THE EFFECTS OF NORM SPEAKING RATE AND TIME-COMPRESSED RATE IN AUDIO TAPED MATERIAL UPON THE LISTENING COMPREHENSION AND RETENTION OF COLLEGE STUDENTS

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PREFACE

This study is concerned with an analysis of the effects rate of presentation of audio taped material have upon the listening comprehension and retention of college students. The major focus is to determine if time-compression of audio taped material in conjunction with a stabilized speaking rate can save presentation time without appreciable losses in comprehension and retention. A sub-purpose of the study is establishing baseline data for determining a "norm" speaking rate for the Oklahoma area.

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CHAPTER I

PROBLEM DEFINITION

Introduction

As auditory educational methods assume more significant roles in today's educational process, it becomes increasingly necessary to pursue alternatives by which such methods may be facilitated. Educators are finding that the volumes of information can not be presented in traditional classroom operations. It, appears, then, that improved methods for the disseminating of information should be given a high priority in our educational process.

Utilization of the audio tape recorder is an efficient way to achieve audiolearning, whether in a traditional classroom or in individualized instruction. Information that is supplemental to regular classroom presentations may easily be recorded onto audio tapes. Professionally designed tape programs are also available in a wide range of topics.

Traditional classroom educators, industry, and the military are employing audio tapes as training aids in areas of personal and professional growth. All educators are faced with a "knowledge explosion" which brings with it the problems of effectively coping with a growing information base and efficiently presenting that information.

The listener in auditory education must be motivated to receive the maximum benefit from the information presented. Arrasjid (1973) contends:

> Since listening plays such a large role in communication and learning, audio tapes can function in an important fashion in the design and delivery of instruction. Such tapes foster individualized instruction and allow material to be presented in less time with no loss of learning, thus freeing both the student and the instructor for other activities (p. 1).

There are two factors of primary importance to the presenter of audio taped information. The first is the listener's ability to comprehend the material. The second is the listener's ability to assimilate the verbalized material within a given time span.

Decreased presentation time can be efficiently achieved through compressed speech. Electronic deletion of pauses between words and the minute deletion of the vowel sounds in taped oral presentation is the technique for processing compressed speech in this study. Another technique actually removes minute segments of the tape and then reunites the remaining segments. Other mechanical speech compression processes include the "speed changing" method where recorded speech is played back at a different speed than the original recording. The "sampling" technique of mechanical speech compression eliminates portions of the audio tape without concern for either consonant or vowel sounds. When initial speaking rate is held constant, presentation time can be effectively shortened by speech compression.

This study examined the feasibility of efficiently

altering presentation time of verbalized material and the effects of the alteration on the comprehension and retention of the material.

Statement of the Problem

Can the time-compression of audio taped material in conjunction with a stabilized speaking rate save presentation time without altering comprehension and retention? Can the presentation rate of audio taped material be altered to reduce optimal listening time? The major focus of this study was the effect of speaking rate on listening comprehension and retention.

Statement of Purpose

The purpose of this study was to determine the effects of speaking rate and time-compression of audio taped material upon the listening comprehension and retention of college students in teacher education. A sub-purpose of the study was to determine a "norm" speaking rate for the Oklahoma area. This "norm" speaking rate was determined by analyzing the speaking rate of selected faculty members of the College of Education at Oklahoma State University. Selection of the faculty to participate in the "norming" group was based on the number of years of continuous residency in the Oklahoma area.

The process used in establishing the "norm" speaking rate for the Oklahoma area can be consistent in establishing

speaking rate baseline data in other geographical regions of the country. The stabilization of speaking rate ascertains that audio material presented remains consistent with the "norm" speaking rate for the Oklahoma area.

Significance of the Study

An expanded information base necessitates the implementation of an educational tool which would decrease presentation time of verbalized material. Speech compression can readily become this tool. Orr et al. (1965) pointed out the need for time saving in an educational setting:

> At a time when the school curriculum is becoming more and more crowded, the possibility of presenting a given amount of information in substantially less time than is now required is of potential importance. Time freed in such a fashion might be used in increasing the number of students taught by an individual instructor; increasing the amount of material presented; or in engaging in any one of a number of educational activities (p. 156).

Statement of Hypotheses

Hypothesis 1: There will be no significant differences between the listening comprehension test scores of students who have listened to audio taped material at differing rates of speech compression.

Hypothesis 2: There will be no significant differences between the listening retention test scores of students who have listened to audio taped material at differing rates of speech compression.

Operational Definitions

Norm speaking rate. The average rate in words per minute of persons located in the Oklahoma area as determined by the sub-test.

Speaking rate. The words per minute rate at which oral communication occurs determined by analyzing recordings of a cross-section of faculty members from the College of Education at Oklahoma State University, based on the "Oral Reading Passage, No. 1", from Voice and Articulation Drillbook, by Grant Fairbanks, Harper and Row, 1947.

Sub-test subjects. Those faculty members from the College of Education at Oklahoma State University participating in the sub-test from the states of Oklahoma and Kansas.

Speaker. A male speaker having a professional speaking voice. The speaker was required to narrate the verbalized material at the "norm" speaking rate.

Intact groups. Those students enrolled in a course in the Department of Curriculum and Instruction in the College of Education, CIED 3122, who participated in the final study. The students were not randomly selected or assigned to the listening groups.

Speech compression. The electronic deletion of pauses between words and the minute deletion of the vowel sounds of spoken discourse to produce an audio taped reproduction of the original verbalized material in less time than the "norm" speaking rate for the Oklahoma area.

100 per cent compression. The "norm" speaking rate in words per minute determined by baseline data of the sub-test subjects.

125 per cent compression. The electronic deletion of pauses between words in spoken discourse by the speaker to reflect a constant speaking rate that reduces listening time by 25 per cent.

140 per cent compression. The electronic deletion of pauses between words and the minute deletion of the vowel sounds of spoken discourse by the speaker to reflect a constant speaking rate that reduces listening time by 40 per cent.

Limitations of the Study

The test population of this research--the effects of norm speaking rate and time-compression of audio taped material upon the listening comprehension and retention of college students enrolled in teacher education--was limited to the students in CIED 3122, during the spring semester 1979. Enrollment in the course consisted mainly of junior level students seeking elementary or secondary certification from Oklahoma State University.

Three listening groups were established for this study. There were no control or experimental groups; each test subject was assumed to be his/her own control. Test subjects in each listening group heard listening passages reproduced on audio tape at a norm speaking rate--100 per cent compression, at 125 per cent of the norm speaking rate, and at 140 per cent

of the norm speaking rate. Immediately following the listening passages, each subject was administered an investigator designed, multiple-choice examination to test for the comprehension of the verbalized material. Examinations for retention were administered one week later. The subjects were given a composite of the three listening comprehension examinations. There was no intention in this study to compare the performances of the three listening groups in the test population.

There was no attempt made at a random selection of the subjects or the random assignment of subjects to listening groups since intact groups were used. A total of 53 students participated in the comprehension study. Due to absentees, only 47 students were represented in the retention study. No attempt was made to obtain the retention test scores of the six students absent on the day of the retention testing. The test scores of those students present for comprehension testing and absent for retention testing were counted once for analysis of comprehension only. The analysis of data was based on a one-way analysis of variance of each student's comprehension and retention test scores.

CHAPTER II

REVIEW OF SELECTED LITERATURE

Introduction

In recent years, progress has been made to alter the presentation time of audio recorded material without significant distortion in pitch and tone--without distortion in listening quality. Within the last two decades, increased attention has been given to varying methods of speech compression, the shortening of the time required to present audio taped material. David B. Orr (1974) explained the role of speech compression in contemporary education:

> Indeed , it may be argued that the entire force of the "educational revolution" of current times is primarily directed at raising the <u>efficiency</u> of time spent at the educational enterprise with respect to the attainment of the output knowledges, skills, goals, etc. Properly applied, speech compression fits well with this emphasis (p. 39).

Many studies conducted within the last 20 years, and some research done prior to that time, have significant bearing on the intended outcomes of this research endeavor. Numerous qualitative and quantitative studies into the uses of speech compression at all levels of education in both public and private education worldwide have been reported. However, studies on the relationship between speaking rate and the degree of comprehension and retention of audio taped material

have been limited.

The purpose of this chapter is to report pertinent research that has been pursued in areas of speech compression. Included in the chapter are: (1) Research into Time-Compressed Speech, (2) A History of Speech Compression Technique, (3) Establishing a Speaking Rate, (4) Speech Compression and Comprehension, (5) Speech Compression and Retention, (6) Limitations of Speech Compression, and (7) Application of Compressed Speech.

Research in Time-Compressed Speech

A basic premise underlying this study is that a person can listen, comprehend and retain spoken discourse (speech) at rate faster than the normal speaking rate. Thomas G. Sticht (1974) found that when speech is compressed in time, the principle effect is the acceleration of the rate which words occur.

Time-compressed speech has been succinctly defined by Nipper (1976) as a technique for shortening the time required for presenting recorded information without significantly distorting the pitch and quality of the message. The process of speech compression according to Silverstone (1974) maintains all consonant sounds, decreases all vowel sounds, and eradicates as closely as possible all pauses. The end product of audio material reproduced in this manner is one of transmitting human speech at a rate faster than its original production time (Orr, 1974, p. 37).

In describing what time-compressed speech is and what it isn't Orr (1974) continued:

> It must be understood that a variety of technical methods can be used to accomplish this end. However, no one of these methods can be applied to the compression of speech simultaneously with its production , since there is no external process which can speed up the source (speaking rate). It is of course true that one can simply request the speaker to speak (or read) faster. However, there are distinct limitations on the rate at which the human speaker can produce connected discourse with acceptable ennunciation; and though these limitations are subject to individual differences from person to person, in general they tend to restrict sustained productions to rates under 200 words per minute. For many people, such rates are well below their demonstrated (through reading) capabilities for processing and comprehending verbal material (p. 39).

Two methods of increasing the presentation rate of spoken discourse have been reported in the literature. One method is simply termed accelerated speech in which the word rate has been increased merely by having the speaker talk or read faster. The other method is termed compressed speech and requires the use of an electro-mechanical device to reproduce a faster word rate. In both cases, by increasing the word rate the time required for presenting a given message is reduced. Emerson Foulke (1974) agreed with Orr in assessing accelerated speech as a method of decreasing the amount of time required to present audio taped information:

> . . . word rate is under the control of the speaker. This method (speaking rapidly) has the virtue of simplicity and requires no special apperatus. However, speaking at a rate that is faster than the normal rate introduces undesired changes in vocal inflection and fluctuation in rate, and . . . makes the method generally unsuitable (p. 479).

If studies in the comprehension of time-compressed speech are to be significant it, appears, then, that one must first record the message at a normal rate, and then subject it to subsequent time-compression. In summary, Orr (1974) stated:

> Time-compressed speech requires pre-recorded material as input, expensive equipment, and, as usually used produces pitch-normal output very similar in sound patterns to the original (p. 39).

A History of Speech Compression Techniques

As early as the 1930s, research was being conducted on the inteligibility of compressed sounds and the effects of quickening the presentation rate of playback. One significant study by Peterson (1939) determined the minimum duration of the pronunciation of a vowel sound without elimination of the comprehension and identification of that sound. Knowledge of the minimum duration of any speech component sets the limits to the degree of compression that would be possible without destroying intelligibility (Nipper, 1976).

Early work done in comprehension of speeded speech lost momentum because of doubt on the part of researchers that any widespread application could ever be determined (Orr, 1968). However, a study in 1946 by Howard Psycho-Acoustic Laboratories was the first investigation in which a method was discovered to speed speech without the unusual frequency distortion. In the study, continuous speech was "chopped" by means of electrically starting and stopping speech. Miller (1946), who reported the study concluded that if some means is found to remove segments from recorded speech by "chopping

and splicing" tapes, the desired effects could be obtained.

The results of this study were apparently implemented in an approach designed in 1953 by William D. Garvey. His "chop-splice" technique removed minute tape segments then reunited the remaining segments. Testing speech intelligibility at varying intervals of compression, he discovered that he could remove up to 50 per cent of a tape without significant alteration in comprehension on the part of the listener. Kodman (1954) determined that a full two-thirds of a tape could be discarded without a significant loss in comprehension. He used the Garvey "chop-splice" technique.

In 1954, Grant Fairbanks and his research staff manufactured a speech compressor that in essence took what Garvey had done by hand, and by an electrical process achieved the same function. The machine's capabilities not only compressed verbalized material, but also expanded the material with little distrotion in quality. Foulke (1974) described the Fairbanks compressor/expander as:

> . . . a continuous loop that passes over a recording head to place on the tape the signal that is to be compressed. It passes over the device used to reproduce samples of the signal. Finally, it passes over an erase head that removes the signals from the tape loop so that the tape can be recorded on the next cycle (p. 476).

Although the machine was large, it was a technological innovation that was to be the pattern that similar compression/expansion machine manufacturers followed. The development of the Fairbanks compressor/expander eliminated the prior difficulties of pitch shift and tone distortion, and

many researchers again became interested in compressed speech.

During the 1960s, compressed speech equipment was continually being researched and refined. Alternatives to the "chop-splice" technique were being investigated. Two such methods were becoming evident. One technique called "speed changing" altered the presentation of verbalized material simply by changing the word rate reproduction of the original recording. Sticht (1974) explained:

> The word rate of recorded speech may be changed simply by reproducing it at a different tape or record speed than the one used during the recording. If the playback speed increased, the word rate is increased and the speech is compressed in time . . . However, when speech is accelerated in this manner, there is a shift in the frequency of the voice signal that is proportional to the change in the tape or record speed . . . If the speed is doubled, the component frequencies will be doubled, and overall vocal pitch will be raised one octave (p.479).

The other method of speech compression was called the "sampling" technique. This method took the recorded verbalized material and through an electrical process altered the audio tape by eliminating very minute portions of the passage, without concern for either consonant or vowel sounds. Orr (1974) described the "sampling" technique of speech compression:

> The tape recording of the material to be compressed is played through the compression device at a rate of speed which is pre-selected faster than the original recording rate of the tape. The device reads alternate portions of the tape in a manner which preserves the pitch and sound characteristics of the original tape, but totally disregards alternate portions in order to compensate for the excess speed. Thus, portions read (sampling interval) are blended into a continuous output signal, and the portions discarded (discard interval) are totally lost. The output signal may be recorded for later playback on

> any standard tape player, or amplified and played as it is being produced (p. 37).

Both techniques were found to be adequate in presenting verbalized material in less time without significant losses in the comprehension level of listeners. The sampling method, however, has been more consistent in presenting speeded speech in terms of normal voice pitch and tonal quality.

VOCOM I and Varispeech I were introduced in the early 1970s as a major advancement to electro-mechanical speech compression. VOCOM I, a product of the PKM Corporation, compresses speech by actually starting and stopping the tape as it reproduces the sound. The tape is stopped intermittently with each pause and then restarted with the next uttered sound. The Varispeech I, by Lexicon Incorporated, is similar in mechanical design to the VOCOM I, but uses a special purpose computer signal and immediately compresses that signal onto another audio cassette tape. Both machines enable the user to pre-select the amount of compression desired for the final tape copy.

In the mid-1970s, the Variable Speech Control Company introduced the VSC-A6 speech controller. This device is a light weight cassette tape recorder/player that enables the playback of any audio cassette tape at varying rates of compression or expansion. The machine can accelerate or slow down any standardized cassette tape by adjusting the control lever to the desired position. Playback adjustments can be from less than two-thirds to two and one-half times the original recording.

There has been considerable confusion in the literature concerning how to report the amounts of compression of audio taped material. Just what does a figure 75 per cent compression mean? Most studies do indicate a compression amount but offer no real reference to the stated figure. There is no hard and fast rule established when specifying the amount of compression being reported. Orr (1974) offered this advice:

> The amount of compression may be specified by the fraction, expressed as a per cent, of the time originally required for the production of a message at a faster rate (30 per cent compression means that 30 per cent of the original recording time has been saved), or the compliment of that fraction, expressed as a per cent, may be used to indicate the fraction of the original time remaining after compression (p. 482).

The second method for specifying compression amounts has been the most widely reported. This method would indicate that audio taped material that normally requires 100 seconds to present, when compressed to 125 per cent could be presented in 75 seconds.

Establishing the Speaking Rate for Time-Compressed Speech

In the majority of studies concerning speech compression, a normal speaking rate figure is given. This figure is often stated in words per minute (wpm), but there is considerable difference as to what is normal speaking rate. Evidence shows that there is not even a consistent method for reporting the normal rate figure. Some researchers report one figure only, i.e. 175 wpm, as normal speaking rate; others report normal

speaking rate ranges, i.e. 140 to 150 words per minute. Sticht (1974) reported:

> A problem common to both indices is that they do not indicate directly the word rate of compressed speech. The final word rate of two listening selections compressed or accelerated by the same amount will depend upon the original or uncompressed word rates, and may differ considerably (p. 482).

In any study involving speech compression, the normal speaking rate must be accurately stated in order to give some degree of credibility to the research. Foulke (1974, p. 483) indicated that: " . . . word rate is probably the most meaningful dimension in terms of the cognitive and perceptual process of the listener."

Researchers attempting to determine a base speaking rate in terms of words per minute have discovered that extemporaneous speech is extremely variable, ranging from 125 to 328 words per minute (Lass and Noll, 1970). According to Grasjean and Lane (1976), the rate of speaking in words per minute is a function of three independent variables: articulation rate , the number of pauses, and the duration of the pause. Harold Helson in 1948 reported that:

> In most studies of word rate, rate has consisted of taking samples of the rates of numbers of speakers, averaging these samples and concluding that this average represented the rate of effective speaking. The studies did not seek to determine the effect of these rates on the audience, although they did suggest that the rate should be adjusted to the audience and the situation (p. 177).

An experiment conducted by Hutton (1954) examined certain aspects of the temporal relationships of speech which are commonly encountered. An experimental procedure was arranged

to permit investigation of the functional relationships between the perceived and measured rates and the durations of speech samples, preferred speech rates, and the perceptual effects of speech compression.

The estimated rate of speech was found by Hutton to be a logarithmic function of measured rate in words per minute during total speaking time. The judged appropriateness of the rate of a given speech sample was found to be an inverse linear function of the difference between the estimated rate of the sample and the estimated rate most preferred. Speech performances with inapproriately low or fast rates were found to be substantially improved by an automatic time-compression toward the most preferred rate.

Speaking rate, when described for the purpose of broadcast journalism, is not based on the number of words spoken, but the number of words printed in a given space. This number, of course, is derived from a spoken rate determined to be most pleasant to read and the easiest to comprehend. For purposes of public service announcements and for news broadcasting, the following formula recognized by the United Press International (1966) determined the number of words allocated to a given line of writing:

> Use a standard size (8½ X 11) copy paper. Triple space all copy and write on one side of the paper only. Begin each story two lines from the top of the page and indent an inch on each side. Count the number of full typewritten lines. If margins have been properly set, the average full line will contain ten words. The average newscaster reads approximately 15 lines, 150 words of copy per minute (p. 8).

In teaching news broadcast reading, Garland McWatters of Oklahoma State University requests that students set up copy with margins set for a 65 space line. Figuring an average of five spaces per word rather than actually counting the words, it is determined that the average line will contain 13 words. One minute of strict copy reading will contain 15 lines of type, or a total of 195 words per minute. McWatters, an experienced broadcaster, maintains that a comfortable reading rate normally will contain 14 lines of copy. If all other variables are equal, the broadcast reading rate will be, at this comfortable reading rate, 180 to 182 words per minute.

McWatters, however, differs his approach to determining speaking rate when requested to read for narration. He counts exactly the number of words in the script, then uses a stopwatch to time his speaking rate while doing the narration. If the desired speaking rate is 170 wpm he will mark on the script each word that falls at the 85 and 170 mark. He then reads the script, timing himself by the stopwatch and attempting to read 85 words in 30 seconds and 170 words in one minute. This was the method used in the narration of the listening passages for this study.

In summary, Foulke (1974) observed:

> If compressed speech is to be specified in terms of percentage of compression or acceleration ratio, the word rate of the original production must be determined and reported. There is no "normal" word rate that can be safely assumed since there is considerable variability in the published estimates of normal word rate. Part of this variability is undoubtedly due to the difference between spontaneous conversational word rate and oral reading rate. The oral reading rate is the word rate that is relevant, since

> in most cases the speech that is compressed is recorded oral reading rate (p. 483).

Speech Compression and Comprehension

Research on the effects of comprehension of time-compressed speech has been studied quite extensively for the past two decades. One of the earliest studies, however, was conducted by Harry Goldstein. His study was designed to compare reading and listening comprehension at varying rates of presentation. The results of Goldstein's study have had a great bearing on the further research endeavors in the comprehension of compressed speech. Goldstein (1940) reported:

> There is a decline of reading and listening comprehension with increased rate. This decline, however, can not be the sole criterion in judging the effectiveness of rate of presentation. The total educational goal must be considered. Where full comprehension is desired and time no object, the slowest rate of presentation may be expected to yield the best results. Where volume of information is of basic importance, and time at a premium, fast rates of presentation would appear to be more efficient yielding increased information per unit of time (p. 60).

In general, studies of comprehension of compressed speech have centered around subjects listening to connected discourse and then being evaluated to determine a relation between rate of presentation and listening comprehension. Diehl et al. (1959) found that rate of presentation may range from 125 to 225 words per minute without appreciable loss in comprehension. The reported results of the study indicate that:

> The relationship between pause time and phonation time in connected discourse can apparently be altered with no appreciable loss in comprehension. This suggests that the hearing mechanism is highly

adaptable (p. 230).

A 1962 study by Foulke indicated that 291 blind students divided into seven groups experienced no significant loss in comprehension of literary material when presented at 225 wpm or of science material that was presented at 275 wpm. The comparison was a reading of the same material in braille.

Friedman (1965) designed a multi-purpose experiment in which he examined the effects on comprehension of time-compressed speech. The experiment (1) studied the effects of time-compressed speech for the purpose of improving comprehension of material ranging from 375 to 425 wpm in female students and (2) examined the differences between practice listening sessions containing numerous rest periods as compared to the uninterrupted listening for longer periods. Friedman concluded as a result of his study, that loss in comprehension at approximately double the normal speed was less than 20 per cent. Male and female subjects did not differ in their comprehension or performance. Nor did more frequent rest breaks improve performance.

Further research by Friedman (1967) examined the major variables in listening comprehension when college-aged students were exposed to rate-controlled speech variables grouped into three areas--stimulus, situation, and listener. The results demonstrated that students can learn to comprehend college level material at better than twice the normal rate through the use of compressed speech. Significant improvements were evident with the material presented at two and

one-half times the normal rate. Ten hours of "practice" listening preceded the listening segments on which the students were tested.

In a study by Foulke (1968) 12 comparable groups of subjects heard a selection in which rate differed from group to group in increments of 25 words per minute, from 125 to 400 wpm. After listening to the selection, the subjects took a multiple-choice test which indicated that comprehension was not significantly affected by the increase in word rate to 250 wpm; however, comprehension declined rapidly after that point. The suggested explanation of the results of this study is that time is required to perceive the words, and that, as word rate is increased beyond a certain point, the perception time available to the listener becomes inadequate.

Goldstein (1940, p. 61) showed that the decline of listening comprehension with increased word rate is slight for the lower rates, but became increased with higher rates. "The relatively small loss in comprehension at a speed of 175 to 200 words per minute is probably more than compensated for by the increased amount of information covered."

Sticht (1974) found that there is a change in the rate at which comprehension declines as word rate increased.

> The relationship revealed . . . is one in which comprehension,as indicated by test scores, decreases as word rate or the amount of compression is increased. However, outcome measures based upon test performance alone do not take into account the learning time that is saved when speech is presented at an accelerated rate (p. 490).

Brown (1969) examined the psychological effects of listening to compressed speech on the untrained observer. At first, according to Brown, the observer had to strain to hear the words as they sped by. But then, "something clicked in the mind." After a few seconds, another mechanism of comprehension meshed with the speed of the compressed speech. The effects of strained listening may have been suggested by some observers as an aid to increased comprehension. As with hearing a foreign language, concentration may result in increased comprehension, where factors do not prohibit intelligibility.

A series of studies by Sticht (1969) were performed to explore the possibility of substituting listening for reading requirements. Time-compressed speech was evaluated as a means of producing listening rates comparable to silent reading. Subjects were divided according to aptitude. Results seem to indicate that for both average and low aptitude subjects, listening was as effective as reading for gaining factual information from test passages of varying difficulty. Both high and low aptitude subjects learned more efficiently with a moderate (36 per cent) compression than with no compression of the listening passages.

Results of a subsequent study by Sticht (1970) indicated that factors limitating the comprehensibility of rapid speech reside more with the inability of the listener to process rapid rates of speech than with the signal distortion produced by the equipment or the compression process.

In a study using 32 blind subjects, Tonara (1969) tried

to determine if students comprehended and recalled more material by listening to recorded speech compressed to 57 per cent of normal rate or by listening to material simply read at an accelerated spoken rate (read 57 per cent faster than normal). It was the conclusion of the study that students achieved higher comprehension scores by listening to the compressed material. This phenomena can be explained by a statement made by Wheeless (1971, p. 239) following his study of speeded talking versus compressed speech. "It is not possible to increase speaking rate by normal means without confounding variables." The compressed speech is produced without distortion of tone or quality. According to Wheeless, such quality is not possible with fast speech. In addition, he pointed out as a result of his study that attitude toward the fast speaker was significantly lower than that toward the compressed speech.

Two general approaches have been employed in the evaluation of time-compressed speech. One such method tests subjects ability to repeat brief messages accurately--often termed tests for intelligibility. The other method tests for the comprehension of listening selections. According to Orr (1968) brief message reproduction is taken as an index of the intelligibility of speech compression.

> A procedure typical of this approach is one in which single words are compressed in time by some amount of time and presented, one at a time, to a listener. The listener's task is to reproduce the words orally or in writing, and the intelligibility scores are the percentage of correctly identified words (p. 291).

The other common approach in evaluating the effects of time-compressed speech is one in which the listener first hears a listening passage at some specified speeded rate and then is tested for knowledge of the content and implications of the selection. Foulke (1974) found that any kind of test may be used, but researchers have in general, preferred objective tests of specifiable reliability. The multiple-choice test has been a frequent choice.

In comparing the two methods for evaluating comprehension of time-compressed speech, testing for intelligibility has clearly achieved the better results. Intelligibility of compressed speech demands merely recall of words presented to the listener. Whereas testing for comprehension requires prolonged listening at rapid rates of presentation by the subject. Sticht (1974) noted that increasing the amount of time-compression appears to have a smaller influence on intelligibility than on comprehension.

Speech Compression and Retention

Retention or recall of time-compressed speech has been shown to be more effective when subjects were tested for intelligibility. Research studying the effects of retention in terms of comprehension testing have been limited, however.

Woodcock and Clark (1969) experimented with elementary school children and compressed speech in a study in which the children were exposed to a narrative passage recorded and presented at rates of compression and expansion ranging from 78 wpm to 428 wpm. It was determined that listening rates of 228

to 328 wpm were more efficient for learning and retention of the material than a normal rate of 178 words per minute.

Retention of recorded material presented at varying rates of speed does not vary with the rate of presentation, according to Barabasz (1968).

> It appears that material presentation, on a college level, can be increased in word rate, with a reduction in presentation time by one-third without any significant loss in recall or retention (p. 238).

Witkin (1969) concluded from her study with both children and adults that listeners can find some degree of accelerated speech both intelligible and comprehensible, with comprehension at about 225 to 300 wpm most desirable. In addition, retention of material presented under compressed conditions is not adversely affected when compared to normal rates, where speaking is judged to be about 125 to 175 words per minute.

In a study by George (1970) more forgetting occured with students who heard material presented at the slower rate--175 wpm, than with students who were exposed to the three highest rates--275, 325, and 375 words per minute. There was no evidence that the percentage of material originally comprehended was subsequently forgotten when the method of presentation differed for the subjects.

Simultaneous presentation of oral and visual material when the oral material was compressed was found to be of great significance in increased comprehension and retention in studies by Parker (1968) and Thames and Rossiter (1972).

Limitations of Speech Compression

Not all research in compressed speech, of course, is supportive of the process. Primrose (1975) found no significant difference in grades among students exposed to both compressed and normal rates of presentation of verbalized material. Students in this study, contrary to subjects used by Orr and other, expressed a preference for material presented at the normal rate. Student responses to a survey conducted by the Brooklyn College Department of Speech (1974) also indicated a preference for the material presented at the normal rate.

Data gathered by Sticht (1974) indicated that the additional information which could be heard in the time span saved by compressing speech did not necessarily lead to more learning. In Sticht's study, this applied to material compressed to 36 percent of the original rate. Sticht's data did indicate, however, an increased "listening efficiency" score.

> Such allowance may be made by dividing the comprehension score by the time required to present the message. This index of learning efficiency expresses the amount of learning per unit of time. Thus, although one who listens to a selection presented at 325 wpm may not be able to demonstrate as much comprehension as one who listens at a normal rate, but he may be learning more per unit of time (p. 490).

Adelson (1975) discovered that time-compressed material suffered a proportionately larger loss of comprehension than did the normal rate material when an "educationally realistic (one hour lecture) length of material" was employed. She

contends that employment of compressed speech shifts the emphasis from how to educate more accurately and adequately to how to educate more groups. The process, she said encouraged superficial examination of material rather than indepth examination.

In summary, Orr (1974) explained:

> Time-compression has its limitations, both in terms of rate and in terms of material. There are many things which probably should not be compressed, both for esthetic and intrinsic reasons. Poetry and mathematics texts, for example. And that which is to be compressed for popular consumption probably should be compressed only moderately to take advantage of the efficiencies of the process without creating comprehension difficulties. For example, most lecture-type presentations could be probably compressed to 65 per cent to 75 per cent of their original lengths without creating strain and loss of comprehension, thus saving a very significant 15 to 20 minutes out of every hour of listening time. However, further compression, particularly if instituted too rapidly, could cause problems. If there is any question, it is better to choose the slower rate, allowing the receivers to demand a faster rate when ready (p. 39).

Applications of Compressed Speech

The findings of the positive effects of compressed speech on comprehension and retention, then, implicate applications of compressed speech as approaches to the ever-widening demands on teaching created by our increasing school population. According to Barabasz (1968, p. 287), "These new approaches might be fostered through further research in the application of accelerated subject matter presentation techniques to normal classroom situations." Foulke (1974) claimed:

> If speech, when compressed, remains comprehensible, the savings in time may be an important consideration

> in these situations in which extensive reliance is placed upon aural communication (p. 478).

Orr (1968) emphasized that the applied dimension of compressed speech lies most clearly in the scope of education:

> It is clear that auditory educational methods are assuming a larger and larger role in our educational process since some children learn better auditorially; since the use of audiovisuals is growing; and since the new educational technologies, such as computer-assisted instruction, dial-access tape lectures, tele-lectures, etc, involve auditory presentations (p. 291).

The significance of compressed speech lies in two basic directions--application and research (Orr, 1976). Compressed speech can be used to examine the basic nature of human information processing. According to Orr, this tool can provide:

> A new degree of control over human communications--i.e., the implications of the differences between auditory and visual information and acquistion processes in the processing phenomenon itself (p. 291).

The applied dimension, again according to Orr, lies in the realm of education. He emphasized the implications of compressed speech in discounting the mind-wander in situations where the mind works faster than the speech it is following. Orr stated:

> . . . there is no apparent reason to assume that people can not be taught to think faster, or at least to make more efficient use of the time they spend in absorbing and processing educational information (p. 291).

Employment of compressed speech into education has been proposed by numerous experimenters in the field. Sticht (1969) advocated the use of compressed speech to selectively extend or review materials. Watts (1971) proposed the use of compressed speech for familiar or not-too-difficult material to

promote subject mastery. She emphasized, however, the use of compressed speech primarily by the "better qualified" student, a position which does not follow the norm.

Time-compressed lectures as a significant factor in the instructional management areas are advocated by Klavon (1975). His study indicated no significant variance in comprehension with varying treatments of time-compressed speech and other modes of presentation.

Short (1975) viewed time-compressed speech as a general method for improved achievement in all educational fields. Her study indicated that sighted students score significantly higher on achievement test after instruction through the use of time-compressed audio tapes than after the use of self-instructional methods.

An important finding (Orr et al., 1969) indicated that even for the untrained listener, the choice of rate of presentation exceeded the normal rate, emphasizing the potential applicability of speech compression as a method for improving the efficiency of educational communication in selected situations.

The use of very rapid auditory materials--compressed speech as a pacing method for reading--resulted in significant increases in reading speed without any loss in comprehension in a study by Orr (1964). Pugh (1975) noted that for students to whom English is not a native language, compressed speech tapes as pacers for silent reading in English proved to be a facilitator rather than a complicator for comprehension of

material. Orr et al. (1965, p. 155) pointed to the compressed tape listening process as a training phenomena. "Listening to speeded speech may have a beneficial effect on reading skill." Berg (1977) achieved similar results in his study of high school juniors and seniors. Both reading comprehension and reading speed increased significantly with "practice listening" to compressed speech tapes.

Foulke defined the role of compressed speech in aural reading in a paper summarized by Arrasjid and Razik (1968):

> When a person listens to the recorded reading of another person, he is resorting to an alternative means of obtaining the information that might be otherwise obtained by reading the printed page, and he is therefore 'reading by listening.' Some of the behaviors that enhance the performance of the visual reader are not ordinarily available to the aural reader. One of these is the ability to choose and vary the word rate in accordance with the reader's objectives and the demands imposed upon him by the reading matter. The recent availability of equipment for the time-compression of speech confronts the aural reader with the opportunity to take control of reading rate from the oral reader and to determine it for himself (p. 5-6).

Orr (1974) concurred when he stated:

> It is indeed true that much of the world's intercommunication takes place on an oral-aural basis. Of course I would not suggest that time-compressed speech should be interjected into all situations, but much of the time we spend listening to tapes (and speakers) could just as easily be time-compressed, both within education and in other areas. The rapid growth of taped newsletters, magazines, and professional digests, not to mention correspondence courses and the usual educational materials provides ample opportunity for the application of time-compressed technology. Thus, it may be seen that in these applications of time-compressed speech technology it is efficiency in the communication of information for which we must work, rather than for sheer speed (p. 39).

It is not suggested by any research that compressed speech is appropriate for all kinds of educational material. And it will be decided only by future research the exact conditions under which compressed speech may be successfully applied to education. However, as Orr et al. (1965), indicated; present research does give rise to numerous hypotheses of obvious implications for education.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

The purpose of this chapter is to describe the design and methodology of this study. Included in the chapter are: (1) a description of the procedures for determining the norm speaking rate baseline data, (2) a description of the final study test population, (3) a description of the design used in the collection of data, (4) a description of the listening passages including the procedures for preparing the audio cassette tapes, (5) a description of the listening comprehension examinations, and (6) a description of the procedures used to analyze the data.

Procedures for Determining Norm Speaking Rate

The majority of the test subjects in this study were from the Oklahoma area; this fact had an important effect on the study. Students reared in this area are accustomed to listening to teachers in public schools who may speak at a relatively constant rate. One reason for this is that the Oklahoma public schools typically employ teachers who have themselves, been reared in Oklahoma. Validity of this fact was borne out

in a telephone conversation to the Oklahoma State Department of Education. Ms. Judy Johnson, Assistant Director in the Teacher Education Section of the Oklahoma State Department of Education, indicated that teachers of Oklahoma background were typically employed in the state.

Test subjects background in this study was determined by the investigator asking the subjects in each listening group to identify states other than Oklahoma or Kansas where they were reared. One test subject indicated being reared outside the Oklahoma area. Table I contains the percentage of test subjects in the test population from the Oklahoma area.

To determine the norm speaking rate for the Oklahoma area, the investigator used a random sample of the faculty members from the College of Education at Oklahoma State University as the norming group. Twenty-two male faculty members read for recording a 300 word passage at their normal speaking rate.

The faculty members were selected from the Oklahoma area. Criteria for selection of the faculty to participate in the norming group were based on the number of years residence in Oklahoma or Kansas. Preference was given to those faculty members reared in the Oklahoma area and remained in this region. The investigator determined from an informal interview with the sub-test subjects the criteria necessary for inclusion in the sub-test.

The purpose of this sub-test was to establish a base from which a norm speaking rate for the Oklahoma area could be

determined. The reading passage used in the sub-test was "Reading Passage, No. 1," found in Grant Fairbanks' Voice and Articulation Drillbook. Appendix B contains a complete text of the reading passage used in the sub-test to determine the norm speaking rate for the Oklahoma area.

Although reading a passage into a tape recorder is not the same as lecturing to a class, care was taken to use the reading passage to simulate a lecture situation. Each faculty member involved in the sub-test was instructed to read the passage as if he was actually lecturing to a group of students associated with his usual level of instruction. The faculty members were asked to read the passage twice. An average of the time, in seconds, of the two readings was recorded and then converted to determine a norm speaking rate.

A classroom in Gundersen Hall was used to accomodate the sub-test. The room was equipped with a lecturn that had in place a copy of the reading passage and a microphone. An audio cassette tape recorder was used to record the faculty members readings. The investigator was present at the time of the reading sessions, but his presence was only to operate the tape recorder. At the time of the readings the faculty were unaware that they were being timed. A stopwatch was used by the investigator to record the number of seconds the faculty members took to read the passage. Timing of the recordings and the analyzing of data were done by the investigator after the sub-test subjects had left the classroom.

Determination of the norm speaking rate was achieved by

dividing the average number of seconds taken to read the passage into 300, the number of words in the passage. That result was multiplied by 60, the number of seconds in one minute. A speaking rate was then determined for each faculty member. By comparing the speaking rates of each faculty member and analyzing the results, a norm speaking rate was established for the Oklahoma area. The norm speaking rate for the Oklahoma area was established at 169 words per minute. Table II contains the raw data utilized in determining the norm speaking rate for the Oklahoma area.

Population Description

The population of this research study was limited to the students enrolled in CIED 3122, "Utilization of Instructional Media", during the spring semester 1979. Enrollment in the course consisted mainly of junior level students seeking elementary or secondary teaching certification from Oklahoma State University. The test population contained 53 students representing three intact groups. There was no attempt at a random selection of test subjects or random assignment of the subjects to particular listening groups. Each subject in this study served as his/her own control. The comparison of data was based on each individual's comprehension and retention test scores as it related to the material presentation rate. There was no comparison among or between the groups. Due to absentees, only 47 students were represented in the retention study.

Group I met at 8:30 in the morning; Group II met at 10:30 in the morning; and Group III met at 2:30 in the afternoon. Using groups that met at differing times of the day alleviated instrumentation as a threat to validity of the research. The subjects in each group were unaware of their participation in the study and had no previous training in listening to compressed speech.

Because of the nature of the study, subjects in each group with impaired hearing were asked to move to the front of the classroom where the tape recorded listening passages were presented. These subjects were given the same treatment as the others in the respective groups, but their test scores were not counted in the final analysis of data. In the final study, there were no subjects who indicated a hearing impairment.

Description of the Design

The test subjects were limited to three intact groups. Each subject in each listening group received the same treatment. Intact groups were used because of their availability and the time limits involved in a study of this nature.

In collecting the data, a counter-balanced design was employed. This design indicated that all subjects in each listening group received the same treatment. The design utilized was similar to that found in Campbell and Stanley's Experimental and Quasi-experimental Designs for Research. In describing the design, the authors state, "Under this

heading come all of those designs in which experimental control is achieved or precision enhanced by entering all responses (or settings) into all treatments" (p. 50).

The Latin Square arrangement was used in the design to take care of the variance in order in the presentation of the verbalized material. In using the Latin Square arrangement for the collection of data, Campbell and Stanley cite:

> Sums of scores are comparable in having each time and group represented in each. The difference in such sums could not be interpreted simply as artifacts of the initial group differences or of practice effects, history, etc. Similarly comparable are the sums of the rows for intrinsic group differences, and the sums of the columns of the first presentation for the differences in occasions (p. 51).

Based on the Latin Square arrangement, test subjects in each of the three listening groups listened to three audio cassette tapes containing verbalized material presented at differing speaking rates. Group I was presented a listening passage at the specified norm speaking rate for the Oklahoma area--169 words per minute (100 per cent compression). Immediately following, a listening comprehension examination was administered. When all written examinations were collected, a second listening passage was presented time-compressed to 125 per cent of the norm speaking rate--211 words per minute. A listening comprehension examination immediately followed. A third listening passage was then presented time-compressed to 140 per cent of the norm speaking rate--225 words per minute. This was followed by the third listening comprehension examination.

Group II was presented the first listening passage time-compressed to 125 per cent of the norm speaking rate; the second listening passage time-compressed to 140 per cent of the norm speaking rate; and the third listening passage at 100 per cent compression, or the norm speaking rate. Immediately following each listening passage, a written listening comprehension examination was administered.

Group III was presented the first listening passage time-compressed to 140 per cent of the norm speaking rate; the second passage at 100 per cent compression; and the third passage at 125 per cent compression. Listening comprehension examinations immediately followed each passage. Table III contains the Latin Square Arrangement for the design used in this study.

The evaluation for retention of the verbalized material came one week later. Test subjects in each listening group were administered a composite of the three listening comprehension examinations to measure the degree to which rate of presentation time of verbalized material affects forgetting. During the time of the first listening session and the re-administration of the examinations the subjects did not have any other instructional media material relating to the tape topics.

The verbalized material presented was in conjunction with regular classroom activities. The subjects were unaware that they were participants in a study. They were under the assumption that their examination scores were to become part of

their final course grade. This was determined to be beneficial in ensuring maximum effectiveness during the proceedings of the study. At the conclusion of the last comprehension examination, the subjects in each group were given an explanation of their part in the study and the reasons for the examination format. This was done to desensitize the subjects. The test subjects were then instructed that the examination results were not to officially become part of their final grade.

As in any process involving one-way communication, variables occur that confound the intended purpose of the message. Two such variables occured in this study. One was that in order to perceive the message clearly, the subjects were to listen with a conscious effort. This was a problem when the rate of verbalized material was speeded up through time-compression. Any distraction that caused the subjects to wander from the task at hand--listening--resulted in their losing the intended meaning of the message.

Another variable within this study was the logistics of the room in which the study was performed. The classroom used was a large room with typical acoustical problems. Sounds eminated easily from the hall into the room. These two variables, combined with the length of each listening passage--approximately 12½ minutes--may have had an effect on the results of this study.

The investigator did not alter the method of presenting the verbalized material. This was determined to be a true

representation of classroom learning utilizing audio media. It was felt that the subjects had adjusted to listening under the adverse conditions. Likewise, the traditional classrooms where compressed speech is to be implemented may not have the equipment needed to enhance the listening environment, i.e. listening stations with headsets.

Description of the Listening Passages

Three listening passages were used in this study to present the verbalized material to the groups. The listening passages chosen were found in Wittich and Schuller's Audio Visual Materials, chapters X and XI. The topics chosen related to the uses of audio media in the classroom, a regular module of instruction in CIED 3122.

The three listening passages were given letter designations. Listening passage A was "The Audio Learning Sequence" and was 2,090 words in length. Listening passage B was "The Language Laboratory" and was 2,186 words in length. Listening passage C was "Using the Tape Recorder in Instruction" and was 2,121 words in length. At the specified normal speaking rate--169 words per minute--the topics averaged 12 minutes and 40 seconds in duration. When time-compressed to 125 per cent or 140 per cent compression, the taped topics were decreased in duration proportionately. Appendix C contains a complete text of the listening passages.

The modes of presentation of verbalized material were categorized in the following manner: Presentation 1 was a

tape reproduction of the specified norm speaking rate, 169 words per minute. Presentation 2 was time-compressed to 125 per cent of the norm speaking rate, 211 words per minute. Presentation 3 was time-compressed to 140 per cent of the norm speaking rate, 225 words per minute.

The listening passages were first recorded onto a reel-to-reel master tape by a professional speaker. The speaker, a former employee of the Audiovisual Center at Oklahoma State University, narrated instructional tapes for various university departments. The speaker was asked to narrate each listening passage at a speaking rate of 169 words per minute.

The speaker practiced with each listening passage for one week and was then able to consistently read all three listening passages at the specified normal rate, 169 words per minute. After the three passages were recorded onto the master reel-to-reel tape, each listening passage was duplicated onto three audio cassette tapes. Each listening tape was then reproduced again to achieve two differing rates of compression and one that remained at the norm speaking rate. Each of the listening tapes was then evaluated by the investigator and the speaker. This step was necessary to determine that all listening tapes were of high quality with little distortion in tone and pitch or evidence of audible external noise.

To obtain the rates of compression desired--125 per cent and 140 per cent--the Varispeech I compressor/expander by the Lexicon Incorporated was used. This machine was made available through the Audiovisual Center at Oklahoma State University.

Utilization of this machine was advantageous because of its accuracy in achieving and maintaining the desired compression rate throughout the reproducing process.

Description of the Listening Comprehension Examinations

Evaluation of comprehension and retention was achieved by an investigator-designed, four option, multiple choice examination. Three listening comprehension examinations were prepared. One examination was designed for each of the three listening passages. Administration of the listening comprehension examinations immediately followed each listening passage

The following measures were used to validate the listening comprehension examinations: (1) The investigator requested assistance from one faculty member of the Applied Behavioral Studies in Education staff qualified in test construction. A comparison of the three listening comprehension examination was made with a transcribed copy of the listening passages. This determined that examination items represented the important topics in the passages. (2) The examinations were administered in a pilot study to 53 students in three sections of CIED 3122, in the spring semester 1979. The subjects listened to each listening passage that was to be used in the final study. Pilot study subjects were then administered the listening comprehension examinations. The pilot study subjects did not participate in the final study.

The purpose of the pilot study was to determine the internal consistency or reliability of the testing instruments. Each subject in the pilot groups listened to the three listening passages at 100 per cent compression. This was determined to be the fairest representation rate of the verbalized material for analyzing the data. Thus, any differing results, positive or negative, from the analysis of examination scores in the final study may then be attributed to the rate of presentation.

The Bureau of Tests and Measurements at Oklahoma State University analyzed the three listening comprehension examination scores of each subject in the pilot study groups. Analysis of data determined the reliability of each examination. The degree of difficulty and the item discrimination of each examination was also determined. The reliability formula used by the Bureau of Tests and Measurements was the Kuder-Richardson Formula 8. The reliability coefficient for listening examination A was .59; for examination B .67; and for examination C .60.

It was suggested that any internal consistency formula which was used for only one administration of a test would probably result in an underestimate of reliability. Likewise, the number of items in the examination is proportionate to the reliability. Generally, the more items, the greater the reliability. Another source for an underestimate of reliabilty is the wide range of item difficulty.

The testing instruments for the pilot study were given

only once to each of the three groups. There was only one form of the tests. Each examination contained 20 items. Table IV shows the analysis of data for the listening comprehension examinations. Listening comprehension examination A had a reliability of .59; the mean difficulty was 62.64; and the mean item discrimination was .30. The data for listening comprehension examination B showed a reliability of .67; a mean item difficulty of 51.51; and a mean item discrimination of .33. Data for listening comprehension examination C showed a reliability of .60; mean item difficulty was 52.45; and mean item discrimination was .30.

Each testing instrument contained 20 items. This could have contributed to the low reliability values. The Spearman-Brown Prophecy formula was applied to the pilot study data; it indicated that if each test was doubled in length in terms of items, the reliability would increase. Using this formula, reliability coefficient for examination A would be .74; for examination B .80; and for examination C .75.

Lengthening of the tests was not feasible. The examinations initially contained measurements of all major concepts in the taped presentations. Additional questions would only re-measure the same material, and nothing would be gained.

Upon reviewing the data analyzed from the pilot study and the Spearman-Brown Prophecy formula, the investigator used the following procedures to revise the testing instruments for the final study. The result of the revision was an increase in the internal consistency in the three listening examinations.

Initially, the number of items to be included in the final study listening comprehension examinations was chosen based on the degree of difficulty and the item discrimination values stated in Table IV. Three criterion were chosen to select the items. First, a table of specifications was designed to determine the content validity of the test items. Examination items were chosen in proportion to the number of major concepts and the percentage of coverage in the total listening passage. Table V contains a diagram of the table of specifications for each listening passage.

A second criterion used in item selection was correct response from one-half or more of the pilot study subjects. The third criterion was a strong positive item discrimination value of the items selected. An asterisk (*) next to the items in Table IV indicated those items selected for inclusion in the final study

When the items in each examination were selected, the pilot study examination answers of each subject were analyzed using only those items indicated by the asterisk (*) to be included in the final study. Computations were made for the mean number of correct answers, reliability, standard deviation, variance and the standard error of measurement. The reliability formula used was the Kuder-Richardson Formula 20. Table IV also contains the analysis of data for each of the revised listening comprehension examinations. Reliability coefficients were .64 for examination A; .67 for examination B; and .61 for examination C.

Although reliability figures did not improve significantly with the elimination of questions, it was determined that each examination was strengthened. The degree of difficulty and item discrimination were increased to present a more balanced testing instrument based on the topics in each listening passage. Reliability improved or remained the same resulting in a stronger testing instrument.

The final listening comprehension examination items decreased from the original 20, to 12 items in examination A and B, and 13 items in examination C. Because there was no control or experimental groupings, the number of questions on each examination did not have to be equal for statistical analysis. Table IV shows the results of item difficulty and discrimination for each revised examination. Appendix D contains a complete text of the three listening comprehension examinations.

Procedure for Analyzing the Data

Analysis of data was achieved, initially, by having the Bureau of Tests and Measurements at Oklahoma State University evaluate each test subjects examination scores for the total number of correct responses.

The next step involved subjecting the results to programmed analysis by the Computer Center at Oklahoma State University. All statistical analysis was achieved using Klecka et al. Statistical Package for the Social Sciences Primer.

The "eta" test of statistical significance was used to determine the significance of the study. Klecka et al. state: "The eta statistic assumes that the independent variable is nominal-level and the dependent variable is interval-level" (p. 75).

For this study the independent variable was the speaking rate and the dependent variable was the subjects test scores. This statistical test is used when non-parametric data are being analyzed. The acceptance or rejection level for the hypotheses was set at the .05 level of confidence.

CHAPTER IV

RESULTS OF THE STUDY

Introduction

The results of this study regarding the comprehension and retention of time-compressed audio taped material is presented in this chapter. The goals of this investigation were (1) to determine the effects of speech compression upon the listening comprehension level of college students, (2) to determine the effects of speech compression upon the retention level of college students, and (3) to determine a norm speaking rate for the Oklahoma area.

Fifty-three students participated in the study to examine the effects of speech compression upon the comprehension of audio taped material. Theses students were enrolled in CIED 3122, "Utilization of Instructional Media" during the spring semester 1979. The participants represented three intact groups meeting at differing times of the day.

Participants in each group listened to three listening passages presented on audio cassette tape. The listening passages were presented at three rates. The rates of presentation were: (1) norm speaking rate for the Oklahoma area, 169 words per minute--100 per cent compression; (2) 125 per cent compression, or 211 words per minute; and (3) 140 per

cent compression, or 225 words per minute. Following each listening passage, the participants were administered an investigator designed, multiple-choice listening comprehension examination.

The effects of speech compression upon the retention of audio taped material was achieved one week after the listening comprehension study. Due to absentees on the days of the retention study, only 47 of the original 53 participants were examined. No attempt was made to obtain the retention test scores of the six subjects absent on the day of the retention testing. The participants were administered a composite of the multiple-choice examination used in the comprehension protion of the study.

A sub-purpose of this investigation was to obtain baseline data for determining the norm speaking rate for the Oklahoma area. The norm speaking rate for the Oklahoma area was used to establish a speaking rate consistent with the rate students in Oklahoma are accustomed to hearing. This speaking rate was also used to establish the rates of time-compression used in this study--125 per cent and 140 per cent. The results of this sub-test are reported in Table II. The mean speaking rate from the sub-test was established at 169 words per minute for the Oklahoma area.

Statistical Analysis

The major purpose of this investigation was to determine the effect rate of presentation (time-compressed speech) had

upon the comprehension level of students listening to audio taped material. After three listening groups heard the listening passages and had taken the listening comprehension examinations, the results were analyzed by the Bureau of Tests and Measurements Center at Oklahoma State University.

A one-way analysis of variance technique was used to analyze the data generated to test each hypothesis in this study. The analysis of variance technique used was found in Bruning and Kintz' Computational Handbook of Statistics. This method of statistical analysis allowed the investigator to determine the effect rate of presentation had upon the listening comprehension and retention of audio taped material.

Upon completion of the analysis of variance of data obtained on the listening comprehension scores of each subject, the "eta" test for statistical significance was employed. The "eta" test, often referred to as the correlation ratio, is used to tell the degree of relation between the dependent variable and the independent variable. In this study, the dependent variable was the comprehension test score of each subject and the independent variable was the time-compression or presentation rate. The formula for the "eta" test for statistical significance is:

$$\text{eta} = \sqrt{\frac{SS_b}{SS_t}}$$

In determining the meaning of the "eta" value in terms of its relation to the significance of this study, the "eta" value must be squared. Kerlinger (1973) reported:

> If eta is squared, E^2 indicates, in essence, the variance shared by the dependent and independent variables . . . Perhaps, more to the point, E^2 indicates the proportion of the variance of the dependent variable /comprehension test score/ determined by the variance of the independent variable /compression or presentation rate/ (p. 231).

Table VI contains the overall results of the data generated to examine the effects of rate of presentation upon the listening comprehension. The analysis of variance indicated in Table VII showed an F ratio of 1.53. In order to reject the null hypothesis at the .05 level of confidence with 2 and 40 degrees of freedom, the F ratio would have had to be 3.23. Table VII also indicated an "eta" value of .24. When this value is squared, the result is .04. According to Kerlinger, this would indicate that only four per cent of the variance of the comprehension test scores was accounted for by the different modes of tape presentation rate. Table VIII contains a complete analysis for each listening comprehension examination.

The hypotheses to be tested in this research were stated in the null form.

Hypothesis 1: There will be no significant differences between the listening comprehension test scores of students who have listened to audio taped material at differing rates of speech compression.

Based on the analysis of data indicated in Table VII, the

investigator failed to reject Hypothesis 1.

The second hypothesis read:

Hypothesis 2: There will be no significant differences between the listening retention test scores of students who have listened to audio taped material at differing rates of speech compression.

The purpose of testing hypothesis 2 was to determine the effects differing rates of presentation had upon the retention of audio taped material. Table IX contains the overall results of the data generated to examine the effects of rate of presentation upon the listening retention of audio taped material.

The analysis of variance depicted in Table X indicated an F ratio of 1.22. In order to reject the null hypothesis at the .05 level of confidence with 2 and 40 degrees of freedom, the F ratio would have had to be 3.23. Thus, the investigator failed to reject Hypothesis 2. The test scores of the subjects taking the retention examinations did not differ significantly due to presentation rate of verbalized material.

Table X also indicated an "eta" value of .22. When this value is squared, the resulting figure is .05. This would indicate that only five per cent of the variance in retention test scores was accounted for by the different modes of tape presentation rate. Table XI contains the description of the raw data for subjects participating in the final comprehension and retention study.

A further analysis of data was employed in order to determine if the testing instruments had an effect on the test scores in the listening comprehension portion of the study. This was suggested as an attempt to ascertain if there was evidence leading to better performance on one examination as opposed to another, or if the presentation rate of the material was truly inconsequential.

A one-way analysis of variance in the same manner as that employed in testing the hypotheses was utilized in analyzing the individual listening comprehension examinations. Each test subjects listening comprehension test score was analyzed without consideration for the order of presentation of the verbalized material. Table XII contains the results of the analysis of variance within the listening comprehension examinations.

The analysis of variance indicated an F ratio of 6.13. To be significant at the .05 level of confidence with 2 and 120 degrees of freedom, the F ratio would have had to be 3.07. Thus, there was a difference between the listening comprehension examinations.

The use of the Sheffe Test for comparison of homogeneity of variance was then employed to ascertain which listening comprehension examination differed significantly. With the data gathered in this study, the Sheffe Test allowed the investigator to obtain a critical difference factor based on the mean test scores of all three listening comprehension examinations, and the mean square (ms) figure for within groups

found in Bruning and Kintz' Computational Handbook of Statistics. The critical difference factor obtained from the data was found to be .92. Table XIII contains the results of the Sheffe Test. It clearly indicated that listening comprehension examination B was significantly different from the listening comprehension examination C.

If reference can be made to Table VI, it can be noted that at each presentation rate, comprehension test score means for examination B were lower than for either examination A or C. This indicated that listening comprehension examination B was the more difficult of the three. It might be noted that listening passage B--"The Language Laboratory"--was the lengthiest passage to be heard by the subjects. This could very easily have had a bearing on the comprehension test scores of the subjects.

Table VI also indicated that at each presentation rate, comprehension test score means for examination C were higher than for either examination A or B. One possible reason for this, is that listening comprehension examination C was one item longer than the other two examinations.

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this research endeavor was to determine the effects of speaking rate and time-compression of audio taped material upon the listening comprehension and retention of college students in teacher education. The investigation was conducted during the spring semester 1979, at Oklahoma State University. The test population of the final study comprised 53 students representing three sections of CIED 3122, "Utilization of Instructional Media." Due to absentees on the day of retention testing, 47 students comprised the three groups that were examined for retention of verbalized material at varying rates of presentation.

The test subjects were not randomly selected or assigned to the listening groups. The three groups were intact groups. All subjects in each listening group were administered the same treatment--three audio taped listening passages presented at three differing rates. Each listening passage was immediately followed by an investigator designed, multiple-choice listening comprehension examination. The examinations were to test the subjects comprehension and retention of the content and the implications of the taped topics.

The audio taped material (listening passages) represented three topics. Listening passage A was "The Audio Learning Sequence" and was 2,090 words in length. Listening passage B was "The Language Laboratory" and was 2,186 words in length. Listening passage C was "Using the Tape Recorder in Instruction" and was 2,121 words in length. The topics were chosen because of there relevance to the CIED 3122 course of instruction. The topics were taken from Chapters X and XI of Audio Visual Materials, fourth edition, by Walter A. Wittich and Charles F. Schuler.

The presentation of the taped topics was presented in three rates. Presentation rate 1, was set at the norm speaking rate for the Oklahoma area, 169 words per minute--100 per cent compression. Presentation rate 2, was set at 125 per cent compression of the norm rate, or time-compressed to 211 words per minute. Presentation rate 3, was set at 140 per cent compression of the norm rate, or time-compressed to 225 words per minute.

To establish control for the order of presentation of the listening passages a Latin Square arrangement was employed. Although each listening group heard the topics at the three rates, each topic was not presented in the same order to each group.

One week following the comprehension portion of the study the retention phase of the study was administered to the same test subjects in each listening group. Due to absentees on the day of the retention tests, the total test population was

reduced to 47 subjects. Each subject in each listening group was administered a composite of the same examination taken in the comprehension portion of the study.

The hypotheses for testing in this study were stated in the null form.

Hypothesis 1: There will be no significant differences between the listening comprehension test scores of students who have listened to audio taped material at differing rates of speech compression.

Hypothesis 2: There will be no significant differences between the listening retention test scores of students who have listened to audio taped material at differing rates of speech compression.

A one-way analysis of variance statistical technique was employed to test the hypotheses. Analysis of variance was used in assessing the listening comprehension and retention level of the subjects in relation to the differing presentation rates. The confidence level for significance was set at the .05 level. After initial computation for analysis of variance of the data, the "eta" test for significance was used.

A sub-purpose of this research was to determine baseline data to establish a norm speaking rate for the Oklahoma area. Twenty-two faculty members in the College of Education at Oklahoma State University from the Oklahoma area participated in the sub-test. Each sub-test participant read for recording a 300 word passage to determine an average speaking rate. A mean speaking rate was established at 169 words per minute

for the Oklahoma area. This figure was also used to obtain the rates of time-compression--125 per cent and 140 per cent--used in presenting the audio taped material for listening comprehension and retention.

Conclusions

Any generalizations from the results derived from this research must be limited to similar test populations used in the present study. From the data gathered, analyzed and presented in Chapter IV, the following general conclusions can be inferred:

1. The investigator failed to reject at the .05 level of confidence the hypothesis stating that no significant differences will be found between rate of presentation of audio taped material and listening comprehension test scores.
2. The "eta" test for significance indicated that only four per cent of the variance of the comprehension test scores was accounted for by the different rates of tape presentation.
3. This indicates that students can listen and comprehend audio taped material at rates up to 225 words per minute without suffering from appreciable losses in comprehension.
4. The listener can be presented more verbal information and comprehend the information in less time than is often deemed necessary.

5. The investigator failed to reject at the .05 level of confidence the hypothesis stating that no significant differences will be found between rate of presentation of audio material and listening retention test scores.
6. The "eta" test for significance indicated that only five per cent of the variance in retention test scores was accounted for by the different rates of tape presentation.
7. This indicates that students can be presented and retain audio taped material at rates up to 225 words per minute without appreciable losses in significant content knowledge.
8. The fact that verbalized material can be presented and retained at speaking rates higher than normal warrants a need for further research into the process of time-compression and retention.

Recommendations for Further Research

The research findings in this study have pointed to several areas in which further research should be attempted. Some suggested research areas for further study are:

1. A replication of this study, but in other geographic areas of the country to determine regional speaking rate patterns.
2. A comparable study, but using a female voice to narrate the listening passages.

3. A comparable study, but using a different testing instrument to test the hypotheses. Perhaps one that can be developed to show a higher reliabilty, and can be standardized.
4. A replication of this study using headsets and listening stations to control for normal classroom acoustical distractions.
5. A replication of this study using a system of "planned distractors" in the presentation of the audio material, or in the daily activities of a normal class setting.
6. A replication of this study using the same design and methodology, but incorporating a random selection and assignment of the subjects to specific listening groups.
7. A study that uses the same design and methodology, but allows for the subjects to "practice" listening to time-compressed speech.
8. A replication of this study but utilizing a larger test population.

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APPENDIXES

APPENDIX A

TABLES

TABLE I

BACKGROUND OF SUBJECTS IN TEST POPULATION

	N	Per Cent From Oklahoma	Per Cent From Other Areas
Group I	15	100	0
Group II	16	100	0
Group III	22	95	5

TABLE II

NORM SPEAKING RATE FOR THE OKLAHOMA AREA

Subject	Average Speaking Time (Seconds)	Rate Equivalency (WPM)
1	103	174.75
2	90	200.00
3	107	168.22
4	108	166.66
5	102	176.47
6	106	169.81
7	117	153.84
8	109	165.13
9	104	173.07
10	121	148.76
11	122	147.54
12	104	173.07
13	103	174.75
14	95	189.47
15	115	156.52
16	104	173.07
17	118	152.54
18	101	178.21
19	109	165.13
20	93	193.54
21	124	145.56
22	108	166.66
N = 22		$\bar{X}$ = 168.64

TABLE III

LATIN SQUARE ARRANGEMENT

	P	P	P
Group I	A1 O	B2 O	C3 O
Group II	A2 O	B3 O	C1 O
Group III	A3 O	B1 O	C2 O

P = Presentation rate

A = Listening Passage A

B = Listening Passage B

C = Listening Passage C

1 = Presentation of verbalized material at the specified norm speaking rate--169 wpm--(100 per cent compression)

2 = Presentation of verbalized material time-compressed to 125 per cent of the norm speaking rate reducing listening time by 25 per cent

3 = Presentation of verbalized material time-compressed to 140 per cent of the norm speaking rate reducing listening time by 40 per cent

O = Listening comprehension examination

TABLE IV

ITEM ANALYSIS OF LISTENING COMPREHENSION EXAMINATIONS USED IN THE PILOT STUDY

Listening Comprehension Examination A

	Pilot Study		Revised Pilot Study	
Item	Difficulty	Discrimination	Difficulty	Discrimination
1	73.5	.39		
2	60.3	.08		
* 3	52.8	.34	52.8	.34
* 4	52.8	.57	52.8	.57
* 5	83.0	.32	83.0	.32
* 6	79.2	.28	79.2	.28
7	66.0	-.06		
* 8	62.2	.54	62.2	.54
9	37.7	-.01		
* 10	66.0	.39	66.0	.39
* 11	86.7	.37	86.7	.37
12	92.4	.08		
* 13	52.8	.39	52.8	.39
14	64.1	.14		
15	30.1	.32		
* 16	49.0	.43	49.0	.43
* 17	71.7	.42	71.7	.42
18	41.5	.28		
* 19	64.1	.56	64.1	.56
* 20	66.0	.28	66.0	.28

N	= 53
# of items	= 20
Test Mean	= 12.53
Std. Dev.	= 2.81
Std. Error	= 1.80
Mean Dif.	= 62.6
Mean Disc.	= .30
Reliability	= .59

N	= 53
# of items	= 12
Test Mean	= 7.92
Std. Dev.	= 2.46
Std. Error	= 1.48
Mean Dif.	= 65.6
Mean Disc.	= .41
Reliability	= .64

TABLE IV (Continued)

Listening Comprehension Examination B

Item	Pilot Study Difficulty	Pilot Study Discrimination	Revised Pilot Study Difficulty	Revised Pilot Study Discrimination
* 1	66.0	.31	66.0	.31
2	39.6	.40		
* 3	67.9	.28	67.9	.28
4	41.5	.05		
* 5	66.0	.41	66.0	.41
* 6	67.9	.53	67.9	.53
7	35.8	.33		
* 8	37.7	.38	37.7	.38
* 9	56.6	.61	56.6	.61
* 10	83.0	.28	83.0	.28
11	32.0	.37		
12	32.0	.38		
* 13	37.7	.37	37.7	.37
* 14	60.3	.48	60.3	.48
* 15	77.3	.56	77.3	.56
16	7.5	-.19		
17	71.7	.10		
* 18	69.8	.35	69.8	.35
* 19	52.8	.47	52.8	.47
20	26.4	.20		

Pilot Study		Revised Pilot Study	
N	= 53	N	= 53
# of items	= 20	# of items	= 12
Test Mean	= 10.30	Test Mean	= 7.53
Std. Dev.	= 3.17	Std. Dev.	= 2.58
Std. Error	= 1.81	Std. Error	= 1.81
Mean Dif.	= 51.5	Mean Dif.	= 62.0
Mean Disc.	= .33	Mean Disc.	= .42
Reliability	= .67	Reliability	= .67

TABLE IV (Continued)

Listening Comprehension Examination C

Item	Pilot Study Difficulty	Pilot Study Discrimination	Revised Pilot Study Difficulty	Revised Pilot Study Discrimination
* 1	79.2	.20	79.2	.20
2	33.9	.30		
3	41.5	.34		
* 4	50.9	.28	50.9	.28
* 5	45.2	.39	45.2	.39
* 6	54.7	.24	54.7	.24
* 7	83.0	.33	83.0	.33
8	5.6	-.30		
9	39.6	.46		
* 10	73.5	.29	73.5	.29
* 11	66.0	.31	66.0	.31
* 12	54.7	.39	54.7	.39
* 13	73.5	.47	73.5	.47
* 14	90.5	.31	90.5	.31
15	22.6	.16		
* 16	58.4	.48	58.4	.48
17	32.0	.22		
* 18	71.7	.49	71.7	.49
* 19	47.1	.50	47.1	.50
20	24.5	.16		

	Pilot Study	Revised Pilot Study
N	= 53	= 53
# of items	= 20	= 13
Test Mean	= 10.49	= 8.45
Std. Dev.	= 2.83	= 2.48
Std. Error	= 1.78	= 1.55
Mean Dif.	= 52.5	= 65.5
Mean Disc.	= .30	= .36
Reliability	= .60	= .61

TABLE V

TABLE OF SPECIFICATIONS

Listening Passage A - "The Audio Learning Sequence"		
Topics	Per Cent Emphasis	# of Questions
Audiolearning	10	1
Hearing	5	1
Psychological Reasons for Listening	10	2
Noise	15	1
Acoustics	5	1
Listening	40	4
Pupil Participation	5	1
Follow-up	10	1
	100	12

Listening Passage B - "The Language Laboratory"		
Topics	Per Cent Emphasis	# of Questions
Learning with the Language Laboratory	5	1
Traditional Vs. Audiolingual Laboratory Approach	10	1
Audiolingual Approach	10	1
Language Laboratory	30	3
Programming	30	3
Visualization	10	2
Utilization	5	1
	100	12

TABLE V (Continued)

Listening Passage C "Using the Tape Recorder in Instruction"		
Topics	Per Cent Emphasis	# of Questions
Tape Recorder Uses	20	2
Listening to Tapes	10	2
Other Uses	10	2
Social Studies	30	3
Music	5	1
Business	15	2
Audiolearning	5	1
	100	13

TABLE VI

OVERALL RESULTS OF LISTENING COMPREHENSION EXAMINATIONS

Comprehension Test Score	Tape Speed: 100 Per Cent	125 Per Cent	140 Per Cent
Exam A	Group I N = 15 $\bar{X}$ = 9.13 S.D. = 1.54	Group II N = 16 $\bar{X}$ = 9.00 S.D. = 1.73	Group III N = 22 $\bar{X}$ = 8.64 S.D. = 1.84
Exam B	Group III N = 22 $\bar{X}$ = 8.36 S.D. = 2.46	Group I N = 15 $\bar{X}$ = 8.60 S.D. = 1.45	Group II N = 16 $\bar{X}$ = 7.25 S.D. = 2.33
Exam C	Group II N = 16 $\bar{X}$ = 9.81 S.D. = 2.30	Group III N = 22 $\bar{X}$ = 9.32 S.D. = 1.43	Group I N = 15 $\bar{X}$ = 9.27 S.D. = 1.61

TABLE VII

OVERALL ANALYSIS OF VARIANCE OF
COMPREHENSION TEST SCORES

Source	SS	df	ms	F	p
TOTAL	905.02	52	--	--	--
Between Groups	52.30	2	26.15	1.53	N.S.
Within Groups	855.71	50	17.05	--	--

Table F (2, 40) = 3.23 at the .05 level "eta" = .24

TABLE VIII

ANALYSIS OF DATA FOR LISTENING COMPREHENSION EXAMINATIONS

Listening Comprehension Examination A

	Pilot Exam	Final Exam 100 Per Cent	Final Exam 125 Per Cent	Final Exam 140 Per Cent
N	53	15	16	22
# of items	12	12	12	12
Test Mean	7.92	9.13	9.00	8.64
Std. Dev.	2.46	1.54	1.73	1.64
Std. Error	1.48	1.07	1.04	1.17
Mean Dif.	65.6	76.1	75.0	72.0
Mean Disc.	.41	.29	.33	.34
Reliability	.64	.52	.64	.49

Listening Comprehension Examination B

	Pilot Exam	Final Exam 100 Per Cent	Final Exam 125 Per Cent	Final Exam 140 Per Cent
N	53	16	22	15
# of items	12	12	12	12
Test Mean	7.53	8.36	8.06	7.25
Std. Dev.	2.48	2.46	1.45	2.33
Std. Error	1.55	1.21	1.08	1.27
Mean Dif.	62.0	69.7	71.7	60.4
Mean Disc.	.42	.47	.27	.44
Reliability	.67	.76	.45	.70

TABLE VIII (Continued)

Listening Comprehension Examination C

	Pilot Exam	Final Exam 100 Per Cent	Final Exam 125 Per Cent	Final Exam 140 Per Cent
N	53	22	15	16
# of items	12	12	12	12
Test Mean	8.45	9.81	9.32	9.27
Std. Dev.	2.48	2.30	1.43	1.61
Std. Error	1.55	1.14	1.17	1.13
Mean Dif.	65.5	75.5	71.7	71.3
Mean Disc.	.36	.46	.25	.27
Reliability	.61	.76	.32	.51

TABLE IX

OVERALL RESULTS OF LISTENING
RETENTION EXAMINATIONS

Retention Test Score		Tape Speed		
		100 Per Cent	125 Per Cent	140 Per Cent
	Exam A	Group I N = 12 $\bar{X}$ = 9.17 S.D. = 2.03	Group II N = 15 $\bar{X}$ = 9.00 S.D. = 1.71	Group III N = 20 $\bar{X}$ = 8.00 S.D. = 1.92
	Exam B	Group III N = 20 $\bar{X}$ = 7.35 S.D. = 2.03	Group I N = 12 $\bar{X}$ = 7.67 S.D. = 3.04	Group II N = 15 $\bar{X}$ = 7.53 S.D. = 2.36
	Exam C	Group II N = 15 $\bar{X}$ = 9.13 S.D. = 2.55	Group III N = 20 $\bar{X}$ = 7.95 S.D. = 2.67	Group I N = 12 $\bar{X}$ = 9.33 S.D. = 1.89

TABLE X

OVERALL ANALYSIS OF VARIANCE OF
RETENTION TEST SCORES

Source	SS	df	ms	F	p
TOTAL	802.29	46	--	--	--
Between Groups	42.23	2	21.12	1.22	N.S.
Within Groups	760.06	44	17.37	--	--

Table F (2, 40) = 3.23 at the .05 level "eta" = .22

TABLE XI

RAW SCORES FOR SUBJECTS PARTICIPATING IN STUDY

(Comprehension and Retention)

		Comprehension Scores				Retention Scores			
	Subject	Exam A 100 Per Cent	Exam B 125 Per Cent	Exam C 140 Per Cent	Total	Exam A 100 Per Cent	Exam B 125 Per Cent	Exam C 140 Per Cent	Total
	1	9	6	10	25	10	7	8	25
	2	12	9	10	31	12	9	9	30
	3	12	7	10	29	12	11	13	36
G	4	7	12	12	29	9	8	11	28
R	5	8	8	12	28	10	11	12	33
O	6	10	10	8	28	9	11	8	28
U	7	8	7	9	24	7	5	9	21
P	8	9	8	10	27	9	4	10	23
	9	10	8	8	26	--	--	--	--
I	10	9	8	8	25	10	6	8	24
	11	9	10	10	29	--	--	--	--
	12	9	9	10	28	--	--	--	--
	13	10	10	8	28	9	10	10	29
	14	9	8	11	28	9	9	8	26
	15	6	9	5	20	4	1	6	11

TABLE XI (Continued)

		Comprehension Scores				Retention Scores			
		Exam A 125	Exam B 140	Exam C 100		Exam A 125	Exam B 140	Exam C 100	
	Subject	Per Cent	Per Cent	Per Cent	Total	Per Cent	Per Cent	Per Cent	Total
	1	11	10	11	32	8	8	9	25
	2	9	10	11	30	8	9	10	27
	3	7	9	9	25	6	4	8	18
	4	7	7	11	25	9	8	9	26
G	5	9	9	9	27	9	9	9	27
R	6	11	6	12	29	10	6	9	25
O	7	10	8	11	29	10	8	11	29
U	8	12	10	13	35	12	10	13	35
P	9	10	4	12	26	11	10	8	29
	10	8	7	7	22	10	10	8	28
II	11	8	9	9	26	9	7	10	26
	12	10	8	9	27	9	9	11	29
	13	10	8	10	28	11	9	11	31
	14	5	3	3	11	--	--	--	--
	15	9	5	11	25	7	3	1	11
	16	8	3	9	20	6	3	10	19

TABLE XI (Continued)

	Subject	Comprehension Scores Exam A 140 Per Cent	Exam B 100 Per Cent	Exam C 125 Per Cent	Total	Retention Scores Exam A 140 Per Cent	Exam B 100 Per Cent	Exam C 125 Per Cent	Total
	1	7	1	8	16	6	5	5	16
	2	10	7	9	26	7	8	6	21
	3	10	12	12	34	10	10	13	33
	4	10	10	11	31	8	7	11	26
	5	10	8	9	27	9	8	7	24
	6	8	7	7	22	9	6	2	17
G	7	7	9	11	27	9	6	8	23
	8	9	9	8	26	8	7	9	24
R	9	8	9	11	28	9	9	8	26
O	10	10	8	7	25	4	6	5	15
	11	7	8	10	25	5	7	9	21
U	12	7	5	9	21	6	4	3	13
P	13	7	11	10	28	--	--	--	--
	14	10	12	10	32	7	4	7	18
	15	9	10	10	29	8	10	10	28
III	16	6	7	10	23	7	7	8	22
	17	11	7	7	25	7	7	10	24
	18	5	8	10	23	8	6	10	24
	19	9	7	8	24	--	--	--	--
	20	10	7	8	25	10	8	11	29
	21	11	10	11	32	12	10	9	31
	22	9	12	9	30	11	12	8	31

TABLE XII

OVERALL ANALYSIS OF VARIANCE WITHIN THE COMPREHENSION EXAMINATIONS

Source	SS	df	ms	F	p
TOTAL	634.34	158	--	--	--
Between Groups	55.34	2	22.67	6.13	Sig.
Within Groups	579.00	156	3.70	--	--

Table F (2, 120) = 3.07 at the .05 level

TABLE XIII

RESULTS OF THE SHEFFEE TEST

Test A	Vs.	Test B		(Critical Difference = .92)	
$\bar{X}$ = 8.89	-	$\bar{X}$ = 8.09	=	.80	(Non-significant)
Test A	Vs.	Test C		(Critical Difference = .92)	
$\bar{X}$ = 8.89	-	$\bar{X}$ = 9.45	=	.56	(Non-significant)
Test B	Vs.	Test C		(Critical Difference = .92)	
$\bar{X}$ = 8.09	-	$\bar{X}$ = 9.45	=	1.36	(Significant)

APPENDIX B

READING PASSAGE, NO. 1

READING PASSAGE NO. 1

Your rate of speech will be adequate if it is slow enough to provide for clearness and comprehension, and rapid enough to sustain interest. Your rate is faulty, if it is too rapid to accomplish these ends. The easiest way to begin work on the adjustment of your speech to an ideal rate is to measure your present rate in words per minute in a fixed situation which you keep constant over a number of trials. The best method is to pick a page of simple, factual prose to be read. Read this page in your natural manner, timing yourself in seconds. Count the number of words on the page, divide by the number of seconds, and multiply this result by 60 to calculate the number of words per minute. As you attempt to increase or retard your rate, repeat this procedure from time to time, using the same reading material, to enable you to check your success.

A common accompaniment of rapid rate is stacatto speech, in which the duration of words and syllables is too short, whereas in slow speech the words and syllables frequently are over prolonged. When the person with too rapid rate tries to slow down, he tends to make the error of keeping the duration of his tones short, and of attempting to accomplish the slower rate solely by lengthening the pauses between phrases and by introducing new pauses. On the other hand, the person who

is working to speed up his rate tends to do this by shortening the pauses alone and retaining his prolonged tones. It is impossible at the present time to set down in rules the ideal relation between the duration of pauses in speech. Further research is needed before this can be done with any great frequency.

APPENDIX C

LISTENING PASSAGES

LISTENING PASSAGES

Listening Passage A

"The Audio Learning Sequence"

While the scope of audition is too broad and too deep for comprehensive treatment, we shall trace in broad strokes the basic sequence through which the learner must pass if he is to achieve audiolearning. First, if the pupil is to hear the instructional message, the message itself must be audible to the normal ear. Also necessary, of course, is that the learner is able to hear the message; that is, his own hearing mechanism must be capable of responding to vibrations that fall within the normal range of audibility. The sensory impressions taken through this mechanism must then be transmitted to the pupil's cognitive awareness.

Next, the learner must listen to the message. It is possible to hear a sound--that is to be aware of it--without attending to that sound. This is particularly true in the case of word sounds which require attention if the subtle syllabic differences are to be distinguished and the intended message is to be received. Finally, if the communication is to be complete, the learner must be able to act as a direct result of the audio learning; that is the learned information

must create in the learner an ability to demonstrate the learned information.

Basically, hearing may be thought of as the physical response of the ear to sound vibrations. In this sense, not all learners hear with normal acuity; it is estimated that 5 percent or more of the school population suffers hearing losses which may interfere with audiolearning. Obviously, those pupils whose auditory mechanism is impaired cannot be expected to profit completely from audioinstructional materials. Thus, the teacher's first responsibility is to determine whether all of his pupils can actually hear sounds which are within the normal ranges of volume and pitch, and which, if any, pupils exhibit difficulty in this area. Auditory sensitivity can be measured objectively by the speech and hearing specialist who are employed in most school systems. If the behavior or performance of a pupil creates doubt that his hearing is physiologically normal, the teacher should refer the child for appropriate therapy or remedial measures.

Even when the physiological aspects of hearing are normal, however, some pupils may seem to exhibit a pathological hearing defect for psychological or psychoneurological reasons. A pupil may have become so accustomed to "tuning out" unwanted noise, for example, that he virtually doesn't hear otherwise audible information. Often this tuning out is so habitual that the pupil himself is unaware of doing it, and though he may want to please by listening and remembering the audioinstructional message, he is unable to control his listening

activities. To illustrate by somewhat extreme, but all too frequent situation, if a child has been raised in a noisy home--perhaps one in which the parents are prone to raising their voices in anger at him or at each other--he may have adapted at an early age to this environment by shutting out this noise. Of course, a disinterested pupil may deliberately or semideliberately tune out unwanted hearing experiences. This may be a temporary adaption to tedious or seemingly irrelevant content from the pupil's point of view, or perhaps the result of distraction by some competing sound. A pupil who does not seem to hear may be attending to introspective thoughts or fantasy and thus shuts out the learning message. Rather than view such pupils with negativism, the teacher should give some thought to specific development of their listening skills. Of primary importance to such training is the nature of the subject matter itself--which should be both interesting and relevant to the pupils--as well as to its method of presentation.

In classroom situations where audioinstructional techniques are relied upon excessively, fatigue may interfere with the pupil's hearing. Here again, the pupils may "tune out" the educational communication. Fatigue is apt to occur when teachers rely endlessly on spoken direction, lecturing, prolonged or tedious class discussion, or oral reading of lengthy passages or sequences which could better be left for the students to read individually. Such excessive reliance on the student's hearing faculty will exhaust even the most consci-

entious student, a factor which should be recognized by teachers to the same extent that it is recognized with respect to excessive physical excercise. The alternative is to arrange a classroom schedule which utilizes various audiovisual techniques and thus permits multisensory learning.

There are many other factors which can obstruct pupil hearing. Extraneous environmental noises, for example, can strongly interfere with the audibility of the instructional message. Noises which emanate into the classroom from out-of-doors can be disruptive. Drilling and other building-construction sounds, heavy traffic noises, the noise from school playground activities, and so forth often can interfere with audiolearning. Similarly, sounds generated within the classroom itself--perhaps due to poor discipline habits among the class members--can provide highly effective competition to audioinstruction.

Such noises need not be extreme to affect at least some of the pupils' auditory faculties, and the teacher should not ignore extraneous noises of seemingly low volume as a potential learning interference merely because he himself is not disturbed by them. It may be that the teacher has become so used to such noises that he has learned automatically to sift them from his awareness, or it may be that his powers of concentration are such as to screen out extraneous sounds. The same may not be true of his pupils.

The degree to which pupils are affected by extraneous noise will vary, not only according to the volume of the noise

itself, but also according to the pupil's individual sensitivity to the nature and volume levels of the noise, and according to the individual concentration and auditory-discrimination habits of the pupils. Some children may find it easier to shut out the lesson in favor of attending to the interfering noise. Significantly, even annoying or bothersome noises may enable the student to discriminate against the audioinstruction.

Another important deterrant to some forms of audiolearning derives from the acoustical situation that exists in the classroom. If the acoustics in the room are such as to create an echo or reverberation of the sounds being communicated, or if the sound is overabsorbed so that it does not reach the student's ear with full impact, audiolearning will be impaired. Thus, even when extraneous noises are not present, audioinstruction will be ineffective in an unacoustically inadequate classroom.

To overcome these physical barriers to hearing, the teacher should see to it that the classroom effectively keeps out annoying extraneous noises and, at the same time, provides a good acoustical environment. Excessive reverberating noise within one's own classroom may be overcome by tacking monkscloth or colored display burlap panels neatly across the offending surface; for example, the backwall. This not only traps sounds but offers more pinup display area for student work. With the principal's consent, the janitor and a few competent students can install "do-it-yourself" acoustical

tile on the wall surfaces above the chalkboards, an area most frequently the cause of annoying classroom acoustics. In new buildings specified to provide for good acoustics, a polite complaint to the principal may secure corrective measures by the contractor. The key idea is to be aware of such problem acoustics and call attention to the fact that instruction can be improved by corrective measures.

Just as it is possible to screen out form one's awareness all of the sounds picked up by his auditory sense, it is possible to hear sounds without heeding or responding to them. Teachers are familiar with students who look alert and attentive during class discussion, and who respond when called upon, yet whose quickly adlibbed responses indicate all too clearly that they have not paid attention, or listened, to the substance of the discussion itself.

For true audiolearning to be achieved, it is important for the pupil to do more than just follow the thread of the information being communicated, he must become actively involved in the information itself--he must think about it, analyse its meaning, organize and reorganize its content elements into his existing frame of reference and, where appropriate, act. If this degree of listening participation in audioinstruction is to be attained, several conditions must coexist: The audioinstructional content must be interesting, provocative, and suitable to the pupil's level of background experience, and the audible messages must be clear and distinct so as to make full impact on the pupil's auditory faculty.

There are many ways by which the teacher can create favorable listening conditions. First, the teacher should arrange the classroom itself so that it is conducive to listening. In addition, if the learning experience is to focus on audioinstruction, any visual materials that are used should be both visual and auditory, illustrations or reading materials should include only those most immediately relevant to the specific content under study. Seating should be also arranged as to focus attention on the source of the audioinstruction.

If attentive listening is to be accompanied, the nature of the aural message must be such that the learner will be interested enough to become involved with, and to react to, the material spoken or played. Of primary importance here is that the audioinstructional material be selected in terms of the maturity of the learners and their interests, vocabulary level, and their need for the audioexperience itself.

It is futile for the teacher constantly to enjoin pupils to "be alert", "listen carefully", and "pay attention" to listening exercises unless previous teacher-pupil planning has encouraged in them a desire to listen and a willingness to investigate audiolearning experiences. The alternative is to arrange experiences which answer questions releting to teacher-pupil planning. When readiness occurs and audiolearning materials are appropriately selected, the chances that pupils will want to listen and to react to listening experiences will be enhanced.

On the other hand, epitomizing the consequences of failing to provide interesting, suitable and clearly presented

material is the illustration cited by Dale, in which one student advises another, "In that lecture room you can't hear Professor X beyond the fifth row. So don't sit any closer than the sixth."

Of considerable value in motivating students to listen is to involve them in activities which are preliminary to the audiolearning experience itself. This may be achieved through teacher-pupil planning carried on before the beginning of the audioinstruction. If possible, the pupils should have a voice in the selection of the materials; this will provide them with the opportunity of realizing their own responsibilities with respect to audiolearning generally, and of understanding thoroughly the purposes of the specific audiolearning experience. Also helpful are the positive experiences gained from past audiolearning experiences. From such past experiences, students are more likely to know that the dramatic recording or verbal demonstration is apt to be interesting and helpful to them.

If audiolearning is to be complete, the pupils must not only be able to hear the message and be willing to listen attentively, they must also be capable of demonstrating or applying their newly acquired knowledge. Typically, the avenues by which the pupil is asked to demonstrate this learning is through tests and examinations, pupil reports and essays, classroom discussion "feedback," and similar situations. However, these avenues provide the pupil with little opportunity to exhibit creative involvement with, and expressive use of

his learning and, as stressed earlier, creativity is a most important outcome of any learning. Thus, creative response is the goal of listening-learning activities just as it is of other classroom learning activities. Effective teachers will complete the successful audiolearning situation by encouraging this creativity. A few suggestions from the teacher may stimulate the pupils to carry out one or more of these suggestions or, better, to invent a creative project on their own.

Creative response to audiolearning experience may include the search for further information, the composition of an original mural, the simulation of a radio or television broadcast, or the performance of a dramatized episode in history. The learning achieved through language-laboratory audioinstruction may be demonstrated through such projects as dramatic improvisations--spoken in the language--of humorous situations, a debate carried out in the learned language between two groups from the class, and so forth. It should be noted that there are often many ways in which the pupil can incorporate and express his personal interests and experiences within the context of the learned material, and whenever possible, he should be encouraged to do so.

Listening Passage B

"The Language Laboratory"

The language laboratory is an electrical learning complex which enables the pupil to listen to the way words, phrases, and sentences are pronounced, inflected, and constructed by those whose native tongue a "foreign language" happens to be. The language laboratory is so constructed as to permit the student to imitate these pronunciations and inflections, and to record his attempts so that when he plays them back he can compare the sounds of his own speech with those of the original. Thus, self-improvement through correction and practice proceeds with the learner developing both his hearing and his speech discrimination of the sounds of the language. The student also learns to associate sounds and the grammatical, syntactical, and idiomatic construction of sentences in this foreign language with those in his own tongue. Eventually the student gains the ability not only to say the foreign words well and to know their meanings, but also to think directly in the language. This electronic approach to language is known as the audiolingual method.

Audiolingual materials are developed on the assumption that language is a skill which is best learned through continual correct repetition. As a child, one imitates easily the sounds spoken by his parents, brothers, sisters, and companions. The small child doesn't "study" his native tongue, he imitates it until it has become an integral part of his

speech. There are no speaking "lessons" for the young child, no formal discussions--rather, the child's language is a skill which is learned by continual imitation of the speaking models he hears. Significantly, this is true also in bilingual homes, where the child learns easily and automatically to think and speak with fluency in two languages.

By contrast, traditional methods in formal language instruction presented the pupil with mostly reading and writing materials. The student was asked to memorize the words and their spellings as given in his text vocabulary and to fill in the blanks and otherwise complete in writing the exercises given at the end of the text lesson. Along with this vocabulary, the student was presented with formal rules of grammar and the other explicit complexities involved in language. Consequently, too often the student who "mastered" the language--that is, who was able to pass the course examination--merely developed a relatively rapid translating ability; he would think in English and then translate these thoughts into the foreign language, he would mentally translate sentences into their English equivalents in order to gain meaning. In short, the product of this teaching approach found himself in the position of the Midwestern French major, who, after graduation and on a tour of France, wrote back the following card: Having a wonderful time, but so far haven't been able to locate any natives who speak 'French 205.'

In the audiolingual system, the formal aspects of language, grammar, syntax, idiomatic expression, and so forth, and reading

and writing are placed in a secondary position to the speech aspects of the language. The pupil engaged in formal foreign language learning as presented in the language laboratory goes through a process very much like that through which he learned to speak his native tongue, as the language laboratory presents him with speaking models to whose speech patterns he may accustom his own ear and whose speech patterns he may imitate.

The audiolingual method was developed during World War II, when the U. S. Army was faced with the need to train tens of thousands of personnel to understand and to speak the languages of countries where it set up military bases. Obviously, this training had to be accomplished quickly and effectively. Because traditional methods of language instruction required many years of formal study in order for any degree of language fluency to be achieved, the Army sought the assistance of the American Council of Learned Societies, which, at that time, was at work on developing methods of teaching languages and dialects of remote and primative societies which had no written form of expression. Out of this collaboration, the audiolingual approach evolved.

The acceptance of the new audiolingual approach has been gradual but remarkably universal. During the last decade the findings from a number of research studies have invariably established that the audiolingual approach does nothing to interfere with the later learning of reading and writing skills in the language techniques, and that it is highly effective in

achieving, in far less time, the mastery and performance of spoken language.

In most school systems that have a language laboratory, a combination of the audiolingual and the traditional approaches to language instruction is used. In the language laboratory itself, tape-recording materials are provided for the pupils' audiolingual learning, while points of grammar, background, and explanatory information are learned during regular class periods. Language laboratory activities generally comprise about 50 percent of course time or more, although this portion will vary from school to school.

Preferably the laboratory should adjoin the classroom so that it will be accessible to students at the point in their learning when they can profit most from it; this does not mean, however, that part of the classroom itself cannot be used as the laboratory. The study of a language is a societal experience; hence, if the classroom does contain the laboratory equipment, another area should be provided for group discussion, for it is essential that teacher and students discuss specific problems that arise in connection with this work.

There are many ways in which a language laboratory can be programmed. Programming refers to the kinds of learning materials used, the methods of presenting information, the lesson content and sequence, drilling methods and so forth. As a general rule, the pupils hear introductory explanations provided on the master tape and then the core of the lesson itself--the language words and phrases. There is then a short

pause during which the pupil imitates what he has heard, his own voice being automatically recorded. At this point the teacher, who is at the control center, may have each student listen immediately to the model tape and then to the pupil's own version, thus allowing the pupil to judge his own performance immediately and to correct it. Usually these corrections require the student to repeat the model-imitation-playback-compare procedure several times, and sufficient time should be built into the program for him to do so.

However, while at first pupils in a language laboratory usually work as a group, with all pupils using the same taped lessons, the audiolingual method ideally encourages individual pupils to proceed as rapidly as they can. Since most language-laboratory systems make it possible for the teacher to tune in on an individual pupil, learners who are having special difficulties may be given special attention and drill. Thus, the programming should be flexible enough to accomodate the learning rates of both slow and fast learners. If such flexibility is built into audiolingual programs, the class may soon be strung out into various groups, each of which is proceeding at its own rate of learning, with some slow and fast learners working individually. Indeed, perhaps the greatest advantage of the audiolingual method is that it permits each pupil to proceed at his own pace.

Clearly such programming requires the simultaneous use of several levels of instruction, and the effectively planned language-laboratory course will provide literally hundreds of

tapes. Although complete prerecorded language courses are available at several levels of advancement, there are still many needs for which prerecorded materials are not available. For example, the pupils may require emphasized drill and practice in the pronunciation of certain vowels, consonants, diphthongs, or syllables, or in perfecting their inflection of certain phrases. In many of these cases, the teacher will need to plan and record his own materials and excercises. He may pattern these additional tapes on the material in the text-book being used, or record short pronunciation and enunciation drills based on sounds or idioms. For the children who are advancing more rapidly than others, he may tape lessons adapted from more advanced foreign-language source books. If the teacher gives the course another year, he may use most of these tapes again, but others may need to be revised or replaced. Constant improvement of his own prerecorded materials should be the teachers goal.

The audiolingual program must also provide for class measurement and evaluation, and for supplementary and follow up activities. During laboratory sessions, the teacher makes sure that the pupils are making the most of the taped lessons, and he tunes in on any of the pupils to check the progress and quality of the work being done. The teacher also determines, by means of periodic tests, how well the pupils know the meanings of the words, phrases, and sentences they have been listening to. But, interesting follow up activities also should take place after the language laboratory period. These may

include conversational situations, games, and cultural drills that enable the students to try out their newly acquired language skills as a group.

There is more to learning a language than being able to speak, read, and write it, however, and understanding of sociocultural backgrounds of the language is an important part of language instruction. Providing for this aspect of foreign language instruction, the role of related audiovisual materials should be considered. Films are available that depict sociocultural scenes in France, Canada, Spain, Germany, and other countries. These films have foreign language sound tracks that give most learners ample time to understand the language as it takes on concrete meaning from the visual presentation itself.

Series of photographic slides as well as filmstrips with corresponding taped language narrations are currently available from commercial sources and are widely used. These tapes carry words and simple dialogues between the characters shown on the filmstrips. This combination of prerecorded tapes and filmstrips offers great promise for efficient foreign language instruction.

An experiment made among East-West Center students at the University of Hawaii revealed the value of coordinating audiolingual materials with specially prepared colored slides. The experiment included a group of Asian students who were attempting to improve their spoken English. A basic working vocabulary was introduced into a tape recorded narration suggesting how to move about the campus and city, how to use local trans-

portation facilities, how to purchase food, clothing, and school supplies, how to enroll in courses, and how to carry on casual conversations with native fellow students. Visualizations of the settings to which the narration referred were presented through color photography projected on a screen at the front of the English-laboratory. Participating students reported unanimously their enthusiasm and desire to continue more sophisticated learning experiences with languages in the same manner; namely, the coordination of words with context visualization. Such an outcome is not surprising, as one learns his native language within a visual context.

Many teachers provide a visual environment by using travel posters and pictures of cities, people, and costumes in the country whose language is being studied. Typical folk songs can be brought into the foreign language laboratory through prerecorded tapes as well as through transcriptions and records. Similar aural materials give students a chance to hear the works of well-known native composers. This use of recorded music makes a learner's interest in good music a powerful motivational device in foreign language study.

The language-laboratory, with its audiolingual and related visual materials, should not be thought of as a replacement for the teacher, but as a powerful tool which allows the pupil to hear language as it is spoken by native speakers and to engage in carefully controlled and recorded drills. When a person is learning to speak a language, he must practice speaking it correctly and, as has already been noted, the language laboratory

encourages trial, evaluation by means of self-appraisal, and improvement through practice with a model tape.

Nevertheless, the teacher-pupil relationship of traditional language instruction is changed. In traditional language-class situations, one pupil may recite about once in 30 times, whereas a pupil in a language laboratory is listening about half the time and reciting the other half. Instead of 30 children listening to one teacher, the language laboratory teacher can listen to one or all 30 pupils, each of whom is making individual judgments and responses.

The language laboratory thus imposes exacting demands on pupils, because it places a constant challange before them. Evaluation and reinforcement are immediate; there is no waiting until the next day while papers are being corrected. For the teacher, the strains of observing 30 pupils simultaneously, and of keeping all of them busy and interested while providing individual attention, are greatly reduced with the aid of a language laboratory. It is through the language laboratory that pupils learn to associate learned skills with later classroom discussion and evaluation which only a qualified teacher can direct. The language laboratory is thus a teaching tool which like most tools, is best employed by a skilled person--in this case, the teacher.

Listening Passage C

"Using the Tape Recorder in Instruction"

In the hands of an imaginative and creative teacher, the tape recorder can be used in a surprising variety of ways to improve classroom learning. As the following case histories indicate, the tape recorder can be a modern day "genie" available at the beck and call of both learner and teacher.

Midway during their study of a unit on Hawaii, one group of fifth-graders wrote to a former exchange teacher who had returned to Oahu asking whether they might initiate a tape-recorded cultural exchange with their Hawaiian agemates. The answering letter promised to send a tape recording made by Hawaiian fifth-graders in response to one prepared by the mainland class. The initial excitement of the mainland pupils was followed by a more controlled planning period. Questions about school, home life, pets, dress, climate, and local customs were quickly formulated and then recorded on tape. The playback of this first effort came as a shock to the pupils.

"We can do better--if we can't we shouldn't send it," suggested another pupil with disappointment.

The pupils' discouragement was small, however, and soon their enthusiasm mounted again as further discussion involved opinions on how ideas should be more clearly stated. Finally, several groups were formed to put on paper the key ideas they

wanted to communicate to the Hawaiian class. These groups agreed that some tape time should be left for extemporaneous comment at the end. Three days elapsed during which writing, recording, and rerecording took place. Finally, when the pupils were satisfied, they mailed the tape reel.

The teacher reported the students were very critical of their efforts. They set standards for themselves which they might not have accepted as a reasonable had I suggested them. Here was an experience in self-criticism and improvement which had taken place through the trial and error made possible by the tape recorder's flexibility.

In another situation, a teacher of music who had tired of continually describing the problems of wavering pitch, finally got his point across to his pupils by recording, playing back, and encouraging self-evaluation by members of the student group. Similarly, a clever dramatic coach who had been unable to effect a change in the voice inflection of the ingenue of the senior play, arranged for her to listen to herself on tape. The student quickly "got the point," and immediately set about correcting the situation.

These examples are only barely indicative of the almost limitless uses to which tape-recording devices can be put. Most machines are very easily operated and cared for, and under proper guidance, the pupils themselves can implement the principles of proper care and use. But it is the teacher's task to provide the context in which the recorder is used and the specific purpose for which it is to be used. Thus, we shall

turn to some of the ways the tape recorder can facilitate learning in different subject areas.

The value of hearing oneself as others do by means of tape recordings has already been suggested. This objective opportunity for self-criticism is valuable during the entire span of school experience. Its value first becomes apparent in the primary grades when the youngsters attempt to read aloud; when they engage in "Monday morning reports" of the weather, weekend activities, and events at home; and also when telephone-answering techniques are recorded and listened to.

In the upper grades, panel discussions, reports of books read, discussions of the news, explanations of processes, and how-to-do-it accounts continue to demonstrate the true importance of being able to get up on one's feet and express one's ideas verbally in a clear and well-organized manner.

Children too often become so accustomed to a teacher's admonition about improving speech or grammar that such remarks are no longer incentives to improvement. But the tape-recorded "voice" played back frequently serves as a fresh new incentive. Errors of grammar and sentence structure and needless repititions become painfully apparent when the child hears them committed in his own played-back voice.

"Do I sound like that" How can I have a better voice?"

"Do I talk that fast," "That slowly," or "with all those 'ah's,' 'er's,' and 'and ah's'?"

When the students have these reactions to themselves and to each other, the teacher no longer needs to wear his own

voice and his patience thin trying to drill suggestions for improvement into his pupils. The child is usually his own critic and this role is also played by his classmates.

The tape recorder is also ideally suited to foreign language instruction. Various specialized equipment has been developed for this usage of tape recording techniques, including the large complexes of electronic equipment that comprise the language laboratory. Other applications of tape recorders include its use in speech improvement and therapy; listening skill development; in reading improvement; and choral speaking and dramatics. In connection with dramatics, the drama coach should not restrict his use of the tape recorder to individual performance improvement, but should also use it to record entire scenes and acts, showing how each player relates to the whole, the timing of lines, and so on.

A primary goal of the social studies is to provide experiences which are so life-like that they give the learner true understandings of people, places, and things throughout the world. The tape recorder makes possible the experience of listening to others as they express their ideas, and that of exchanging spoken ideas with others. For example, in one civics class, students were assigned to one of several committees, each committee being responsible to gathering information on one aspect of governmental control--public school and adult education, fire and police protection, traffic control, recreation provisions and maintenance, sanitation and public health, and taxation and finance. In their planning sessions, each

committee reviewed and decided upon the offices and personnel they would visit to gather facts. Some members of the committee decided that by tape recording their interview--later editing the tape to eliminate secondary information--they could, in effect, bring the government officials right into the classroom. The carrying out of these plans resulted in levels of effort and learning accomplishment seldom experienced through more traditional methods of teaching the same type units.

The tape recorder also presents a challenge to those who are willing to undertake the research, writing, editing, rehearsal, and final production of "Reports from History." It is one thing to read passively the history book reports of the Norman Invasion or the Battle of the Coral Sea, or the magazine accounts of astronauts first space walk. It is more exciting to reconstruct factual accounts into dramatic, "on-the-spot" news reports with background "color" narration of such quality as will hold the attention of the class group. The tape recorder is well suited to such projects, for it enables the students to test themselves and arrange for try-outs before presenting the finished product to the class. Pupil and teacher interest runs high in such projects.

Other uses of the tape recorder in the social studies include historical interviews with local old-timers who remember all manner of interesting things, tape-exchange programs similar to that mentioned earlier, and recording for permanent possesion in the school library tapes which other classes or schools have done on appropriate social studies subjects.

Further, group reports and discussions can become objects of self-criticism among the pupils. As class members listen to a taped discussion, the entire group can criticize themselves and one another.

In beginning band and orchestra work, the thrill of listening to themselves perform through tape-recording playbacks can be a great incentive to the pupils to listen, evaluate, and practice--all to the end of better performance. Recordings of individual vocal and instrumental performances, quartets and choral singing all allow the individual or group to listen, learn, and improve.

Today many school music departments have tape recorders set up on which soloists can record their work, then practice and listen. This procedure places the responsibility on the learner and gives him the opportunity to advance as rapidly as he wishes.

Other uses of the tape recorder in music apply advantageously to individualized help for pupils who experience difficulty in note reading and tone accuracy. By presenting prerecorded new songs pupils develop an ear for the tunes and thus learn them more rapidly. The prize-winning effort of a groups' performance at a music festival may serve as a goal and an incentive to those who strove for quality achievement in either instrumental or choral music.

One guidance director reported using tape for anecdotal records which are filed in the student's cumulative record folder. At one-year intervals, the tape recorded student

reports and interviews are spliced end-to-end and wound around a flat cardboard reel. "Teachers," this director says, "are very willing to stop by my office, as if they were chatting with me, record their comments on tape, knowing that I will add their taped report to the progressively growing information record of a given student. At the time of graduation or on any occasion for listening, the tape record can be played back for parents, teachers or pupil."

We are only beginning to realize the many important guidance uses that can be devised for the tape recorder. Suppose that Johnny comes to kindergarten, a simple conversation with him is recorded. As he goes from grade to grade, his oral speech habits, oral reading, and conversations revealing his interests, likes and dislikes, ambitions, and relationships with home, school, and friends could be captured on tape, placed in his folder, and on graduation be spliced together as an aural document of his school life and progress. Imagine the interest of his parents, and possibly an employer, in such a document.

For students who plan to start working right after high school, the tape recorder is also valuable. After the guidance director determines what kind of employment offers the best opportunities for the student, both the student and his instructor may engage in role playing, the instructor taking the part of an employer interviewing the student for a job. The taped interview is then played back for criticism.

Actual employers may be asked to appear before the class

and conduct an interview with one of their own employees or a pupil. This can also be taped for later study.

Speed tests and vocabulary and spelling drill all lend themselves admirably to prerecording on tape. In typing and shorthand classes, a tape recording that has been carefully worked out in advance by the teacher can be used repeatedly to measure the speed and accuaracy of various classes.

In order to give his pupils experience in doing typing and shorthand in actual business situations, one commercial teacher arranged for each of 15 local businessmen to dictate on tape three letters of varying length and difficulty selected from his files. The resulting 45 letters were a challenging and exciting variation from the regular class routine, and gave the class a realistic idea of the requirements expected by business firms. Similar tapes for use in business education have also been commercially recorded.

Other uses of tape recording in business education include taping business telephone conversations, employer interviews at local business firms and both imaginary and genuine sales talks--the latter recorded by local sales people.

Unusual examples of speeches, debates, reporting, or dramatics are frequently heard on radio or television, and these can be useful in teaching speech or dramatics. Most tape recorders are equipped with a radio take-off line, a length of wire with a plug-in device at one end and twin metal clips at the other. By attaching the clips to the "voice coils" of the radio, and then plugging in the tape recorder, the teacher can

tape an address by the President of the United States, the audio part of a television drama, a panel discussion, or a well-delivered commercial.

Any of these may become teaching materials at the right time and under the right conditions. Used as models, such tapes can help pupils make judgments about good speaking, clear enunciation, pleasing phrasing and voice intonation, vocabulary choice, and sentence structure.

When a tape recorder is used during rehearsal of a play, the members of the cast gain a vivid idea of their strengths and weaknesses from the playback.

Once the teacher has experienced the unique characteristics of the tape recorder to improve students audiolearning, listening-skill development, and oral criticism, other values and uses of the tape recorder become apparent.

APPENDIX D

LISTENING COMPREHENSION EXAMINATIONS

LISTENING COMPREHENSION EXAMINATIONS

Listening Comprehension Examination #1

"The Audio Learning Sequence"

1. For communication to be complete, the learner must finally:
   A. Listen favorably or unfavorably to the message
   B. Act upon the message
   C. Attend to the message
   D. Both A and C

2. The percentage of students in the school suffering from significant hearing loss is:
   A. Ten
   B. Five
   C. Three
   D. None of these

3. A student who appears to be listening to an audio message but is actually attending to other thoughts is said to be:
   A. Disinterested
   B. Psychological unstable
   C. Tuning out
   D. Tone deaf

4. The teacher can control for passive listening in his/her students by having the audio material be:
   A. Interesting to the students
   B. Produced by the students
   C. Relevant to the students
   D. Both A and C

5. The degree to which students are affected by outside interference is directly related to the:
   A. Intensity of the message to be understood
   B. Student's individual sensitivity to the message
   C. Student's auditory discrimination habits
   D. Both B and C

6. For true audio learning to be achieved the audioinstructional content must be dependent upon the:
   A. Teacher's knowledge of the material
   B. Suitability of the content to the students level of experience
   C. Production quality of the material
   D. Both A and C

7. Of the following, which is the best way for the teacher to create favorable listening conditions:
   A. Arrange the classroom so that it is conducive to listening
   B. Warn the students to "pay attention"
   C. Preassess the students for content knowledge
   D. None of these

8. Teachers suggestions such as "listen carefully" and "pay close attention," are:
   A. Beneficial to the student
   B. Futile in the auditory setting
   C. Desirable for audio learning
   D. Both A and C

9. By enabling students to have a voice in the selection of audio materials they are provided with the:
   A. Understanding of the specific audio learning experience
   B. Respect for equipment operation in the classroom
   C. Realization of the value of auditory learning
   D. Both A and C

10. The teacher will follow-up an audio learning experience by:
   A. A field trip with the class
   B. A student written report over the content
   C. Encouraging creative activities
   D. An oral examination

11. To make the classroom acoustically sound, the teacher can:
   A. Construct decorative wood panels to absorb sound
   B. Place acoustical tile above the chalkboard
   C. Build an acoustical "soundproof listening station"
   D. Both B and C

12. If audio learning is to be complete, the students must not only hear the message, but also:
   A. Apply the message to a learning situation
   B. Select appropriate follow-up activities
   C. Discriminate relevant material from the tedious content
   D. None of these

Listening Comprehension Examination #2

"The Language Laboratory"

1. The language laboratory is designed to instruct students in:
   A. Grammar skills
   B. Word and sentence pronunciation
   C. Reading readiness
   D. Listening comprehension

2. Audiolingual materials are developed on the assumption that language is best learned through:
   A. Continual, correct repitition
   B. Formalized discussion of the material in the lab
   C. Memorization
   D. Voice inflection practice

3. In the audiolingual system employed by the language laboratory, the speech aspects of the language become:
   A. Secondary to the formal aspects of the language
   B. Confusing with the formal aspects of the language
   C. Redundent with the formal aspects of the language
   D. Primary to the formal aspects of the language

4. The audiolingual method was started extensively during World War II by:
   A. The German Air Force
   B. The U. S. Army
   C. The U. S. Air Force
   D. The German Army

5. In most school systems that have a language laboratory, the utilization of the lab comprises approximately:
   A. 75% of language learning time
   B. 50% of language learning time
   C. 25% of language learning time
   D. 60% of language learning time

6. Programming in the audiolingual experience refers to:
   A. Types of media needed to equip the lab
   B. Correction of materials used in the lab
   C. Analyzing the materials used in the lab
   D. Lesson and content material organization

7. An important advantage of the audiolingual method is that it enables the students experiencing difficulty to be"
   A. Given group linguistic instruction
   B. Reassigned to another linguistic program
   C. Given special attention and drill
   D. None of these

8. The role of related audiovisual material has a place in language instruction enabling the student to:
   A. Learn to associate language with the environment
   B. Understand the sociocultural background of the language
   C. Learn to read the signns in the language studied
   D. Establish the continuity in the instructional process

9. The primary focus of the language laboratory is to teach students to:
   A. Write in the language presented
   B. Read in the language presented
   C. Speak in the language presented
   D. Both A and C

10. For the young child, language learning in the home takes place through:
   A. Visualizing the language in relation to the mode of presentation
   B. Listening intently to the language
   C. Role playing in the native language
   D. Imitation of the aural aounds in the language

11. Acceptance of the audiolingual approach to learning a language has been:
   A. Immediate, with reservations
   B. Gradual, but with remarkable universality
   C. Immediate, but with caution concerning content
   D. Gradual, but needing further research

12. The ideal language laboratory placement should be:
   A. In the classroom
   B. Completely separate from the traditional classroom
   C. The entire classroom
   D. Adjoining the classroom

Listening Comprehension Examination #3

"Using the Tape Recorder in Instruction"

1. The first playback that the students hear of their own recording efforts:
   A. Is reinforcing and encouraging
   B. Comes as a shock to them
   C. Discourages them from further efforts
   D. None of these

2. Rather than telling students about themselves an instructor can use the recorder to <u>show</u> his/her point by:
   A. Recording classroom activities prior to audio learning
   B. Playing back previous tapes of high quality instruction
   C. Encouraging self-evaluation
   D. None of these

3. It is the students' duty in working with tape recorded instruction to:
   A. Implement principles of proper care and use
   B. Provide the context in which the recorder is used
   C. Determine the specific purpose for which the tape recorder will be used
   D. Both B and C

4. It is the teachers' duty in working with the tape recorded instruction to:
   A. Implement principles of proper use and care
   B. Provide the context in which the recorder is used
   C. Determine the specific purpose for which the tape recorder will be used
   D. Both B and C

5. The objective opportunity offered by tape recorded instruction for self-criticism is valuable:
   A. Primarily in the elementary school
   B. Primarily in the secondary school
   C. During the entire span of the educational process
   D. Only when used in relation to other units of study

6. The tape recorded voice played back frequently:
   A. Reinforces students caution in using the recorder
   B. Places the students in a situation of refusing to use the recorder for learning
   C. Serves as a new incentive for improvement in learning
   D. All of these

7. In connection with dramatics, the drama coach can use the tape recorder to:
   A. Improve individual performances
   B. Record audience reaction
   C. Show each player where he/she belongs on the stage
   D. All of these

8. The tape recorder is best suited for:
   A. Foreign language instruction
   B. Speech instruction
   C. Speech therapy
   D. Audio learning

9. Levels of effort and learning accomplishment reached by the utilization of audio in instruction are:
   A. Equal to those found in traditional instruction
   B. Below those found in traditional instruction
   C. Far above those found in traditional instruction
   D. There is no relation between the two

10. One of the major benefits of audio instruction is that it increases the interest level of the"
    A. Teachers
    B. Councelors
    C. Employers
    D. Students

11. All of the following are attributes of audio instruction EXCEPT:
    A. It affords the opportunity to hear oneself as he/she really sounds
    B. It places responsibility on the learner to create learning
    C. It gives the learner the opportunity to advance as rapidly as he/she wishes
    D. It places the responsibility on theinstructor to create learning

12. A benefit of audioinstruction in a business classroom is:
    A. Taking the student from regular classroom situations
    B. Placing the student in a position of modified stress
    C. Reflecting of actual business conditions
    D. Increasing employment opportunity awareness

13. Tape recordings can help students make judgments about good speaking, clear enunciation, phrasing, etc. when:
    A. They are played repetitively
    B. They are used as models
    C. The students hear the recordings as a group
    D. Both A and C

VITA[2]

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Doctor of Education

Thesis: THE EFFECTS OF NORM SPEAKING RATE AND TIME-COMPRESSED RATE IN AUDIO TAPED MATERIAL UPON THE LISTENING COMPREHENSION AND RETENTION OF COLLEGE STUDENTS

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