program lessons to enable students to make correct, active responses, it is beneficial for learning if students are stimulated to and, in fact, do respond actively". (p. 13)

The research studies previously reported provide a representative sample of the existing literature on the effects of requiring students to make overt or covert responses during a televised lesson. While a general trend in favor of requiring a response on the part of the learner is established, the questions of the exact type of response to be required (overt or covert) still remains unanswered. The research cited provides no clear-cut evidence to suggest one type of response over

another. The studies do indicate the complexity of the problem--that the structure and rate of the lesson, the allowance of time for a response, and the provision for response feedback all have an effect on the relationship between response type and learning outcome.

The research investigation outlined in Chapter III included and controlled the variables of structure, rate, response time and feedback to provide additional information on whether requiring an overt or covert response during a televised lesson improves student performance.

CHAPTER SUMMARY

This review of the research literature pertinent to the questions under examination in this dissertation has examined (1) the research literature on note-taking during a class lesson, and (2) the research literature on overt and covert student responses during a class lesson. The research literature on student note-taking during a class lesson fails to provide a conclusive answer as to whether note-taking during a lesson helps or hinders student learning.

The research literature on overt-covert student responses during a lesson suggests student participation is generally beneficial, but fails to find any conclusive evidence for suggesting one type of student response over

another. The research investigation outlined in Chapter III. combines the note-taking and response variables into treatments that generate data to assist college teachers and instructional television developers in designing adjunct note-taking activities that will maximize the learning potential of an instructional television lesson.

CHAPTER III

RESEARCH DESIGN AND PROCEDURES

OVERVIEW

This chapter of the dissertation presents a description of the research design and procedures utilized in this research investigation. The first topic presented is an outline of the experimental design, which includes a description of the design matrix, variables, treatments, and research hypotheses.

The second topic presented is the procedures used to conduct this research investigation. Here, the subjects, treatment materials, pilot test and the data collection procedures are described. The final topics of this section are a discussion of the validity and reliability concerns of this research investigation, and a description of the data analysis procedures used in this investigation.

EXPERIMENTAL DESIGN

This investigation examined the effects on learning of the presence or absence of structured notes and the presence or absence of an overt written response. Because this investigation involved the study of two different treatments, each of which was varied in two ways, a 2 x 2 factorial design was used as the experimental

design (Isaac and Michael, 1971).

The design matrix is illustrated in Figure 3.1.

Figure 3.1:

Treatment Groups

		Structured Notes	
		Not Provided	Provided
Overt Response	absent	TREATMENT ONE	TREATMENT FOUR
	present	TREATMENT TWO	TREATMENT THREE

VARIABLES

Two independent variables were manipulated in this study. They were (1) the presence or absence of structured notes, and (2) the presence or absence of an overt written response.

The two dependent variables of interest in this investigation were (1) the scores of student posttest performance on the immediate recall of the content presented in the instructional televised lesson, and (2) the scores of student posttest performance on the application of the content presented in the instructional televised lesson.

TREATMENTS

The four treatment groups used for this research investigation were as follows:

T_1 = This group took the pretest, viewed the televised lesson, was not allowed to take any notes, and was given a posttest.

T_2 = This group took the pretest, viewed the televised lesson, took notes as they normally would, and was given a posttest.

T_3 = This group took the pretest, viewed the televised lesson, completed the structured note-taking guide requiring an overt written response, and was given the posttest.

T_4 = This group took the pretest, viewed the televised lesson, followed the lesson with a structured note-taking guide, and was given the posttest.

RESEARCH HYPOTHESES

In Chapter I of this dissertation, the hypotheses were presented in a broadly-stated form. The hypotheses are restated at this point in the research form used to examine the research questions posed by this investigation. It should be noted that the eight broadly-stated hypotheses were collapsed into six research hypotheses. This was necessary to meet the non-directional statement of hypotheses required by the analysis of variance form of data analysis. The relationships established in the broadly-stated hypotheses are maintained in the research hypotheses. Figure 3.2 summarizes the research hypotheses in terms of the independent and dependent

variables under investigation.

Figure 3.2:

Summary of Research Hypotheses

	Dependent Variable	
Research Hypothesis	Recall	Application
Structured Notes Main Effect	H_1	H_4
Overt Response Main Effect	H_2	H_5
Interaction	H_3	H_6

Stated in research form, the research hypotheses established for this investigation were:

H_1: Students who are given structured notes and view the televised lesson will score significantly differently on a test of immediate recall of content presented in the lesson from those students who view the televised lesson without using structured notes. (T_3 & T_4 ≠ T_1 & T_2)

H_2: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will score significantly

differently on a test of immediate recall of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes. (T_2 & T_3 ≠ T_1 & T_4)

H_3: There will be an interaction between using structured notes and making overt responses on a test of immediate recall of the content presented in the televised lesson. (T_1 ≠ T_2 ≠ T_3 ≠ T_4)

H_4: Students who are given structured notes and view the televised lesson will score significantly differently on a test of the application of the content presented in the lesson from those students who view the televised lesson without using structured notes. (T_3 & T_4 ≠ T_1 & T_2)

H_5: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will score significantly differently on a test of the application of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes. (T_2 & T_3 ≠ T_1 & T_4)

H_6: There will be an interaction between using structured notes and making overt responses on a test of the application of the content presented in the televised lesson.
($T_1 \neq T_2 \neq T_3 \neq T_4$)

PROCEDURES

SUBJECTS

The subjects who participated in this investigation were graduate and undergraduate students enrolled in instructional development and technology courses at Michigan State University during Spring term, 1976. Four different classes were chosen to participate: ED431, ED825, ED831A, and ED853A. Two of the classes were taught in late afternoon, and two classes were taught in the evening.

Data for the investigation were collected during the first and second weeks of the term. The pretest was administered during the first week of the term, with the subjects receiving the experimental treatments the following week. Each of the four treatments was administered within a class. The data were then pooled and analyzed as if one large group had been available.

A total of 84 subjects participated in the investigation. The class sizes were 15, 17, 22 and 30 subjects. Seven subjects were discarded for data analysis

purposes before the treatment because their command of the English language was not sufficient for them to complete the pretest. When their pretests were turned in they were either blank or partially completed. These subjects were allowed to view the televised lesson, but their posttest was not included in the data anlaysis.

TREATMENT MATERIALS

Three types of treatment materials were utilized in this research investigation. They were (1) the instructional television lesson, (2) the pretest and posttest measuring immediate recall and application of the content presented in the instructional television lesson, and (3) the two versions of the structured note-taking guide. All treatment materials were originally constructed for and used with a student audience who had enrolled in a special section of ED410--Instructional Design and Technology, taught by Dr. Stephen L. Yelon during Winter term, 1976. The television lesson, the pretest and posttest and the structured note-taking guide were all evaluated for their effectiveness, efficiency and relevancy by these winter term students.

Instructional Television Lesson

The instructional television lesson used in this research investigation was Shaping and Scheduling, Lesson Five from the "Learning and Liking It" television

series produced at Michigan State University by the Instructional Television Service. The series was designed to assist parents, pre-service and in-service teachers in utilizing learning principles and the techniques of behavior management in the home and at school. Each lesson in the series was designed to stand alone, i.e., it was not necessary for the viewer to have watched the previous four lessons to understand the information presented in Lesson Five.

The Shaping and Scheduling lesson presented information about how to positively reinforce children and students to assist them in achieving a desired target behavior, as well as different strategies for using positive reinforcement so that it is not necessary to reward them every time they achieve the desired behavior. There were fourteen concepts and principles presented in the lesson. The televised lesson was designed to explain each concept or principle in the following manner: (1) the idea was introduced, (2) there were explanations and examples of how to use the idea, (3) there were also explanations and examples of when to use the idea, and (4) there were practice situations in the lesson (with feedback) to assist the students in applying the new idea to different behavioral situations. The lesson was designed to include a high level of redundancy to assist students in learning the new concepts and principles. The ideas

presented in the televised lesson, as well as the lesson objectives are reproduced in Appendix A.

The Shaping and Scheduling lesson was chosen for use in this investigation because it met several pre-established selection criteria. One of those criteria was that the lesson contained content about which the subjects would know little or nothing. This lesson met the criterion because of the technical terminology associated with the schedules of reinforcement principle. This determination was made by Dr. Stephen Yelon, course and lesson instructor, based on his past association and experiences with the lesson content.

Another selection criterion was that the lesson would discriminate subject achievement when shown on a pilot basis to a group of subjects with characteristics similar to those subjects who would participate in the actual study. A pilot group was shown the lesson and achievement scores ranged from 92% to 40%. More information about the pilot group is presented later in this chapter.

The final two lesson selection criteria were that the lesson would be no longer than 45 minutes, and that the lesson would recieve a positive rating from the Winter term experimental course students. The Shaping and Scheduling lesson was 41 minutes in length, and it did receive a positive rating from the Winter term students.

Pretest and Posttest Items

The pretest and posttest items were drawn from a pool of test items designed to measure student achievement of the content presented in the instructional television lesson. The test items measuring immediate recall were multiple choice, while the items measuring application of the content were short-answer. The pretest and posttest were alternate forms, and contained the same number of items, tested all concepts and principles presented in the lesson, and had pre-established scoring criteria. The alternate forms were constructed by locating pairs of test items from the item pool that were of the same lesson objective number and concept number. The pairs were then split to form two alternate form tests. The reliability and validity of the measuring instruments are discussed later in this chapter.

The pretest was administered prior to the treatment, and the posttest was administered immediately after the treatment. Because of the objective scoring criteria, both instruments were hand-scored by the experimenter. Copies of the pretest and posttest are in Appendix B and Appendix C.

Structured Note-taking Guide

One of the two structured note-taking guides, the overt response version, was reproduced from the

student handout originally designed for the experimental ED410 course offered Winter term, 1976. This version of the note-taking guide contained an outline of the television lesson with key words or phrases blanked-out to allow the student to write in the key word or phrase when that information was presented in the lesson.

The second version of the note-taking guide was very similar to the first. The only difference between the two was that the key words or phrases had been written-in by hand in the blanked-out spaces. The handwritten words or phrases served as a visual cue to assist subjects in locating the key ideas as they viewed the televised lesson. With this version of the note-taking guide, it was not necessary for the subjects to make an overt written response during the lesson.

The overt response version of the structured note-taking guide was evaluated by the students in the Winter term experimental section of ED410. These students had very high praise for the guide and had no recommendations for any changes from the original version. Copies of both versions of the structured note-taking guide are reporduced in Appendix D and Appendix E.

PILOT TEST

Before administering the treatments to the experimental sample, a pilot test of the instructional

television lesson was conducted with a group of students (N=13) with characteristics similar to those of the students who would participate in the investigation. The purpose of the pilot was to be sure the instructional television lesson would discriminate among students on a posttest of immediate recall and application of content presented in the lesson.

Students enrolled in ED442, a pre-service teacher education course, were asked to view the television lesson without taking notes. At the end of the lesson, the posttest was administered to the students. The post-test was scored by hand, and student achievement scores on the posttest ranged from 40% to 92% with a mean score of 68.31%. The reliability of the posttest (Cronbach's Coefficient Alpha) was r = .74 (recall) and r = .70 (application). Based upon data obtained from the pilot, it was shown that the instructional television lesson did in fact discriminate student achievement and that the posttest was reliable.

DATA COLLECTION PROCEDURES

The following procedures were used to collect the necessary data for this research investigation:

1. After the experimental sample had been chosen, subjects were pretested for prior knowledge of the content presented in the

instructional television lesson. The pretest took place at least one week prior to the experimental treatment, and subjects did not receive any knowledge of the correct responses to pretest items.

2. The pretests were scored for each class, and the scores were ranked from highest to lowest. Beginning with the top four pretest scores, subjects were randomly assigned to the four treatment groups.
3. When the treatments were administered, they were administered in two different rooms. Treatment groups one and three were within one room and viewed the lesson, and a similar procedure took place with treatment groups two and four. There was a proctor in each room.
4. Before viewing the instructional television lesson, the proctor read a set of instructions to the subjects, and the appropriate treatment materials were distributed among the subjects. The proctors also made sure subjects did not discuss the lesson among themselves or between groups.
5. At the end of the lesson, proctors immediately collected notes from those groups who used

them during the lesson, and distributed the posttest.

6. When a subject completed the posttest, it was collected by the proctor. The average time to administer the treatment and complete the posttest was one hour and 25 minutes.

VALIDITY AND RELIABILITY

The following paragraphs present a brief discussion of the validity and reliability concerns of this research investigation. Validity is an index of the utility of the experimental treatments, and is defined in terms of external and internal validity. Reliability refers to the consistency or stability of a measuring instrument. Although it is difficult to predict all threats to the experimental results caused by validity and reliability factors, it is possible to plan and conduct the experimental methodology and procedures in such a way so as to minimize the effects of these factors.

Internal validity asks the question: did, in fact, the experimental treatments make a difference in this specific instance? Campbell and Stanley (1963) have identified eight extraneous variables which must be accounted for before claiming the independent variable caused the effect.

Those variables relevant to this research study

are presented below along with a brief discussion of how they were accomodated or controlled in the research design and procedures.

The contemporary history of a subject or the subject's previous experience to the treatment may influence research findings. This investigation controls for contemporary history by selecting an instructional television lesson that includes content about which subjects are likely to know little or nothing. Also, those subjects who did have some previous knowledge of the content and scored well on the pretest, were equally distributed among the treatment groups.

The pretesting procedure used in this study was a possible threat to internal validity. It is possible that the pretest served as a learning experience for subjects and caused subjects to alter their responses on the posttest. This factor was controlled by presenting the pretest one week prior to the treatment, not providing students with a knowledge of correct pretest responses, and by utilizing an alternate form of the same question in the posttest. Also, all subjects received the pretest, so any possible influence caused by the pretest will affect all subjects.

The measuring instruments themselves did not pose a great threat to internal validity in this study. All test questions had been used in prior offerings of

the ED410 course. All application questions had pre-set criteria for scoring, and multiple choice recall questions were hand-scored.

Statistical regression toward the mean is of some concern in this investigation. Regression toward the mean occurs because of random imperfections in measuring instruments and random instability in the test populations. This investigation did use a test-retest procedure, so some statistical regression toward the mean is likely. However, because subjects were assigned to treatments randomly and not by extreme scores, and because the two measurements were at least one week apart, no significant statistical regression toward the mean occured.

Because subjects were randomly assigned to the various treatment groups, and because treatments were administered during class time, the differential selection of subjects and experimental mortality factors were not a major concern in this research investigation. These factors were also controlled by using a large number of subjects.

External validity asks the question: What relevance do the findings concerning the effects of the experimental variable have beyond the confines of the experiment? Examining the four factors concerning external validity proposed by Camphell and Stanley (1963) of interaction of selection biases and the treatment, the

reactive effect of pretesting, the reactive effects of experimental procedures and its multiple treatment interferences, none of these factors presented threats to the external validity of this research investigation.

No specific background data was collected on the subjects who participated in this research investigation. However, after examining information about the subjects collected by their course instructors, the subjects appear to represent variety of academic majors and represent a cross-section of College of Education graduate and undergraduate students. The research design and procedures were arranged to limit the effects of pretesting and the experimental procedures, and there was no multiple-treatment, hence no multiple treatment interference.

The main reliability concern of this research investigation was the measuring instruments for the immediate recall and application dependent variables. The pretest and posttest were alternate forms of the same test. The items on the tests covered the same concepts and principles from the instructional television lesson, and the questions were also similar in the level of the lesson objective being tested. The alternate form approach to test reliability is generally considered the most desirable index of test reliability because it involves

two different representative samples of items (Isaac and Michael, 1970).

A measure of reliability of the tests was made by using Cronbach's Coefficient Alpha estimate (1951). For the pilot test, the reliability of the posttest was r = .74 for the immediate recall test, and r = .70 for the application test. The reliability coefficients for the tests when used with the actual research investigation subjects were r = .71 for the immediate recall test and r = .53 for the application test. The coefficients obtained from the pilot test indicated the two tests were reliable; however, in the administration of the posttest to the experimental subjects, the reliability of the application test fell to an unacceptable level.

This event was not anticipated and created problems in analyzing the results of the research investigation. The reliability level of the application posttest made it impossible to determine if the hypothesized relationships did not exist or whether they existed and the posttest was too unreliable to detect treatment differences. This event is further discussed in Chapters IV and V.

DATA ANALYSIS

The pretest and posttest data were hand-scored, coded, and transferred to computer cards. A total of three

data analyses were made by using the Finn Program for Univariate and Multivariate Analysis of Variance, Covariance and Regression, Version Four.

Initially, a multivariate analysis of variance was conducted for the immediate recall and application dependent variables by using the gain score means for each treatment. Supplementary multivariate analysis of variance were conducted by using proportionate gain score means and the means from the posttest only scores. All data were analyzed by the CDC 6500 computer at Michigan State University with computer time made available through the Office of Research Consultation, College of Education.

CHAPTER SUMMARY

A 2 x 2 factorial design was utilized as the research design of this investigation to study the effects of the presence or absence of a structured note-taking guide and the presence or absence of an overt student response while viewing an instructional television lesson. The two dependent variables were the (a) immediate recall and (b) application of content presented in the instructional television lesson.

Three treatment materials were used with experimental subjects. There were (a) the instructional television lesson, (b) the structured note-taking guide,

and (c) the pretest and posttest. All materials had previously been used with an experimental course. The treatment was administered to 84 subjects in graduate and undergraduate education courses during the Spring term, 1976.

The data were analyzed on the M.S.U. CDC 6500 computer using the Finn Program for Univariate and Multivariate Analysis of Variance, Covariance and Regression, Version Four. Chapter IV will present the results of the data analyses.

CHAPTER IV

ANALYSIS OF DATA

OVERVIEW

In this chapter, the data obtained during the the research investigation are presented and analyzed. In the first section of this chapter, the research hypotheses are restated as well as the findings obtained from the investigation of each hypothesis. A summary of results is provided in tabular form. The findings of additional analyses of the research hypotheses are presented in a supplementary findings section. The third section of this chapter contains a brief discussion of the research findings and a disucssion of reliability data.

FINDINGS

The six hypotheses were presented in Chapter III. They are repeated here, first in research form and then in null form. The hypotheses will be followed by the findings obtained from a data analysis by the Finn Program for Univariate and Multivariate Analysis of Variance, Covariance, and Regression, Version 4. All hypotheses were tested at the .05 level of significance.

The first three hypotheses examined the immediate recall of content presented in the televised lesson. This

dependent variable was measured by a multiple choice test administered immediately after the various treatments.

The first hypothesis was:

H_1: Students who are given structured notes and view the televised lesson will score significantly differently on a test of immediate recall of the content presented in the lesson from those students who view the televised lesson without using structured notes. (T_3 & T_4 ≠ T_1 & T_2)

For the purpose of statistical analysis, the null hypothesis is as follows:

H_0: Students who are given structured notes and view the televised lesson will not score significantly differently on a test of immediate recall of the content presented in the lesson from those students who view the televised lesson without using structured notes. (T_3 & T_4 = T_1 & T_2)

The subjects' gain scores on the pre-post test of immediate recall were analyzed, and an F-ratio of .0562 was found with a p value less than .8133. This was not significant at the .05 level of confidence. The null hypothesis, therefore, was not rejected.

The second hypothesis was:

H_2: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will score significantly differently on a test of immediate recall of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes.

$(T_2 \ \& \ T_3 \neq T_1 \ \& \ T_4)$

The appropriate null hypothesis is:

H_0: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will not score significantly differently on a test of immediate recall of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes.

$(T_2 \ \& \ T_3 = T_1 \ \& \ T_4)$

The gain scores on a test of immediate recall for this hypothesis yielded an F-ratio of .3346 with a p value less than .5647. This was not significant at the .05

level, and the null hypothesis was not rejected.

The final hypothesis for this dependent variable was:

H_3: There will be an interaction between using structured notes and making overt responses on a test of immediate recall of the content presented in the television lesson. ($T_1 \neq T_2 \neq T_3 \neq T_4$)

The appropriate null hypothesis is:

H_0: There will be no interaction between using structured notes and making overt responses on a test of immediate recall of content presented in the televised lesson. ($T_1 = T_2 = T_3 = T_4$)

The gain scores on the pre-post test of immediate recall showed an F-ratio of .4597 with a p value less than .4998. This was not significant at the .05 level of confidence, and the null hypothesis was not rejected.

Table 4.1 summarizes the analysis of variance results for the three hypotheses dealing with the dependent variable of immediate recall.

Table 4.1

Analysis of Variance Table for Immediate Recall Gain Scores

Source of variation	Mean Square	DF	F	p
Structured Notes	.4027	1	.0562	.8133
Overt Response	2.3982	1	.3346	.5647
Interaction	3.2951	1	.4597	.4998
Error	7.1683	80		
Total		83		

The final three hypotheses examined the application dependent variable. This variable was measured by a series of items requesting the subjects to briefly write how they would use a particular concept or principle to achieve a stated target behavior. This variable was also measured immediately after the treatment.

Hypothesis four was as follows:

H_4: Students who are given structured notes and view the televised lesson will score significantly differently on a test of the application of the content presented in the lesson from those students who view the televised lesson without using structured notes.

$(T_3 \ \& \ T_4 \neq T_1 \ \& \ T_2)$

The appropriate null hypothesis is:

H_0: Students who are given structured notes and view the televised lesson will not score significantly differently on a test of the application of the content presented in the lesson from those students who view the televised lesson without using structured notes.

$(T_3 \ \& \ T_4 = T_1 \ \& \ T_2)$

The gain scores on the pre-post application test were analyzed, and an F-ratio of .3362 was obtained with a p value less than .5637. These values were not significant at the .05 level, and the null hypothesis was not rejected.

The fifth hypothesis established a relationship between an overt responses and the application variable:

H_5: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will score significantly differently on a test of the application of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes.

$(T_2 \ \& \ T_3 \neq T_1 \ \& \ T_4)$

The null hypothesis is:

H_0: Students who overtly respond to the televised lesson by writing their own notes or overtly responding to the structured notes will not score significantly differently on a test of the application of the content presented in the lesson from those students who do not take notes or who do not overtly respond to the structured notes. (T_2 & T_3 = T_1 & T_4)

The gain scores on the application test for this hypothesis yielded an F-ratio of 2.8498 with a p value of less than .0953. This was not significant at the .05 level of confidence. The null hypothesis, therefore, was not rejected.

The sixth hypothesis was:

H_6: There will be an interaction between using structured notes and making overt responses on a test of the application of the content presented in the televised lesson.

($T_1 \neq T_2 \neq T_3 \neq T_4$)

The appropriate null hypothesis is:

H_0: There will be no interaction between using structured notes and making

overt responses on a test of the application of the content presented in the televised lesson.

$(T_1 = T_2 = T_3 = T_4)$

The F-ratio for this hypothesis was .0825 with p value of less than .7747. This again was not significant at the .05 level, and the null hypothesis was not rejected.

Table 4.2 summarizes the analysis of variance results for the three hypothesis related to the application dependent variable.

Table 4.2:
Analysis of Variance Table for Application Gain Scores

Source of Variation	Mean Square	DF	F	P
Structured Notes	2.5667	1	.3362	.5637
Overt Response	21.7553	1	2.8498	.0953
Interaction	.6299	1	.0825	.7747
Error		80		
Total		83		

SUPPLEMENTARY FINDINGS

Because statistical significance was not achieved for any of the six research hypotheses using the pure gain score matrix, additional analyses of the research hypotheses were made by using proportionate gain scores and posttest only achievement scores. These additional analyses were made to see if the relationships expressed in the research hypotheses still held true despite the lack of statistical significance on the pure gain score analysis. It is possible that actual differences do exist among treatments, but that the pure gain score matrix was not accurate enough to discriminate these differences. The rationale for the use of each additional analysis is explained in the following paragraphs and tables of results for each analysis are presented.

Proportionate Gain Score

An analysis of proportionate gain scores was made to see if the range of the pure gain scores was restricted by the ceiling effect. In brief, the ceiling effect occurs when a subject scores high on the pretest. When given an alternate form posttest, the amount of the gain possible is restricted by the high pretest score. The pure gain score is biased against a high pretest score. This bias causes a restriction in the range of scores and could possibly have an effect on the statistical

analysis of pure gain scores.

The proportionate gain score helps reduce the bias of a high pretest score by comparing the subject's actual gain score with the possible gain score. It then becomes possible for a subject with a high pretest score to improve in the same proportion as a subject who had a low pretest score. Proportionate gain scores are reported as a percentage representing a subject's actual gain divided by the possible gain.

A proportionate gain score was figured for each subject in this research investigation and the six research hypotheses were analyzed by the Finn Program for Univariate and Multivariate Analysis of Variance, Covariance and Regression, Verson 4. All hypotheses were tested at the .05 level of significance. The findings for the analysis of the immediate recall dependent variable are reported in Table 4.3, and the findings for the analysis of the application dependent variable reported in Table 4.4.

Table 4.3:
Analysis of Variance Table for Immediate Recall Proportionate Gain Scores

Source of Variation	Mean Square	DF	F	P
Structured Notes	551.3040	1	.1866	.6669
Overt Response	749.0817	1	.2536	.6160
Interaction	2193.5417	1	.7426	.3915
Error	2953.9164	80		
Total		83		

Table 4.4:

Analysis of Variance Table for Application Proportionate Gain Scores

Source of Variation	Mean Square	DF	F	p
Structured Notes	429.0131	1	.2066	.6507
Overt Response	48.9494	1	.0235	.8784
Interaction	33.4493	1	.0161	.8994
Error	2076.1947	80		
Total		83		

For the proportionate gain score matrix analysis, none of the six research hypotheses were significant at the .05 level of confidence.

A final analysis of the six research hypotheses was made using only the posttest scores. This was done because of the general statistical problems posed by gain scores. As reported by Mehrens and Lehman (1973), difference scores are less reliable than single scores; gain scores are in general the least reliable of all difference scores; and while difference or gain scores may be too unreliable for use with individuals, they may be reliable enough for making decisions about groups.

The six research hypotheses were analyzed by using the posttest-only scores in the Finn Program for

Univariate and Multivariate Analysis of Variance, Covariance and Regression, Version 4. All hypotheses were tested at the .05 level of significance. The findings for the immediate recall dependent variable are reported in Table 4.5, and the findings for the application dependent variable are reported in Table 4.6.

Table 4.5:

Analysis of Variance Table for Immediate Recall Posttest-Only Scores

Source of Variation	Mean Square	DF	F	p
Structured Notes	1.2391	1	.2053	.6518
Overt Response	.7234	1	.1198	.7302
Interaction	2.6501	1	.4390	.5096
Error	6.0368	80		
Total		83		

Table 4.6:

Analysis of Variance Table for Application Posttest-Only Scores

Source of Variation	Mean Square	DF	F	p
Structured Notes	6.6563	1	1.2078	.2751
Overt Responses	.2234	1	.0405	.8410
Interaction	1.4681	1	.2664	.6072
Error	5.5111	80		
Total		83		

For the posttest only score matrix analysis, none of the six research hypotheses was significant at the .05 level of significance.

DISCUSSION

In this section, the findings reported in the two previous sections will be discussed. The two sets of three research hypotheses examining the immediate recall and application dependent variables will be discussed. All findings will be discussed at the .05 level of significance. Following the discussion of findings will be the presentation of reliability data for the treatment quiz.

Discussion of the Structured Notes Hypotheses

Considered at the .05 level, neither the immediate recall nor the application dependent variables was significant for the structured notes hypotheses. The purpose of these hypotheses was to see if giving students structured notes helped or hindered their learning of the content presented in the televised lesson. As summarized in Chapter II, the research literature is inconclusive and even contradictory on this procedure.

The outcomes of interest to this researcher were to see if the structured notes, with their cues and prompts, would provide statistically significant results on the two dependent variables for those students who used

the structured notes over those students who did not have structured notes. However, the analysis of variance data for the pure gain, proportionate gain and posttest only score matrices produced no support for the hypotheses. An analysis of the lesson mean scores for the two dependent variables also produced no support. The findings of this research investigation indicate no support for providing students with structured notes while they view a televised lesson.

Discussion of the Overt Response Hypotheses

The three analyses of pure gain, proportionate gain and posttest only gain scores on the dependent variables of immediate recall and application produced no significant results of the overt response hypotheses. The outcome of interest was to see if these hypotheses would lend support for requiring students to actively respond by writing their own notes or filling in the structured notes during the viewing of the televised lesson. The research literature reported in Chapter II shows no conclusive results, but indicates that student participation is generally beneficial.

This research investigation provided no additional information about whether requiring an overt student response during a televised lesson facilitates or impedes student immediate recall or application of content. An analysis of cell mean scores provided no additional information. Table 4.7 provides a summary of cell mean scores and standard deviations for all data analysis.

Table 4.7

Means and Standard Deviations for Treatment Groups

Treatment Groups	Recall Gain Score		Application Gain Score		Recall Proportionate Gain Score		Recall Proportionate Gain Score		Recall Posttest-Only Score		Application Posttest-Only Score	
	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.	$\bar{X}$	S.D.
No Notes - No overt Response	1.76	2.49	3.38	2.64	27.57	53.73	50.57	39.41	12.24	2.00	7.28	2.53
No Notes - Overt Response	2.48	2.91	4.57	2.50	43.30	41.01	53.30	60.37	12.39	2.33	7.43	1.78
Structured Notes Overt Response	2.32	2.97	3.21	2.86	43.42	68.30	47.37	33.91	12.37	2.65	7.00	2.73
Structured Notes No Overt Response	2.24	2.30	4.05	3.06	38.67	53.66	47.57	41.31	11.81	2.80	6.62	2.33

Discussion of Interaction Hypotheses. At the .05 level of significance, there was no interaction between structured notes and the overt response independent variables with the dependent variables of immediate recall or application. The three analysis of variance for pure gain, proportionate gain and posttest only gain scores produced no significant results, and there were no additional trends indicated by an analysis of the cell mean scores.

The purpose of the interaction hypotheses was to indicate support for the use of structured notes requiring an overt response while students viewed a televised lesson. The findings of this research investigation, however, indicate no support for providing students with structured notes requiring an overt response while they view a televised lesson.

Reliability Data. When no significant results are found in the analysis of the research hypotheses, a question emerges as to whether the hypothesized relationships did indeed exist or whether the measuring instruments for the dependent variables were too crude and to unreliable. Analyzing the measuring instruments for reliability is an attempt to determine the accuracy or precision of the instruments. (Kerlinger, 1973)

The posttest used in this research investigation included fifteen multiple choice items to measure the

dependent variable of immediate recall, and five short-answer items for the application dependent variable. Measures of reliability for the multiple choice and short-answer instruments were made by using Cronbach's Coefficient Alpha estimate (1951). The calculations were made from data obtained from the posttest scores of students who participated in the research investigation. For the test of immediate recall, the computed reliability value was r = .71, and the reliability value for the application items was r = .53.

The higher the reliability coefficient, the more consistently the test measures what it purports to measure. Perfect reliability, never actually obtained in practice, would be represented by a coefficient of 1.00. (Ebel, 1972) According to Mehrens and Lehman (1973), a reliability coefficient of about r = .65 is an acceptable level of reliability to make group decisions from a classroom-constructed test instrument. Thus, the test of immediate recall was of sufficient reliability for use in the research investigation, whereas the test for the application dependent variable might have been too unreliable to detect differences in the hypothesized relationships. A procedure for improving the reliability of the test for the application dependent variable will be discussed in the next chapter.

CHAPTER SUMMARY

The data obtained during the research investigation have been presented and analyzed in this chapter. The six research hypotheses were analyzed by a multivariate analysis of variance computer program using pure gain scores. None of the six research hypotheses was significant at the .05 level of significance. The results of the data analysis indicate that the structured note-taking guide and the use of overt written responses had no effect on the learning of content material presented in the instructional television lesson.

The measuring instruments used in the research investigation were analyzed for their reliability. Using Cronbach's Coefficient Alpha estimate, the reliability of the immediate recall test was $r = .71$, and $r = .53$ was computed for the application test.

The final chapter of this dissertation presents a summary and conclusions of the research study.

CHAPTER V

SUMMARY AND CONCLUSIONS

OVERVIEW

In this final chapter of the dissertation, the first topic presented is a brief summary of the research investigation. Next, the conclusions of this study are presented, based upon an analysis of the research data. A discussion of the possible reasons for the no significant difference findings are presented, followed by the implications of this investigation for further research studies and for designers and users of instructional television.

SUMMARY OF THE RESEARCH INVESTIGATION

The purpose of this research investigation was to determine (a) if student note-taking during an instructional television lesson helped or hindered learning, and (b) if one method of student note-taking maximized student learning from the instructional television lessons. The experimental design used was a 2 x 2 factorial design which varied the presence or absence of an overt student response and the presence or absence of a structured note-taking guide. The two dependent variables for this investigation were the immediate recall and application of the content presented in the instructional television

lesson.

The treatment materials used in this investigation were (a) an instructional television lesson from the "Learning and Liking It" series, (b) a structured note-taking guide, and (c) a pretest and posttest. Subjects in this investigation were graduate and undergraduate students in the College of Education at Michigan State University. The treatments were administered during Spring term, 1976. Treatment one viewed the instructional television lesson, was not given notes or allowed to take notes, and was given the posttest. Treatment two viewed the lesson, was instructed to take notes as they normally would, and took the posttest. Treatment three viewed the lesson, was given a structured note-taking guide requiring an overt written response, and took the posttest. Treatment four viewed the lesson, was given a structured note-taking guide and took the posttest.

Six research hypotheses were examined in this investigation. For both the immediate recall and application dependent variables the hypotheses examined: (a) a structured notes main effect, (b) an overt response main effect, and (c) a structured notes by overt response interaction. These hypotheses tested both the immediate recall and application dependent variables. The data were analyzed by a multivariate analysis of variance of cell

mean gain scores, proportionate gain scores, and posttest-only scores at the .05 level of significance.

CONCLUSIONS

An analysis of the research data provided the following conclusions:

1. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when students are required to take notes during the lesson.
2. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when students are provided with structured note-taking guides.
3. Student performance on a test of immediate recall and application of the content presented in an instructional television lesson is not improved when students are required to make overt written responses during the lesson.
4. Student performance on a test of immediate recall and application of the content presented in an instructional television

lesson is not improved when students are provided with a structured note-taking guide requiring an overt written response.

To summarize the results of this research investigation, there was no indication that providing students with structured notes or requiring students to make overt written responses facilitated the learning of television lesson content. Also, there were no data obtained that suggested one note-taking treatment was any better than any other at improving student learning from the instructional television lesson.

DISCUSSION

This section will discuss some of the possible reasons for the no significant difference findings of this research investigation. In general, the outcomes of this study may be viewed in one of two ways: (1) that the theory behind the use of structured notes and overt student responses is still valid and the no significant differences findings were a result of experimental weaknesses and error, or (2) that structured notes and overt student responses really have no effect on the learning of content material presented in an instructional television lesson. The experimenter prefers to believe the former outcome, and the following paragraphs will explain how experimental weaknesses and error could have contributed

to findings of no significant differences for the research hypotheses.

One weakness in the investigation was the instrument designed to measure the application dependent variable. This instrument consisted of five short-answer questions asking students to apply the content presented in the televised lesson to new behavioral situations. The reliability coefficient obtained from the pilot test of the procedures and instruments indicated the instrument was reliable with $r = .70$. However, when a reliability check was run for the instrument with the experimental subjects, the reliability coefficient for the application dependent variable was $r = .53$.

The low reliability of the instrument made it impossible to determine if the hypothesized relationships did not exist or whether they existed and could not be detected by the measuring instrument. One possible reason for the low reliability was the number of questions. Five short-answer questions may have been too few to accurately measure whether or not students could apply lesson content to new behavioral situations.

A method for determining what the reliability of a test would be if it were lengthened is the Spearman-Brown Formula (Cronbach, 1960). By taking the known reliability of the instrument ($r = .53$), doubling the number of items to ten and putting this information into

the formula, the estimated reliability of the lengthened test for application would be r = .70, well within the range of reliability for a measuring instrument. By doubling the number of items from five to ten on the test of the application dependent variable, the reliability of the instrument would have increased to the degree that the findings could be attributed to the treatment effects and not to the measuring instrument.

A second possible explanation for the low reliability of the application posttest is that there were not enough subjects in the pilot test of the treatment materials to provide an accurate estimate of the reliability of the instrument. With an N of 13 in the pilot group (compared to an experimental N of 84), sampling errors and differences within the groups could have caused the reliability coefficient for the pilot group to be high. With a larger N for the pilot group, the reliability coefficient may have more closely approximated the coefficient obtained for the experimental group.

A second possible source of experimental error in this study is the phenomenon known as the Hawthorne effect (Roethlisberger and Dickson, 1940). In brief, the Hawthorne effect refers to any situation in which the experimental conditions are such that the mere fact that the subject is participating in an experiment or is receiving special attention will tend to improve the

subject's performance.

Because the treatments were not a part of the on-going activities of the classes who participated in this investigation, the subjects no doubt realized they were participating in an experiment. The special attention they received in their treatment groups may have initiated unusually cooperative behaviors that overpowered the effects of the different treatment groups. An examination of the high pretest and posttest scores indicates that all of the treatments were working well with the subjects, possibly attributable to the Hawthorne effect. The influence of the Hawthorne effect can be expected to decrease as the novelty of the treatments wear off.

Another possible source of experimental error is related to the Hawthorne effect, and that is the short duration of the experimental treatment. The treatment consisted of a pretest (30 minutes), viewing one instructional television lesson (41 minutes), and taking the posttest (30 minutes). The short amount of time the subjects were exposed to the television lesson may have not been long enough to provide information about the differences in note-taking treatments. When the influences of the Hawthorne effect are coupled with the short duration of the experimental treatment, actual differences in note-taking treatments may have existed, but were hidden by the experimental procedures used in the research

investigation.

A fourth possible source of experimental error is the subjects who participated in the study. As previously stated, the subjects were graduate and senior-level undergraduate students enrolled in four different courses in the College of Education. Because all subjects were in their final year of undergraduate study or were enrolled for graduate study, the range of study and test-taking skills may have been severely clustered at the high end of an ability scale. Their high degree of skill at listening, identifying important points, and remembering those points for a test may not have allowed the differential effects of the treatments to emerge.

The fifth possible source of experimental error relates to the content of the instructional television lesson. It appears that despite attempts to select a lesson about whose content the subjects would know little or nothing, the subject's scores on the pretest indicated a fairly-high entry level knowledge about the concepts and principles presented in the Shaping and Scheduling television lesson. The immediate recall pretest score mean was 9.8 out of a possible 15, while the application pretest mean was 3.2 out of 10.

According to Ebel (1972), the 9.8 immediate recall mean value exceeds the ideal mean score (halfway between change and perfect scores) for a posttest. With

subjects scoring this high on the pretest, a ceiling effect is created no matter what score metric is used. Any differences that may have occurred as a result of the experimental treatments were diminished as a result of the subjects' performance on the pretest.

The relationship between the different note-taking treatments and the instructional television lesson selected for this investigation may also have contributed to the no significant difference findings for the research hypotheses. As stated in Chapter III, the televised lesson used in this study was designed to first explain the concept or principle, and then provide numerous examples of how and when to use the idea in different behavioral situations.

This careful explanation of new ideas may have provided enough redundancy of essential information to allow subjects to learn the new concepts andprinciples without having to rely on note-taking. In other words, the redundancy in the televised lesson may have replaced the redundancy created by note-taking. Therefore, the effects of note-taking during this instructional television lesson could have been diminished. If a televised lesson with little redundancy of information had been used in this study, the effects of note-taking on the initial processing and learning of lesson content may have been different.

In concluding this section, it should be noted this investigation was quasi-experimental in nature, and the experimenter did not have control over all possible sources of experimental weakness and error. This statement provides no excuse for the research findings; rather, it indicates the practical realities faced by experimenters attempting quasi-experimental research. Also, some of the determinations of experimental error were made ex post facto. The final section of this chapter will incorporate the possible sources of experimental error discussed above into the implications for further research in the area of student note-taking during an instructional television lesson.

IMPLICATIONS

Implications for Future Research

1. Future investigations exploring the relationships between student note-taking during an instructional television lesson and student learning should utilize an instructional television lesson or lessons that present content that is totally unfamiliar to the experimental subjects. While pre-established criteria had been established for the lesson used in this investigation, subjects still scored higher

than chance on the pretest of lesson content.

2. Future investigations examining student note-taking during a televised lesson should select an instructional television lesson with little or no redundancy of lesson content information. A great deal of information redundancy during the lesson may diminish the effects of the different note-taking treatments.
3. Future investigations in this area should use experimental subjects with varying academic levels and abilities. This investigation was restricted to utilizing college seniors and graduate students.
4. Future investigations in this area should examine the subjects' entry level note-taking skills. It is possible the various note-taking treatments would have differentiating effects when high ability note-taking subjects are compared to low ability note-taking subjects.
5. Future investigations in this area should measure the effects of the different note-taking treatments over several different television lessons. This procedure may diminish the Hawthorne effect and provide

data from a number of observations to be used in examining the research hypotheses. This study was limited to one instructional television lesson.

6. While this investigation concentrated on the first of two note-taking functions, the initial processing and learning of lesson content, future studies should examine the second function of student note-taking, the use of notes as an external storage device for use in later study. Future investigations should examine the effects of the various note-taking treatments on retention of information and also the use of notes for study purposes.
7. Future investigations should examine the use of cognitive mapping diagnostic tests to identify the learning styles of subjects. It may be possible for the note-taking treatments to have differentiating results with the various learning styles of the subjects.
8. Future investigations should replicate the various note-taking treatments with different types of subject matter and with different dependent variables.

9. Future investigations in this area should include an attitudinal measure of the efficiency of the various note-taking treatments. It may be possible that subjects would find one method of note-taking to be a more efficient way for them to learn or review the information presented in the televised lesson.

Implications for Designers and Users of Instructional Television

The findings for the research hypotheses of this investigation are restated below in terms of their practical implications for designers and users of instructional television. These implications should be interpreted in light of the types of television lesson used for this particular study, the population from whom subjects were chosen, the type of student achievement measured, and the previously-reported low reliability level for the application dependent variable.

1. This study provides no justification for restricting students from taking notes during the television lesson on the basis that note-taking interferes with student learning.

2. This investigation also found no justification for recommending one note-taking treatment over another on the basis that one of the treatments would maximize the student/learning of content presented in the instructional television lesson. All treatments appear to work equally well.
3. Viewing the results of this investigation from the standpoint of practicality, there is no justification for designing an adjunct note-taking guide to accompany the instructional television lesson on the basis that such a guide would improve the initial processing and learning of television lesson content. Such a note-taking guide may be beneficial for use in increasing the student's retention of content, but the question of the use of notes for later study went beyond the scope of this research investigation.

APPENDICES

APPENDIX A

Lesson Five: Shaping and Scheduling Lesson Concepts and Objectives

ESSON CONCEPTS

1. Shaping: the procedure of reinforcing successively closer approximations of the desired behavior in order to teach a new response.
2. Superstitious behavior: a behavior rewarded by an accidental contingency; when a consequence, unrelated in cause, occurs through chance after behavior.
3. Continuous reinforcement: a conditioning procedure where consequences interpreted as pleasant, or having the effect of increasing the frequency of the behavior, are presented every time the behavior occurs.
4. Intermittent reinforcement: a conditioning procedure where the consequent stimuli (which control behavior) are not presented after every response.
5. Fixed schedule: a reinforcement schedule where depends upon a set number or time.
6. Variable schedule: a reinforcement schedule reinforcement depends upon an average number

or time (not random, not merely different, the schedule is planned to average to a number or time).

7. Interval schedule: a reinforcement schedule where reinforcement depends on time passed since the last reinforcement (or amount of time a behavior is shown).
8. Ratio schedule: a reinforcement schedule in which reinforcement depends upon the number of responses performed, no matter how long it takes to emit the response.
9. Fixed interval schedule (FI): an interval reinforcement schedule where reinforcement is given for the next correct response after a fixed amount of time since the last reinforcement.
10. Fixed ratio schedule (FR): a ratio reinforcement schedule where a fixed number of responses must be emitted before reinforcement is given.
11. Variable interval schedule (VI): an interval reinforcement schedule where reinforcement is contingent on performance of the next correct response following passage of the average of some predetermined amount of time.

12. Variable ratio schedule (VR): a ratio reinforcement schedule where reinforcement is contingent on performance of the average of some predetermined number of responses.
13. Cumulative charts: a method of recording emitted behaviors by recording and adding each additional behavior to the total number of responses recorded over time.
14. Frequency charts: a method of recording emitted behavior by recording the number of times a behavior occurs over time.

LESSON OBJECTIVES

1. Given a behavioral problem situation in any form, the student will be able to state a desired target behavior; the target behavior must be an observable, specific, child behavior, positively stated and most similar to a behavior that terminates the problem situation.

   Explanation: The way to begin to solve behavior problems or to motivate students is to determine precisely what desirable actions you believe a student should exhibit.
2. Given the name of a learning concept or principle and choice of a series of situations

in any form (cartoon, recording, film, role, or a real learner), the student will be able to select the situation that matches the stated learning concept or principle so well that the attributes of the situation will be most similar to the attributes of the definition of the learning concept or principle.

3. Given a situation and a choice of concept or principle names, the student will choose the correct label (same criterion as above). Explanation: To show rudimentary understanding learning and motivation principles, you should be able to recognize principles in use. One way to do that is to choose examples or choose the name of a principle for a given example.
4. Given a behavioral problem situation in any form and a stated target behavior, the student will be able to state (or choose) a learning concept or principle to achieve the target behavior and an abstracted rationale so well that application of the concept or principle will bridge or change the behavior presented in the situation to reach the target behavior.

Explanation: One of the most difficult decisions to make is which principle to apply in a given situation. Some principles fit certain circumstances better than others.

6. Given a behavioral problem situation in any form, a target behavior, and a learning concept or principle, the student will be able to state how the concept or principle would be used to achieve the target behavior so well that the explanation will be in performance terms, possible to achieve in a real-world situation, directed toward the target behavior, and the attributes of the application must match the attributes of the principle given.

   Explanation: Once you have selected a principle which applies in a given situation, you have to convert the principle into a solid concrete plan of action.

7. Given a behavioral problem situation in any form, the student will be able to choose a learning concept or principle and state a practical application of the principle so well that the explanation will be in performance terms, possible in the instructional situation, directed toward the target behavior,

and the prescriptive statement's attributes match the attributes of the definition for the concept or principle selected. (This objective combines objective 5 & 6).

APPENDIX B

INTRODUCTION

During this term, you will assist in the evaluation of a television lesson from the "Learning and Liking It" series, produced at Michigan State University. The television series is designed for teachers and deals with how to use basic learning, behavior management and psychological principles in the classroom. The purpose of the evaluation is to determine if the lesson and the accompanying materials actually teach.

The following quiz measures what you currently know about the ideas you will see in the television lesson. You may not be able to answer all questions, but do the best job you can. At a later date, you will see the television lesson.

DIRECTIONS

1. Write all answers on the Answer Sheet.
2. Write your name and quiz number in the spaces provided on the Answer Sheet.
3. Complete the information requested in the Student Information section.
4. Read each question carefully and write your answer on the Answer Sheet.
5. When completed, turn-in this quiz and your Answer Sheet to the proctor.
6. Thank you for your help.

IMPORTANT

INFORMATION COLLECTED FROM THIS QUIZ WILL BE PRESERVED IN PROFESSIONAL CONFIDENCE. YOUR NAME OR STUDENT NUMBER WILL NOT BE USED IN ANY REPORT OF THIS EVALUATION.

SHAPING AND SCHEDULING
PRETEST

INSTRUCTIONS:

1. This quiz measures what you currently know about the psychological principles of shaping and scheduling. You may not be able to answer all questions, but do the best job you can.
2. Write all answers on your Answer Sheet.

PART I: MULTIPLE CHOICE

1. Mr. Bonaparte wants his students to pronounce their French according to the best French grammatical standards. At this moment, his students have a very strong American accent and pronounce the words without any flaws. How would you use shaping in this case?

   a. Continuously reward a student's attempts at trying to pronounce words correctly.
   b. Reward only flawless pronunciation.
   c. Reward students any pronunication, then reward them for pronunciation for one less flaw, and so on.
   d. Reward student for any pronunciation.

2. Which of the following is a fixed reinforcement schedule?

   a. Praising the student for an average of every 3 piano exercises completed.
   b. Praising the student for every 3 piano exercises successfully completed.
   c. Praising the student for practicing the piano.
   d. Praising a student for practicing the piano on an average of every ten minutes.

3. Fran wore her blue dress on the day of the midterm exam. She got one of the best grades ever on that exam. Now Fran wears the blue dress to all her exams. What idea explains this example?

   a. Continuous reinforcement.
   b. Empirical Law of Effect.
   c. Fixed reinforcement schedule.
   d. Shaping.
   e. Superstitious behavior.

4. You want students to work very hard on their composition. How would you use a variable ratio schedule here? Praise students for:

   a. every 4 compositions
   b. every 40 minutes at composition
   c. an average of 4 compositions
   d. an average of 40 minutes of composition

5. Ms. Hoffa praises her students after every 5-10 times they successfully complete a task instead of after every time. What idea is she applying?

   a. Continuous reinforcement.
   b. Intermittent reinforcement.
   c. Intrinsic reinforcement.
   d. Shaping.

6. When you record only the number of responses for each time period on a chart, the chart is called a:

   a. reinforcement chart
   b. cumulative chart
   c. frequency chart
   d. record keeping chart

7. How would you use a variable interval schedule to get students to attend to what you were saying over a long period of time.

   a. Praise students for paying attention about (on the average of) every five minutes.
   b. Praise students for paying attention every 5 minutes.
   c. Praise students for taking an average of 2 pages.
   d. Praise students for taking 2 pages of notes.

8. Mr. Goode rewards the class for every assignment they turn in. What idea is Mr. Goode applying?

   a. Continuous reinforcement.
   b. Intermittent reinforcement.
   c. Intrinsic rewards.
   d. Natural consequences.
   e. Variable reinforcement.

9. When you add responses for a given time period to previous responses shown, the chart is called a:

   a. time chart
   b. a time by response chart
   c. cummulative chart
   d. frequency chart

10. Which of the following is an example of a fixed interval schedule? Giving praise for:

    a. producing about 16 pieces of work
    b. producing each 10 pieces of work
    c. staying at work for each half hour period
    d. doing work for an average of 45 minutes

11. When a teacher praises students for the number of reports done, he is using the idea:

    a. fixed reinforcement schedule
    b. interval reinforcement schedule
    c. ratio reinforcement schedule
    d. variable reinforcement schedule

12. Which of the following is an example of a fixed ratio schedule? Giving points for:

    a. each set of 5 excellent compositions
    b. an average of every 5 excellent compositions
    c. spending an hour writing compositions
    d. spending an average of 60 minutes writing compositions

13. Ms. Printe rewards students for the amount of time they pay attention. This example represents the idea:

    a. Continuous reinforcement schedule.
    b. Fixed reinforcement schedule.
    c. Interval reinforcement schedule.
    d. Ration reinforcement schedule.

14. Which of the following is an example of a variable interval schedule?

    a. Praise only for attending
    b. Praise for attending after each 5 minute period
    c. Praise for attending with face forward
    d. Praise for attending on the averave of every 5 minutes

15. Which of the following is an example of a variable schedule? Providing tokens for:

    a. an approximation to a good pushup
    b. a certain number of pushups
    c. somewhere between 5 & 10 pushups
    d. time spent doing pushups

PART II: SHORT ANSWER

INSTRUCTIONS: On your Answer Sheet, write how you would use the idea underlined to solve the instructional problem. Be as precise and practical as possible.

EXAMPLE:

Question: How would you use continuous reinforcement to get a student to talk more during class discussion time?

Answer: Give praise or rewards to the student every time he/she makes a statement during discussion time.

16. How would you use a fixed ratio schedule to get students to work on multiplication table exercises?

17. How would you use shaping to get a student who is frequently late now to arrive at school on time?

18. How would you use a variable interval schedule to get students to work hard at swimming practice?

19. How would you use a fixed interval schedule to get students to work on typing practice exercises?

20. How would you use a variable ratio schedule to get students to complete the writing of research abstracts?

TURN IN THIS QUIZ AND YOUR ANSWER

SHEET TO THE PROCTOR

THANK YOU FOR YOUR HELP

APPENDIX C

SHAPING AND SCHEDULING
Lesson Quiz

DIRECTIONS:

1. The questions in this quiz cover information presented in the television lesson. Answer each question as best you can.
2. Write all answers on your Answer Sheet.

PART I: MULTIPLE CHOICE

1. Students in the medical technology class make readings from instruments which are very rough, and the teacher demands precision. How would you use shaping in this case? Give high praise for:

   a. Precise readings only.
   b. Rough readings for at least one month.
   c. Attempts at precision readings.
   d. Rough readings at first, later only for more precise readings.

2. Mr. Rockerfeller praises his students after they have worked for a certain period of time. This example represents the idea:

   a. Fixed reinforcement schedule.
   b. Interval reinforcement schedule.
   c. Ratio reinforcement schedule.
   d. Variable reinforcement schedule.

3. Which of the following is an example of a variable interval schedule?

   a. Praising students for completing assignments on the average of 3 days a week.
   b. Praising students for completing every 5 homework assignments.
   c. Praising students for completing homework assignments every other day.
   d. Praising students for every completed assignment.

4. Miss Cauley does not praise the students for every assignment they turn in. What idea is she applying?

   a. Continuous reinforcement.
   b. Fixed schedules of reinforcement.
   c. Intermittent reinforcement.
   d. Shaping.

5. Mr. Hays rewards his players for every tackle they make. What idea is he applying?

   a. Complete feedback.
   b. Continuous reinforcement.
   c. Intermittent reinforcement.
   d. Natural consequences.

6. Which of the following is a fixed reinforcement schedule?

   a. Rewarding every other word spelled correctly.
   b. Rewarding students for an average of every 10 spelling words.
   c. Rewarding students for every ten correct spelling words.
   d. Rewarding students for spending an average of 10 minutes at spelling.

7. Mr. Columbia kept a record of student responses in which only the number of responses for each time period was shown. This type of chart is called:

   a. Cumulative chart.
   b. Frequency chart.
   c. Reinforcement chart.
   d. Reinforcement record.

8. Which of the following is a variable reinforcement schedule?

   a. Only rewarding a student for paying attention after 15 minutes.
   b. Rewarding students for paying attention for an average of 15 minutes.
   c. Rewarding a student for paying attention every 15 minutes.
   d. Rewarding a student for paying attention every minute.

9. George found that he did best in swimming class on days when he sang in the locker room. George sang in the locker room before each class. What is the most likely reason for George singing in the locker room?

   a. George is getting better at swimming.
   b. George was being shaped.
   c. George was reinforced accidentally for singing.
   d. George was being reinforced on a fixed interval schedule.

10. Mr. Samuels doesn't want his students working so hard. Right now he rewards assignments in an inconsistent fashion. Sometimes he will give credit for 2 assignments, sometimes 4, sometimes 6, etc. Students are working themselves very hard. What is the most likely cause for the students great effort?

a. Mr. Samuels rewards students on a variable ratio schedule.
b. Mr. Samuels rewards students on a variable interval schedule.
c. Mr. Samuels rewards students on a fixed interval schedule.
d. Mr. Samuels rewards students on a fixed ratio schedule.

11. Which of the following is an example of a fixed ratio schedule?

a. Rewarding students after every ten minutes of practicing Morese Code.
b. Rewarding students for any improved performance.
c. Rewarding students for an average of every three Morse Code letters learned.
d. Rewarding students for every three new Morse Code letters learned.

12. Mr. Borg kept a record of student responses which added each new response to the total on the graph. This type of chart is called a(n):

a. Cumulative ratio chart.
b. Cumulative record chart.
c. Frequency chart.
d. Reinforcement chart.
e. Reward chart.

13. Which of the following is an example of a fixed interval schedule?

a. Reward students for reading approximately every 15 minutes (13, 16, 18, etc.).
b. Reward student for an average of every 5 assignments handed in.
c. Reward students for reading for each 15 minutes.
d. Reward students for every 3 assignments handed in.

14. Ms. Cooke rewards students for the number of tasks completed. This example represents the idea:

a. Fixed reinforcement schedule.
b. Interval reinforcement schedule.
c. Ratio reinforcement schedule.
d. Variable reinforcement schedule.

15. How would you use a variable interval schedule to get students to stay and use the library over a long period of time?

    a. Praise students for choosing about 3 books.
    b. Praise students for choosing 3 books.
    c. Praise students for staying for an average of 10 minutes.
    d. Praise students for staying 10 minutes.

PART II: SHORT ANSWER

INSTRUCTIONS: On your Answer Sheet write how you would use the idea underlined to solve the instructional problem. Be as precise and practical as possible.

EXAMPLE:

Question: How would you use continuous reinforcement to get a student to talk more during class discussion time?

Answer: Give praise or rewards to the student every time he/she makes a statement during discussion time.

16. How would you use a fixed interval schedule to get students to study quietly during study period?

17. How would you use shaping to get a student to measure more accurately with a ruler?

18. How would you use a variable ratio schedule to get students to work in their handwriting assignments?

19. How would you use a variable interval schedule to get a student to practice piano exercises?

20. How would you use a fixed ratio schedule to get students to complete laboratory experiments?

TURN IN THIS QUIZ AND YOUR ANSWER

SHEET TO THE PROCTOR

THANK YOU FOR YOUR HELP

APPENDIX D

TELEVISION LESSON OUTLINE

I. Introduction

A. When using positive reinforcement two questions arise:

1. What if a child has not done something well enough to be reinforced?

2. What would happen if you can't reinforce a student everytime he performs well?

B. There are three major ideas which help answer these questions.

1. Shaping
2. Charting
3. Schedules of reinforcement

II. Shaping

A. What is shaping?

1. Reward a student for successive _____ toward the desired behavior.

2. Example: backscratch

3. Example: _____

B. How do you use shaping?

1. Reward any _____ the student makes toward the desired behavior.

2. Once established, reward only for better attempts.

3. Use when the behavior is _____ or there is a low level of performance.

4. Example: sloppy school home work

5. Example: getting a student to work

6. Example: Lorie Loner playing with other children

III. Schedules of Reinforcement

A. One reinforcer is very powerful and can generate a number of behaviors.

1. Example: _____

2. Example: student faking class assignments

B. Because one reinforcer is so powerful a person can get reinforced

_____.

1. The consequence is not caused by the person's behavior, but he believes it is.

2. This is called _____ behavior.

3. Example: Fixing the furnace.

4. Example: Fixing the television set

5. Example: Rodney's bad luck

C. You do not have to reinforce a person every time he does something well.

1. There are two ways to do this. The first is to reinforce someone _____ he does something.

2. When you do, you are using _____ reinforcement.

3. The results of continuous reinforcement are:

   a) very rapid initial increase in behavior
   b) great for starting a child on a new behavior
   c) behavior stops quickly when _____ stops

D. When you do not reinforce every time, you are using _____ reinforcement.

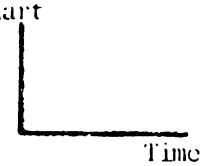
1. The results of intermittent reinforcement are

   a) more behavior over a longer period of time
   b) get the desired behavior even though you do not reward because one cannot tell when the rewards are cut-off

E. When using either continuous or intermittent reinforcement, how do you keep track of responses?

1. You can use a _____ to keep a record.

2. Typical chart



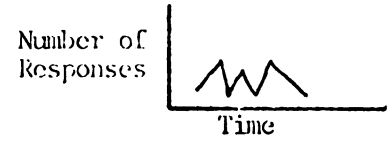
F. Charting is important because a person generally cannot notice small changes and improvements over time.

1. Example: spelling and reading new words

G. There are two types of charts

1. Frequency charts: record the number of _____ given in a time period.

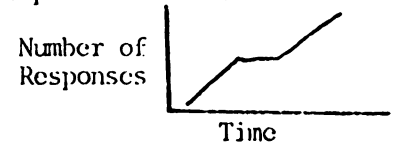
   a) shows ups and downs

   b) does not show cumulative responses over time

2. Cumulative charts: record the number of responses totaled to that point in time.

   a)

   b) a steep line shows _____

   c) a gradual slope shows _____

   _____

   d) a flat line shows _____

   _____

II. How to use a intermittent schedule

1. Ratio schedule: rewards for _____ of responses performed.

2. Example: _____

3. Interval schedule: rewards depend upon amount of _____ spent on an activity.

4. Example: _____

   _____

5. Fixed schedule: rewards depend upon a _____ amount of time or numbers of responses.

6. Example: _____

   _____

7. Variable schedule: rewards depend upon _____ amount of time passed or number of reseponses.

8. Example: _____

   _____

I. Combinations of Schedules
(See Figure 1 - next page)

J. Practice in identifying reinforcement schedules

1. Example: push-ups for credit in gym class
This is a _____ schedule.

2. Example: rewarding themselves for completing two chapters.

This is a _____ schedule.

3. Example: studying for a weekly quiz

This is a _____ schedule.

4. Example: rewarding different amounts of assignment sheets.

This is a _____ schedule.

5. Example: working continuously for a surprize quiz.

This is a _____ schedule.

6. Example: going to the mail box once a day.

This is a _____ schedule.

7. Example: child coming in for dinner at set times.

This is a _____ schedule.

K. Teachers can use different schedules to get different effects.

1. Example: work steadily but breaks are okay.

Use a _____ schedule.

2. Example: ready for a quiz at any time but wants to study other subjects as well.

Use a _____ schedule.

3. Example: work very hard and not waste time.

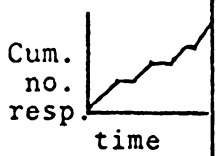
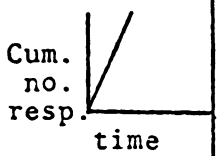
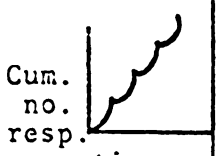
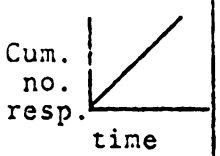
Use a _____ schedule.

4. Example: don't mind cramming but do want students ready for the exam.

Use a _____ schedule.

L. Summary Practice

FIGURE 1: SCHEDULES OF REINFORCEMENT

	SCHEDULE TYPE	GRAPHED RESULTS	RATE OF RESPONSE (RESPONSES PER UNIT OF TIME)	TYPE OF PAUSE	WHEN REINFORCEMENT APPEARS	WHEN TO USE EACH
1.	Fixed Ratio (FR)		high	brief; follows reinforcement	only after set number of responses	when you can count responses and when you want steady work with a break
2.	Variable Ratio (VR)		high; sustained (more the student reponds, the more reinforcement is delivered. Students work very hard.)	None	May come at anytime average number of responses	when you can count responses and when you want a high rate of work in a short time
3.	Fixed Interval (FI)		low; higher as time interval ends	increases with interval length	after set amount of time (probability that reinforcement will follow immediately zero	when the behavior can be counted in time and when you don't mind low periods of work and a great deal of last minute work
4.	Variable Interval (VI)		low; sustained; (longer the interval, lower the rate) maintains behavior over the longest time	None	after an average length of time (cannot estimate when it will appear)	when the behavior can be counted in time and when you want steady work over a long period

APPENDIX E

TELEVISION LESSON OUTLINE

I. Introduction

A. When using positive reinforcement two questions arise:

1. What if a child has not done something well enough to be reinforced?

2. What would happen if you can't reinforce a student everytime he performs well?

B. There are three major ideas which help answer these questions.

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A. What is shaping?

1. Reward a student for successive approximations toward the desired behavior.

2. Example: backscratch

3. Example: hot and cold game

B. How do you use shaping?

1. Reward any attempt the student makes toward the desired behavior.

2. Once established, reward only for better attempts.

3. Use when the behavior is complicated or there is a low level of performance.

4. Example: sloppy school home work

5. Example: getting a student to work

6. Example: Lorie Loner playing with other children

III. Schedules of Reinforcement

A. One reinforcer is very powerful and can generate a number of behaviors.

1. Example: feeding a stray cat

2. Example: student faking class assignments

B. Because one reinforcer is so powerful a person can get reinforced accidentally.

1. The consequence is not caused by the person's behavior, but he believes it is.

2. This is called superstitious behavior.

3. Example: Fixing the furnace.

4. Example: Fixing the television set

5. Example: Rodney's bad luck

C. You do not have to reinforce a person every time he does something well.

1. There are two ways to do this. The first is to reinforce someone every time he does something.

2. When you do, you are using continuous reinforcement.

3. The results of continuous reinforcement are:

a) very rapid initial increase in behavior
b) great for starting a child on a new behavior
c) behavior stops quickly when reward stops

D. When you do not reinforce every time, you are using intermittent reinforcement.

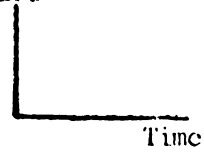
1. The results of intermittent reinforcement are

a) more behavior over a longer period of time
b) get the desired behavior even though you do not reward because one cannot tell when the rewards are cut-off

E. When using either continuous or intermittent reinforcement, how do you keep track of responses?

1. You can use a chart to keep a record.

2. Typical chart



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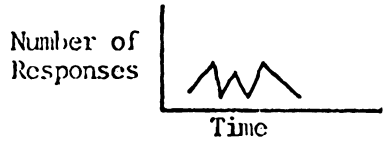
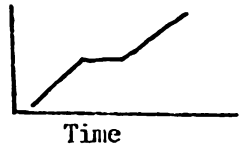
   

   b) does not show cumulative responses over time

2. Cumulative charts: record the number of responses totaled to that point in time.

   a) Number of Responses

   b) a steep line shows working very hard

   c) a gradual slope shows working steadily over time

   d) a flat line shows no additional responses

H. How to use a intermittent schedule

1. Ratio schedule: rewards for number of responses performed.
2. Example: number of assignments handed in.
3. Interval schedule: rewards depend upon amount of time spent on an activity.
4. Example: amount of time spent sitting up straight
5. Fixed schedule: rewards depend upon a set amount of time or numbers of responses.
6. Example: every 3 assignments
7. Variable schedule: rewards depend upon average amount of time passed or number of reseponses.
8. Example: an average of about every 3 assignments

I. Combinations of Schedules
(See Figure 1 - next page)

J. Practice in identifying reinforcement schedules

1. Example: push-ups for credit in gym class
This is a fixed ratio schedule.

2. Example: rewarding themselves for completing two chapters.
This is a fixed ratio schedule.

3. Example: studying for a weekly quiz
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1. Example: work steadily but breaks are okay.
Use a fixed ratio schedule.

2. Example: ready for a quiz at any time but wants to study other subjects as well.
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FIGURE 1: SCHEDULES OF REINFORCEMENT

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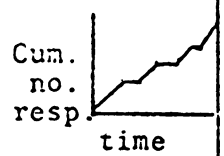
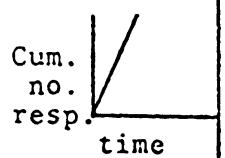
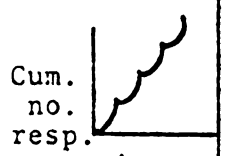
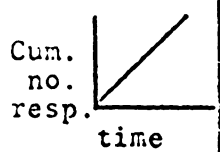
1.	Fixed Ratio (FR)		high	brief; follows reinforcement	only after set number of responses	when you can count responses and when you want steady work with a break
2.	Variable Ratio (VR)		high; sustained (more the student reponds, the more reinforcement is delivered. Students work very hard.)	None	May come at anytime average number of responses	when you can count responses and when you want a high rate of work in a short time
3.	Fixed Interval (FI)		low; higher as time interval ends	increases with interval length	after set amount of time (probability that reinforcement will follow immediately zero	when the behavior can be counted in time and when you don't mind low periods of work and a great deal of last minute work
4.	Variable Interval (VI)		low; sustained; (longer the interval, lower the rate) maintains behavior over the longest time	None	after an average length of time (cannot estimate when it will appear)	when the behavior can be counted in time and when you want steady work over a long period

BIBLIOGRAPHY

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Abbey, June C., et.al. "Home and Hospital Viewing of Continuing Education Broadcasts under Three Presentation-response Conditions." Theo S. Grant and Irving R. Merrill, Television in Health Sciences Education. USOE Project Number 164. San Francisco: University of California, San Francisco Medical Center, September 30, 1963.

Aiken, Edwin G., Gary S. Thomas and William A. Shennum. "Memory for a Lecture: Effects of Notes, Lecture Rate, and Information Density." Journal of Educational Psychology 67 (1975), pp. 439-444.

Ash, Philip and B. J. Carlton. "The Value of Note-taking During Film Learning." SDC-269-7-21. Instructional Film Research Reports. Port Washington, New York: U.S. Naval Special Devices Center, 1951.

Campbell, Donald T. and Julian C. Stanley. "Experimental and Quasi-Experimental Designs for Research on Teaching," in Handbook of Research on Teaching, N. L. Gage (Editor). Chicago: Rand McNally College Publishing Company, 1963.

Crawford, C.C. "Some Experimental Studies of the Results of College Note-taking." Journal of Educational Research 12 (1925), pp. 379-386.

Cronbach, Lee J. Essentials of Psychological Testing, Second Edition. New York: Harpers and Brothers, 1960.

Cronbach, Lee J. "Coefficient Alpha and the Internal Structure of Tests", Psychometrika, 1951, 16, p. 297-334.

Doty, C. R. "The Effect of Practice and Prior Knowledge of Educational Objectives on Performance. (Doctoral Dissertation, Ohio State University, 1968). Dissertation Abstracts, 1968-69, 29, 3035A

Ebel, Robert L. Essentials of Educational Measurement. Englewood Cliffs, New Jersey: Prentice Hall, Inc., 1972.

Eisner, S. and K. Rhode. "Note-taking During or After the Lecture." Journal of Educational Psychology 50 (1959), pp. 301-304.

Farquhar, William W. Directions for Thesis Preparation. East Lansing, Michigan: Graduate Student Affairs Office, College of Education, Michigan State University, 1969. (Mimeographed)

Fisher, Judith L. and Mary B. Harris. "Effect of Note-taking and Review on Recall." Journal of Educational Psychology 65 (1973), pp. 321-325.

Gropper, George L. and Arthur A. Lumsdaine. "An Experimental Comparison of a Conventional TV Lesson with a Programmed TV Lesson Requiring Active Student Response." Studies in Televised Instruction, Report No. 2 Pittsburgh: Metropolitan Pittsburgh Educational Television Stations WQED-WQEX and American Institute for Research, March, 1961. (USOE Project No. 336; University Microfilms Pub. No. 62-1080).

Gropper, George L. and Arthur A. Lumsdaine. "An Experimental Evaluation of the Contribution of Sequencing, Pre-Testing, and Active Student Responses to the Effectiveness of 'Programmed' TV Instruction." Studies in Televised Instruction, Report No. 3. Pittsburgh: Metropolitan Pittsburgh Educational Television Stations WQED-WQEX and American Institute for Research; April 1961. (USOE Project No. 336; University Microfilms Pub. No. 62-1081).

Issacc, Stephen and William B. Michael. Handbook in Research and Evaluation. San Diego: Robert R. Knapp Publishers, 1974.

Kerlinger, Fred N. Foundations of Behavioral Research, second edition. New York: Holt, Rinehart and Winston, Inc., 1973.

Lavin, Marvin H. "The Relative Effectiveness of Three Types of Notes Used as Adjunct Study Activities to Group Audio-visual Instruction." (Doctoral Dissertation, University of Iowa, 1971) Dissertations Abstract, 1971-72, 32 (University Microfilm No. 72-8272).

McClendon, Paul I. "An Experimental Study of the Relationship Between the Note-taking Practices and Listening Comprehension of College Freshman During Expository Lectures." Speech Monographs 25 (1966), p. 222-228.

Mehrens, William A., and Irvin J. Lehman. Measurement and Evaluation in Education and Psychology. New York: Holt, Rinehart and Winston, Inc., 1973.

Michael, Donald N. and Nathan Maccoby. "Factors Influencing Verbal Learning from Films under Varying Conditions of Audience Participation." Journal of Experimental Psychology 46 (1953), pp. 411-418.

Peters, Donald L. "Effects of Note-taking and Rate of Presentation on Short-Term Objective Test Performance." Journal of Educational Psychology 63 (1972), pp. 276-280.

Roethlisberger, Fritz J. and W. J. Dickson, Management and the Worker. Cambridge Massachusettes: Harvard University Press, 1940.