This thesis is based on an experiment in typewriting which utilized specially designed audio-monaural equipment for skill-building. The experiment was conducted with students taking typewriting instruction at the intermediate level at Oregon State University during the Fall quarter, 1960. Three control and three experimental classes participated and were compared on speed improvement, consistency, production, class tests and final examinations. One hundred forty six students, selected by a random sampling technique, participated in the study.

This experiment, as designed, suggested the provision of instructional assistance to each student in the experimental group and that the following might be observed by using audio-monaural equipment in the typewriting classroom: increased attention span,
increased production of materials, improved skills in recognition-response patterns, improved techniques, superior instructional procedures, individual differences handled more effectively, loss of "make-up" time at a minimum, more effective use of classroom time, students challenged at their own levels and yet able to achieve basic learnings of the curriculum.

The hypothesis stated that with the use of predictated material and an audio contact by headsets, students having access to specially designed audio-monaural equipment, will type at a skill level better than those students without the aid of this equipment. Improved results will be seen in speed improvement, consistency (accuracy), and total production of copy.

The teaching methods used in the experiment were:

1. The control group was taught in the traditional classroom style with the instructor in complete control giving all instructions orally.
2. The experimental group utilized specially constructed audio-monaural equipment, for skill-building, on Tuesday and Thursday of each week for one-half hour.
3. Class presentations—to control and experimental groups—were identical, with one exception. The three experimental groups wore headsets throughout each classroom hour and were guided through an electronic auditory contact, with the instructor giving the directions and dictation orally with the assistance of a microphone. At other times they received the directions and dictation through Dictaphone input transcribers.
4. The same visual copy was used by both groups.
The significance of differences between the control and experimental groups was determined through the use of the F-test (analysis of variance). The achievements of the control and experimental groups were compared on speed improvement, consistency (accuracy), production, class tests, and final examinations.

The statistical results showed no significant difference between the control and experimental groups on all tests measured. A significant difference was noted for the experimental group at the five percent level among sections on the speed improvement analysis. The results further indicated a favorable difference for the experimental group significant at the one percent level among sections on the consistency tests.

On the basis of the data gathered and analyzed, there was little evidence that the audio-monaural method was superior to conventional methods for teaching typewriting. In all cases of measurement on speed improvement, consistency, production, class tests and final examinations, the evidence was the same--no significant difference.
The Effectiveness of Audio-Monaural Equipment in Skill-Building in Typewriting

by

Robert Ells Wiper

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Typewriting lends itself to an effective utilization of audio-visual aids and many teachers in the field have been endeavoring to improve their teaching through the use of various teaching aids. The subject is an exacting one and one which may become very humdrum and strenuous unless some attempt is made to provide interest and efficiency in the learning processes. (28, p.2)

The use of sensory aids, and specifically audio aids in typewriting, is not new. In 1929, Marie E. Marik (19) conducted an experiment comparing the use of the Dictaphone method of teaching typewriting to the traditional method. In 1936, Mr. John S. Townsend (27) made a similar study of teaching typewriting with the use of the Dictaphone. A complementary study was made in 1938 by Frances M. Freeman (10) on the applications of using the Dictaphone method of teaching typewriting to retarded students. For some years, teachers of typewriting and shorthand have used tape recorders to prerecord dictation and lectures for classroom use. This technique has provided additional time for teachers and allowed for individual differences of students.

Although audio-monaural equipment for classroom use is not entirely new, certain adaptations of equipment
developed in the past few years are quite new. Language is one area that has obtained good learning results with the use of this equipment. Other subjects such as mathematics, physical science, English, social studies, history, civics and business have also used audio media to advantage.

Mrs. Rita Barrows notes that in using the electronic classroom, the energy and efficiency of the teacher is multiplied.

With one channel, two activities are controlled at the same time; with three channels, up to four activities. To the teacher this means, first, less effort in maintaining discipline. The time that pupils used to spend in "busy work", idleness, or mischief while they waited their turn for teacher's attention is now put to productive use. Once committed to permanent voice recording, any material can be repeated as often as needed without additional effort on the part of the teacher. It can be used as extra help for a slow learner, or to bring up to date the pupil who has been absent. The teacher may use the recording as a guide in preparing reviews and tests, and next year as a memorandum in preparing or revising lesson plans. (1, p.3)

**Educational Requirements**

Education requires more than just the transfer of information from the educator to the student. Better approaches will include perception, innovation, and good motivation. If coupled with audio-visual devices
and a wise selection of educational supplements, the instructor's teaching effectiveness should be greatly improved.

Typewriting instructors have learned through observation, that typewriting students may progress as well, if not better, with the use of facilities that will enhance their listening receptivity and produce serial response patterns that can be learned rapidly and with retention. It is generally accepted that visual acuity plays an important part in the training of the typing student. Many students fail to grasp the significance of instructions when these are given verbally. It has been suggested that with better use of the sense of hearing, used with the other senses, more desirable response patterns may be produced.

Socony-Vacuum Oil Company has published a study which substantiates this theory. The study shows that when telling is used alone, recall three hours later is 70 percent; three days later--ten percent. Showing when used alone produced better recall three hours later--72 percent and 20 percent recall three days later. However, when a blend of telling and showing is used the recall three hours later has risen to 85 percent and after three days--65 percent. (25) In a speech given in 1966, Mr. Robert Hutchings of IBM referred to the learning process:
In studying the learning process, we are brought face to face with the fact that in less than half a day people forget 60 percent of everything they have been exposed to. In about 11 hours over half of all the communications people receive have been forgotten. That certainly makes it tough for a teacher who is trying to build interest in a subject such as typewriting or shorthand or office practice.

A basic reason for this is that listening is hard work. The brain soon tires and tunes out after a period of time. Educators call this brief time period the attention span. What a burden it must be for you who spend most of your time during the day talking, to find out that your students learn only 11 percent of what they have been exposed to from what they hear. As a matter of fact, the relative effectiveness of the five senses and how people learn, looks like this: They learn one percent of what they know through taste, one and one-half percent through smell, 11 percent through hearing, and, get this, an overwhelming 83 percent through the sense of sight. There are no other ways than these five senses for people to communicate with each other. . . . Businesses don't get much selling mileage out of the sense of taste or smell because they are often blocked from the best sense, the sense of touch. My point is this: The most flexible and convenient way to get things understood is the strategic use of the senses, sight and sound and touch. Merging these basic communication concepts to problem solutions may make the tough job you've got to do a little bit easier. (14)

The Problem

This experiment was designed to show that those students who had the benefit and use of audio-monaural
equipment while taking typewriting instruction at the intermediate level, would be able to type at a skill level better than students taking the same course without the aid of the equipment.

The typewriting course, SS122 intermediate collegiate typewriting, was selected for the experiment because of its emphasis on skill-building objectives. These objectives as developed, were to produce realized skills in word recognition, serial response patterns, syllable recognition (stroke group patterns), phrase recognition, and other pattern responses.

Observations

This experiment, as designed, suggested it would provide instructional assistance to each individual student, and the following might be observed:

1. The students' attention span would be increased and self-motivation would be improved.
2. The production of materials (letters, tabulation exercises, and manuscript typing) would be significantly expanded.
3. Skills in recognition-response patterns would be further developed.
4. Techniques would be improved through superior supervision.
5. The instructional procedure would be more stimulating due to a closer verbal contact with each student.
6. Individual differences in skill development would be handled more easily through specially predictated programs.
7. Loss of "make-up" time caused by absences would be reduced to a minimum.
8. Total use of classroom time would be at an optimum level.
9. Each student would be challenged at his own basic level and, yet, would not miss the basic learnings of the regular typewriting curriculum.

The Hypothesis

With the use of predictated material and an audio contact by headsets, students having access to specially designed audio-monoaural equipment, will type at a skill level better than those students without the aid of this equipment. Improved results will be seen in speed improvement, consistency (accuracy) and total production of copy.

Source of Data

At the beginning of the Fall Quarter, 1960, six classes of intermediate typewriting were organized at Oregon State University consisting of 146 students. Through a table of random numbers, three of the classes were designated as control groups and three as experimental. Each student had an equal chance of being placed in either the experimental or the control group. Students unable to arrange their schedules to fit this selection pattern were placed in the class of their choice and were not considered part of the experiment. The two groups were almost equal in number, with 71 students in the control group and 69 in the experimental. These numbers
exclude non-participating students who had schedule conflicts.

Teaching Methods

The teaching methods used in the experiment were as follows:

1. The control group was taught in the traditional classroom style with the instructor in complete control giving all instructions orally.
2. The experimental group utilized specially constructed audio-monaural equipment, for skill-building, on Tuesday and Thursday of each week for one-half hour.
3. Class presentations--to control and experimental groups--were identical, with one exception. The three experimental groups wore headsets throughout each classroom hour and were guided through an electronic auditory contact, with the instructor giving the directions and dictation orally with the assistance of a microphone. At other times they received the directions and dictation through Dictaphone input transcribers.
4. The same visual copy was used by both groups.

Both groups developed their typewriting skills on electric typewriters. The following makes were represented: International Business Machines, Underwood, Remington Rand, Royal, and Smith-Corona. All participants had from one semester to three years prior typewriting experience on the secondary school level. Not all students had typed on electric typewriters, so an orientation session was held for both groups during the first week of the experiment.
Evaluation of Data

The following sets of data were accumulated for measurement: Speed improvement, consistency (accuracy), production (production class tests), class tests, and final examinations. The significance of the difference between the control and experimental groups was determined through the use of the F-test (analysis of variance). The five percent level was considered acceptable as an indicator of significance. The variance ratio was applied to the differences between the achievements of the two groups by measuring the foregoing sets of criteria.

Terminology

The terminology used in this experiment may need some explanation for those not completely familiar with this field. The discussion will be limited to the use of nontechnical terms when possible, but there are a few that may need further definition.

Adjacent Finger Reaches

Adjacent finger reaches are those reaches made from one key on the typewriter keyboard to another key adjacent (next to) it.
**Alphabetic Copy**

Alphabetic copy contains each letter of the alphabet at least one time.

**Audio-Monaural Equipment**

Audio-monaural as defined in this study, is sound that is transmitted to the ear through a single source. The audio-monaural equipment was specially designed for this study and will be described in detail later.

**Balanced Hand Words**

Balanced hand words may be typed with rapid response because each letter as typed is alternated from one hand to the other hand. Example: The "t" is struck with the left index finger; the "h" with the right index finger; the "e" with the left middle finger.

**Common Words**

Common words are used more frequently in spoken and written communications than other words. These words will be practiced by typewriting students to improve their immediate recognition so that a response may be made more immediately at the typewriter keyboard.
Consistency

Consistency is the degree of accuracy a student may be able to achieve over a period of time between testing periods.

Dictaphone Belts

Dictaphone belts are prepared with a wax base that accepts sound configurations when dictation is given and is recorded through a stylus that "grooves" the belts. All skill building dictation for this study was placed on Dictaphone belts and used as the input media to individual groups of students or to a single student.

Dictaphone Transcribers

The Dictaphone transcribers were three Dictaphone combination dictation-transcription units, specially wired and used as input recorders to the audio-monaural system. Each machine was capable of three watts of power with additional amplification provided for the microphone input.

Double Letter Words

Double letter words are words that have double
letter combinations, often requiring special drill practice for fluency of typing.

**Gross Words Per Minute**

Gross words per minute represent the total number of words written in one minute. The figure is determined by dividing the total number of strokes written by five and then by the number of minutes in the timing. Five strokes are considered a word in typewriting computations. This measurement does not take into account the accuracy of the stroking. (21, p.6)

**Left-Right Hand Words**

Left-right hand words are typed either completely by the left or the right hand. Example: **bad** (left hand word), **joy** (right hand word).

**Letter Response**

Letter responses are normally made by a beginning typewriting student as he types each single letter of a word, consciously groping for each stroke.

**Net Words Per Minute**

The net words per minute rate is obtained by deducting a penalty of ten words for each error. The number of errors made is multiplied by ten, and this figure
is subtracted from the gross words typed and divided by the number of minutes in the timing. (21, p.7)

**Pacing Drills**

A pacing drill is designed to help a student type at a rate which will encourage a high degree of accuracy at a rapid speed.

**Phrase Response**

A phrase response is achieved when a student of typewriting is able to accept several words in a phrase and type them without hesitation, (it is time).

**Production Tests**

Production tests are designed to measure a typist's total production of copy within a set time period. The material used for the production tests, in this study, measured knowledge and skill in typing letters, tabulation problems, and manuscripts.

**Rhythmic Response**

Rhythmic response is that response recorded at the typewriter keyboard when typing one stroke immediately after another in constant rhythm.
Row-Reach Drills

Row-reach drills provide for developing reaches to the first, third and fourth rows on the typewriter from the home-row. This type of drill is particularly helpful in gaining keyboard security.

Static Response

Static response is a nonconsistent stroking pattern—the opposite of rhythmic response. This typing response parallels radio static that does not have a set pattern. This response pattern is normally associated with higher-speed typists.

Stroke Intensity

Stroke intensity is one of the measurements used in analyzing the difficulty of typewritten copy. It is determined by adding the total number of strokes in the copy, including the spaces, and dividing by the total number of words. Average copy will have a stroke intensity of about 5.3.

Syllabic Intensity

Syllabic intensity is another measurement used in analyzing the difficulty of typewritten copy. It is
determined by adding the total number of syllables in the copy and dividing by the total number of words. Average copy will have a syllabic intensity of 1.3 to 1.35.

**Word Response**

Word response occurs when a typist is able to see and respond to a total word without hesitation, by typing the entire word as one unit rather than in sections or by syllables.
CHAPTER II

TYPEWRITING AND USES OF AUDIO EQUIPMENT

Historical Background of Audio Equipment

An accurate determination of the beginning use of audio equipment in typewriting is difficult to pinpoint, but it is known that its use is not new. In 1877, Edison invented the phonograph which allowed for the preservation of sound on a crude cylinder of foil paper. Edison had envisioned the capturing of sound and later its transmission by means of the phonograph, as being an educational tool to be used chiefly for the teaching of music. To an extent, Edison was correct. In 1911, RCA Victor established an educational department to produce music recordings for schools. The first records, made strictly for educational purposes, included Mother Goose songs, folk dances, art songs for children, and military marches. A music supervisor from Milwaukee, Mrs. Frances Elliot Clark, who had begun using music records in 1909 for instruction, was appointed to head the RCA educational department.

In the middle 1920s, Victrola and Electrola revolutionized the industry by introducing electrically powered phonographs that utilized flat discs for the recording of sound replacing the wax cylinder. This technological breakthrough provided the industry with the capability of producing mass recordings for broad
public and educational use. There soon appeared in the educational field, a wide variety of recorded material including items from nursery rhymes to musical renditions. The greatest impact for recorded materials was in high school. Recordings were used in teaching music, English, social studies, speech, sports, and foreign language.

During the second World War, the United States Army, as well as other branches of the armed services, did a great deal of pioneering work in the teaching of service personnel with the use of audio equipment. Kinder reports that there were two innovations that were used by the United States Army that were notable. They were (1) the combining of conversational materials with instructional content, and (2) the introduction of recordings which reproduced all or part of a printed text. From these developments by the Army have come the Spoken Language Series of texts and records. Even more recently, there has been the development of the "getting around series" consisting of Getting Around in Spanish by Trevinel and Getting Around in French by Denoeu. (15, p.247, 253) Today, the Army Language Training School at Monterey, California, is providing outstanding training for linguists for specialized government service. Every type of audio and visual device presently known is being used in its training programs. The United States Navy Training Facility at
San Diego has also developed a series of massive educational programs for the training of personnel, both land and sea based.

**Development of Other Recorders**

The need for other types of audio devices for the recording of sound became apparent after the development of the wax cylinder and disc. The essential element of an early recorder was a small circular diaphragm mounted so that its center was free to vibrate in resonance with air pressures conveyed to it by a horn or megaphone. When the pressures impinged upon the diaphragm, it vibrated inward and outward with the same frequencies and intensities as the air waves. Variations in sound transmission were great and fidelity was poor due to inadequate control of impedance factors in recording the sound. In addition, it was difficult to reproduce the original recordings economically.

It is reported by Kinder that in 1900, Valdemar Paulsen invented a magnetic wire recorder, but that it was not widely used. (15, p.262) An excerpt from a book by Holland, Hartsell and Davidson notes:

> Various types of magnetic recorders were made in England in the early 1930s. These made and reproduced sounds on steel tapes similar to those used for measuring distances in surveying. During World War II, fine steel wire recorders appeared on the market in the United States. These were
used for professional work, but they presented many difficulties in school use. The wire tended to rust and break easily. It was difficult to splice except by tying the wire in a knot. On both the recording and playback, the wire turned and reduced the uniformity of the recorded sounds. Wound on reels, adjacent turns and recorded wire often magnetized each other resulting in producing an echo during playback. (11, p.15)

When the American forces occupied Germany during the second World War, they found that the Germans had perfected a reasonably satisfactory magnetic recorder. This machine was operated by passing a plastic or paper tape coated with a thin layer of minute iron-oxide particles through a magnetic field. When handled in this manner, the iron-oxide was capable of absorbing a magnetization directly proportional to sound put into the recording head of the machine. The tape recorder added an extra dimension to the flexibility requirements needed by the educational market. Because of its relative simplicity in use and its flexibility for change of recordings, it has become a frequently used teaching tool in the classroom.

The Dictaphone--An Audio Device for Teaching Typewriting

The Dictaphone was developed out of the early inventions of sound recorders by Edison. At first, it utilized wax cylinders which had to be shaved after each
recording so that the cylinder could be reused. Later a wax belt was developed which was used just one time. The Dictaphone, electrically powered, provided a constant revolution of the cylinder. On later models, electrically powered mandrels were used to turn the wax belts at a constant speed. The constant speed feature was particularly helpful to early experimenters developing recorded educational materials for typewriting. Dictaphone equipment was available for use in business education curriculum programs and new materials needed by instructors could be easily recorded on the equipment. As the Dictaphone was used for training of transcription operators, it could be used by students with a minimum amount of instruction.

The first reported used of the Dictaphone in the typewriting classroom was reviewed by Pearson in 1926:

To meet the important need of direct dictation as an incentive to write rapidly, the Dictaphone is introduced into the classroom. By using records, which parallel the exercises in the textbook, at graduated rates of speed of from 10 words a minute upward to 60 words a minute, a student is given the urge best adapted to his needs. Individual needs are provided for by giving slower records to the backward students and faster records to the swift typist. (22, p.78-79)

Lessenberry summarizes the essential features and results of Pearson's work:

(1) No keyboard charts are used; (2) the student is not to keep his eyes away from
his fingers and the typewriter keys; he is
told to study the location of the keys and
watch his fingers as they strike each new
key for the first few times; (3) to meet the
need of direct dictation as an incentive to
write rapidly, the Dictaphone is used; (4) when
a student reaches a plateau and cannot write
at a given speed, say, 20 words per minute,
he is advanced to a record dictated at a
higher speed--25 or 30 words per minute.
After he has worked with this for awhile,
he is put back on the one that was too
troublesome; (5) the student is always asked
to write just as well as he can, but the
customary requirement of perfect copies
has been abandoned.

Two small groups of students were used for
the experimental study of the Dictaphone
and the dictational methods. The students were
not equated. After the study began, it was
found that the Dictaphone group averaged
higher in intelligence, and chronological age,
and in school training. These measures of
equating students are not reliable, for
there is research proof that these are factors
that must be present for successfully learning
to type. As a result of the study, it is
claimed that the Dictaphone method gives
better skill than other methods.

The Dictaphone class was typing at a rate
about 86 and one-half points faster than the
traditional class at the end of the semester
and had made a net gain in speed 63 percent
greater than the traditional class.

The Dictaphone method has been used widely in
the Chicago high schools and is claimed
that the method has increased students' production and reduced the time needed for
developing typing skill. (17, p.28)

In 1929, Marik reported on a comparative study
of the Dictaphone method of teaching typewriting as
compared to the traditional method of learning typewriting.
She found that in median typewriting scores, the Dictaphone
class fell several points below the traditional class in all tests but one. There was little difference between classes in accuracy comparisons. Those pupils of superior ability in the Dictaphone class responded favorably to the stimulus of machine dictation, but the majority of those of normal ability preferred copy exercises. (17, p.29) Lessenberry comments on the conclusions of Marik's study:

Learning to typewrite by the Dictaphone method does not seem to result in either a greater degree of speed or of accuracy than learning to typewrite by the traditional method, when such learning is restricted to developing skill and operating the typewriter on copy work. Provided pupils are actually taught typing and not left to acquire the skill by merely copying the exercises in a textbook, a method used is probably of less importance in effect and progress than are other factors. (17, p.29)

In 1936, Townsend reported on Teaching Typewriting by Dictaphone. He noted that educators are confronted with the problem of individual differences, that students have varying abilities in adapting to typewriting and that pupils should have the opportunity to advance from one level of skill to another without being slowed down by the rest of the group. The Dictaphone system gives the teacher freedom from giving group dictation and instructions and provides the incentive to students to proceed at their own rates of progress. Townsend further notes:

To be a good typist one must reach a level of
skill where the mind and muscles function with such coordination that it becomes an over-learned action, which almost reaches the unconscious mind level. It would take a psychologist to determine whether hearing the words from a Dictaphone, or from a teacher's voice, or seeing them on the printed page of the text is the best method for the development of mental and muscular coordination. But from achievements obtained, which are discussed in a later chapter, it stands to reason that the Dictaphone method is the most efficient in developing mental and muscular coordination. (27, p.16-17)

In the 1930s, several informal studies were conducted by a number of secondary and collegiate programs using installations of Dictaphone equipment. Some of the schools using this equipment in providing for more efficient typewriting instruction were: Ontario College of Education, Toronto, Ontario; Drexel Institute of Philadelphia; Eveleth High School, Eveleth, Minnesota; Miller Vocational School, Minneapolis; Julia Richmond High School, New York City; Lynn High School, Lynn, Massachusetts; University of Iowa, Iowa City; Madison Vocational School, Madison, Wisconsin; Chicago Public Schools. Most of the schools which conducted studies cited preference for the Dictaphone method of instruction.

A study with retarded students was conducted by Freeman in 1938 using the Dictaphone method of teaching typewriting. It was noted that remedial exercises used for correction of errors in typewriting or in improvement of technique proved beneficial alike to students
learning typewriting by the Dictaphone method and those learning it by the traditional method. (10, p.48) The data gathered in the study showed no statistical difference in the results obtained by the two groups during the course of the experiment.

Summary

Audio devices for use in the classroom are expanding at an increased rate. Magnetic tapes, records and belts, wax records and belts, and even voice-actuated equipment provide a means of "input" for individualized multi-channel communication with students. Adequate utilization of audio equipment, however, is a teacher function. Studies that have been conducted rarely show a significant difference between using audio devices as opposed to using traditional teaching techniques. Audio equipment cannot replace good teaching, but the judicial use of such devices may well enhance good teaching. The good teacher will utilize the best techniques, teaching methods, and equipment to effect the most promising learning outcomes.
CHAPTER III

THE EXPERIMENT

Development of Classes

This experiment was conducted during the Fall quarter of 1960 in the intermediate typewriting classes of the Departments of Business Education and Secretarial Science at Oregon State University in Corvallis, Oregon. The typewriting classes met five days a week for 50 minutes each day. The writer taught all classes involved in this experiment.

The course, SS122, intermediate typewriting, was selected because of its emphasis on skill-building objectives. These objectives tend to produce realized skills in word recognition, serial response patterns, syllable recognition (stroke group patterns), phrase recognition, and other pattern responses. It was felt that this particular course would lend itself to the further development of the skills needed for effective typewriting. Through the use of predictated material, it was considered that those students having access to the audio-monaural equipment to be used in the experiment, would type at a skill level better than those students without the aid of the equipment.
Experimental and Control Groups

At the beginning of the Fall quarter, 1960, six classes of intermediate typewriting were organized consisting of 146 students. Through a table of random numbers, three of the classes were designated as control groups and three as experimental. The random sample method was used for selection of participants for the experiment so that an evaluation procedure could be established which would provide objective data and lend itself to statistical treatment. Each student had an equal chance of being placed in either the experimental or the control group. Students unable to arrange their schedules to fit this selection pattern were placed in the class of their choice and were not considered as part of the experiment. The two groups were nearly equal in number, with 71 students in the control group and 69 in the experimental. These numbers exclude non-participating students who had schedule conflicts. Periods 1, 2, and 5 became the experimental groups and periods 3, 4, and 6 were the control groups.

Textbook, Supplementary Materials and Test Copy

The textbook used in both the experimental and control groups was Gregg Typewriting for Colleges, Intensive Course, by Alan C. Lloyd, John L. Rowe and Fred E. Winger.
In addition to the textbook, Tailored Timings by Winger was used as a supplement for pacing drills. Both groups were given the same material to work with each day. The difference between the experimental and control groups was that the control group was taught in the traditional manner, with the teacher giving all dictated drills and instruction to the class, whereas the experimental group utilized the audio-monaural equipment provided. On Tuesday and Thursday each week, one-half hour was devoted to skill-building in both groups, with full directions and dictation being given to the experimental group through the use of predictated Dictaphone belts. In addition, at all other times during the week, the experimental group was guided by the instructor through the use of headsets and a microphone. All production copy used in the course was designed and written by Dr. Fred E. Winger of Oregon State University. The copy was of four types: Left-right hand words, double letter words, adjacent finger reaches, and row-reach letters and words. Other production copy and tests used were designed by the writer and other members of the Departments of Business Education and Secretarial Science at Oregon State University.

Classroom Environment

All the students in both groups developed their
typewriting skills on electric typewriters. The following makes were represented: International Business Machines, Underwood, Remington Rand, Royal, and Smith-Corona. All students had the use of posture chairs and oversized typewriting desks with a top surface of 20 x 44 inches. The desks varied in height from 27 to 28 and one-half inches. All classes were conducted in a room 25 x 43 feet with candlepower lighting rated at 75 to 100 output. A master cutoff switch was used to control the power to all machines in the classroom.

Audio-Monaural Equipment

The audio-monaural equipment used in this experiment was original and unique in design to this project. A series of 40 three-way switches allowed for lecture, discussion, and prerecorded programs. Position one of the switch directed a prerecorded program to members of the class from one of two Dictaphone transcribers. In the second position, the instructor could talk to the entire class, a portion of the class, or one individual with the use of a traveling microphone and headsets. The third position allowed for another prerecorded program to be directed to members of the class from the second Dictaphone transcriber. The selection of the switches by the instructor determined the type of program going to
individual students. The majority of the class could be working from a skill-building recording, while a few selected remedial students were working on a remedial program from the other transcriber. At the same time, the instructor could be talking to a single member of the class about technique problems, using the microphone.

Dictaphone equipment was used exclusively throughout the experiment and the Dictaphone Corporation contributed much of their equipment and time in underwriting the project.

All lectures, discussions, and dictated programs were given with the aid of the headsets and complementary audio-monaural equipment. The students in the experimental classes wore the headsets the entire period. Chin band hearing devices of 70 ohms were used with a binaural plastic diaphragm insert. Volume controls for each headset were mounted in a junction box at each individual station. They were so regulated that they could be turned down but not off.

All of the equipment was housed in, or on a birchwood console that was placed in the front of the typewriting room.

Each Tuesday and Thursday of the Fall quarter was used to develop skill at the typewriter. The experimental classes were directed to put their headsets on at the
beginning of the class period. The audio-monaural equipment was then turned on and used for one-half hour drill sessions. Each student received a program that directed him to selected drill materials dependent on previous performance and individual ability. Some students received directions for typing on speed improvement drills, others on accuracy, and still others on pacing and number drills.

All programs that were prerecorded and dictated to the experimental classes were identical to those used by the control group. The method of directing certain materials to individuals requiring special drill was different. The audio-monaural equipment provided the means to reach each student at his level of development. The students had full use of visual copy while the material was being dictated. Various instructional procedures were used when dictating to produce different responses and to increase the desire to perform at a new skill level.

Measurement Techniques Used

The primary emphasis in using the audio-monaural equipment was on the individual development of skills at the typewriter. Particular attention was given to individual differences of learners and specific prerecorded
Drills were given to meet individual needs. At the beginning of the Fall quarter, each student was given a series of five-minute timed tests to determine basic typing speeds. A basic rate was assigned to each student following these examinations and a challenge speed was established for each of them. Students that were typing at a lower rate of speed, as established by their basic rates, were given specific challenge speeds to attain. Students with higher basic rates were also encouraged to reach new levels, but the rate of increase was commensurate with their present level of typing ability. Each challenge was issued based on a sliding scale—more initial achievement for the slower students, less for those already at a high level of speed proficiency. In this way, each was challenged at specific levels dependent on her own level of performance. Data were accumulated on the timed writings given each student and later measured to determine differences between control and experimental groups. In addition, other data were tabulated to be measured. Consistency was analyzed each time a timed writing was given to determine improvement. Four production tests were given during the quarter which tested factors of assembly of materials, performance in setting up copy and typing it in the correct format and speed and consistency in producing the finished product.
Further measurements were secured through class tests given during the quarter, in two week intervals, plus three separate tests given during final examinations. In all, twenty nine separate exercises were given which measured an individual's particular skill development. All 29 pieces of data were accumulated for later examination in comparing the differences between the achievements of the two groups.
CHAPTER IV

RESULTS AND STATISTICAL INTERPRETATIONS

Report on Analysis

This experiment has had two basic treatments; namely, experimental and traditional methods of teaching. The design was of the hierarchical type. The experimental subjects were divided at random into two groups. One group was taught by the experimental method and the other group was taught by the control method. Each group of students was further divided into three sections. All together there were six sections, three of which were taught by the traditional method and the other three taught with the use of audio-monaural equipment.

The following sets of data were accumulated for measurement: Speed improvement, consistency (accuracy), production (production class tests), class tests, and final examinations. For each set, the mean scores are given in Tables I through X. The significance of the differences among these means have been tested by the analysis of variance. This method was used to test the effect of audio-monaural training due to the difference in teaching method from that due to the difference between classes and individual differences of students within the classes. Both five and one percent levels of confidence were reported. With either of these there is a
possibility that what is shown to be statistically significant is but a chance happening. It therefore can be assumed that should audio-monaural training produce a difference, there is a small probability of error. This probability is five percent when the five percent level of confidence is used and one percent when the one percent level of confidence is used as the criterion of rejection of the null hypothesis.

Table I

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Mean Score</td>
<td>Number of Students</td>
</tr>
<tr>
<td>1</td>
<td>8.50</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>10.48</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>11.05</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>9.84</td>
</tr>
</tbody>
</table>

Tables I and II

The mean score of the experimental group was slightly higher in all nine speed improvement examinations given to the two groups. A significant difference is noted at the five percent level among sections, but no
significant difference is noted between the groups. Although the experimental group gained an average of 9.84 words per minute during the Fall quarter, it can be assumed that nearly the same would have been accomplished without the use of the audio-monaural equipment.

Table II

Analysis of Variance Calculations on Speed Improvement

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt. vs. Control</td>
<td>52.1569</td>
<td>1</td>
<td>52.1569</td>
<td>1.03</td>
</tr>
<tr>
<td>Among Sections</td>
<td>202.7500</td>
<td>4</td>
<td>50.6875</td>
<td>2.77*</td>
</tr>
<tr>
<td>Within Sections</td>
<td>2,453.2288</td>
<td>134</td>
<td>18.3077</td>
<td>—</td>
</tr>
<tr>
<td>Total</td>
<td>2,708.1357</td>
<td>139</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Significant at the five percent level.

There were nine measurements of consistency made during the Fall quarter to evaluate student performance in the improvement of accuracy. The mean scores of the groups on consistency are listed in Table III.
Table III
Mean Scores for Consistency

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Score</td>
<td>Number of Students</td>
</tr>
<tr>
<td>1</td>
<td>3.57</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>7.14</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>4.75</td>
<td>20</td>
</tr>
</tbody>
</table>

Combined 5.00 69 3.93 71

Table IV
Analysis of Variance Calculations on Consistency

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt. vs. Control</td>
<td>40.0950</td>
<td>1</td>
<td>40.0950 .85</td>
</tr>
<tr>
<td>Among Sections</td>
<td>189.1815</td>
<td>4</td>
<td>47.2954 3.73**</td>
</tr>
<tr>
<td>Within Sections</td>
<td>1,699.4664</td>
<td>134</td>
<td>12.6826 - --</td>
</tr>
<tr>
<td>Total</td>
<td>1,928.7429</td>
<td>139</td>
<td>- --</td>
</tr>
</tbody>
</table>

** Significant at the one percent level.

Tables III and IV
The results shown indicate significance at the one
percent level among sections, but no significant difference is evidenced between groups or within sections. We can assume the experimental group had little advantage over the control group in their ability to type copy more consistently.

Production Tests

Production tests were given to measure a student's ability to assemble materials, perform under pressure of time in setting up copy and typing it in the correct format and finally, to produce the finished copy with good speed and consistency. Tables V and VI indicate the results of these tests.

Table V

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Experimental Mean Score</th>
<th>Number of Students</th>
<th>Control Mean Score</th>
<th>Number of Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>110.33</td>
<td>28</td>
<td>111.93</td>
<td>17</td>
</tr>
<tr>
<td>2</td>
<td>123.67</td>
<td>21</td>
<td>115.20</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>140.18</td>
<td>20</td>
<td>127.94</td>
<td>30</td>
</tr>
</tbody>
</table>

Combined 123.04 69 119.80 71
Table VI
Analysis of Variance Calculations on Production

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt. vs. Control</td>
<td>367.4678</td>
<td>1</td>
<td>367.4678</td>
<td>.20</td>
</tr>
<tr>
<td>Among Sections</td>
<td>13,954.1660</td>
<td>4</td>
<td>3,488.5415</td>
<td>1.94</td>
</tr>
<tr>
<td>Within Sections</td>
<td>241,061.8644</td>
<td>134</td>
<td>1,798.9691</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>255,383.4982</td>
<td>139</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Tables V and VI

The figures in Table V show that the mean score of the experimental group was slightly higher than the control group. Table VI indicates that even though the mean score was slightly higher, there is no significant difference noted between groups, within groups, or among the sections. Again, the audio-monaural equipment treatment did not increase averages over those of the traditionally taught control group.

Class Tests

Class tests were given four times throughout the quarter to measure the performance level of students at given times. Analyses of particular students' performance could then be quantified for remedial drill if required.
Tables VII and VIII indicate the results of the class tests.

Table VII
Mean Scores for Class Tests

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>Mean Score</td>
<td>Number of Students</td>
</tr>
<tr>
<td>1</td>
<td>-13.04</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>-11.43</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>-9.75</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Combined</td>
<td>69</td>
</tr>
</tbody>
</table>

Table VIII
Analysis of Variance Calculations on Class Tests

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt. vs. Control</td>
<td>52.6959</td>
<td>1</td>
<td>52.6959</td>
<td>1.51</td>
</tr>
<tr>
<td>Among Sections</td>
<td>308.4049</td>
<td>4</td>
<td>77.1012</td>
<td>2.21</td>
</tr>
<tr>
<td>Within Sections</td>
<td>4,677.2619</td>
<td>134</td>
<td>34.9049</td>
<td>--</td>
</tr>
<tr>
<td>Total</td>
<td>5,038.3627</td>
<td>139</td>
<td></td>
<td>--</td>
</tr>
</tbody>
</table>
Tables VII and VIII

Table VII gives the mean scores for the class tests. The experimental group was slightly ahead of the control group in performance, but as is noted in Table VIII there was no statistical difference noted between groups or among sections. The experimental and control groups performed nearly identically on the class tests.

Final Examinations

Final examinations were given over a period of three days near the end of the quarter. Each examination took two hours to complete. A total of six hours time was employed during the three days of final examinations. In this way, it was felt that all students would have an equal opportunity to perform at maximum proficiency levels. A motivational factor was built into this procedure to encourage a better performance each day. If a student did not perform well one day, she was encouraged to do better the next. Tables IX and X indicate the results of the final examinations.
Table IX

Mean Scores for Final Examinations

<table>
<thead>
<tr>
<th>Section Number</th>
<th>Experimental</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean Score</td>
<td>Number of Students</td>
</tr>
<tr>
<td>1</td>
<td>-13.02</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>-12.50</td>
<td>21</td>
</tr>
<tr>
<td>3</td>
<td>-11.18</td>
<td>20</td>
</tr>
<tr>
<td>Combined</td>
<td>-12.33</td>
<td>69</td>
</tr>
</tbody>
</table>

Table X

Analysis of Variance Calculations on Final Examinations

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>Degrees of Freedom</th>
<th>Mean Square</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expt. vs. Control</td>
<td>8.3391</td>
<td>1</td>
<td>8.3391</td>
<td>.25</td>
</tr>
<tr>
<td>Among Sections</td>
<td>160.8791</td>
<td>4</td>
<td>40.2197</td>
<td>1.19</td>
</tr>
<tr>
<td>Within Sections</td>
<td>4,512.6776</td>
<td>134</td>
<td>33.6767</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>4,681.8958</td>
<td>139</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>
Tables IX and X

Table IX shows that the mean scores for both groups were nearly identical. Table X indicates that there was no statistical difference between the groups on the final examinations. Again, no difference was seen among the various sections.

Summary

For all criteria used to measure the difference of the audio-monaural approach in teaching typewriting through the use of the experimental group as opposed to teaching typewriting using conventional approaches, the conclusion is the same; that is, the differences between the two methods are not significant. There is no evidence in these data used for comparison that one method is superior to the other.
Conclusions

It was assumed at the beginning of this experiment that certain results could be obtained in teaching typewriting through the design and use of audio-monaural equipment.

It was felt that with the use of predictated material and an audio contact by headsets, that those students having access to the audio-monaural equipment used in the experiment, would type at a skill level better than those students without the aid of this equipment and predictated material. Supportive observations made before the experiment were given to help justify this hypothesis:

1. The students' attention span would be increased and self-motivation would be improved.
2. The production of materials (letters, tabulation exercises, and manuscript typing) would be significantly expanded.
3. Skills in recognition-response patterns would be further developed.
4. Techniques would be improved through superior supervision.
5. The instructional procedure would be more stimulating due to a closer verbal contact with each student.
6. Individual differences in skill development would be handled more easily through specially dictated programs.
7. Loss of "make-up" time caused by absences would be reduced to a minimum.
8. Total use of classroom time would be at an optimum level.
9. Each student would be challenged at his own level and, yet, would not miss the basic learnings of the regular typewriting curriculum.

The statistical evidence gathered indicates that the hypothesis was incorrect. There is virtually no evidence in the data used for comparison that the audio-monaural method was superior to conventional methods for teaching typewriting. In all cases of measurement on speed improvement, consistency, production, class tests and final examinations, the evidence is the same—no significant difference.

Recommendations

On the basis of the evidence generated in this study, the following is recommended:

No further experimentation be done using audio-monaural equipment for the improvement of typewriting skill unless sufficient evidence becomes available to redirect present techniques for building skill development in the classroom in which audio equipment could be used to advantage. All studies completed to this date indicate the same evidence—no statistically measurable difference.

Additional studies could be made which deal with
the effective utilization of audio-monaural equipment to improve efficiency of teaching.

It would seem that audio-monaural equipment could provide teachers with a more efficient means of teaching their classes. If similar responses can be made by students using this equipment compared with those being taught in the traditional setting, then audio-monaural equipment and its usage in teaching typewriting could possibly provide the teacher with more efficient ways to teach the subject. These studies could make a valuable contribution. Salser makes a further point on this recommendation:

Our interest in an Electronic Console Operative System (ECOS) is not a precipitant reaction to something new but originally evolved from a desire to relieve our teachers from many of the time consuming routine procedures commonly associated with skill subjects, particularly type-writing and shorthand.

It is our hope that a System could perform these routine chores as satisfactorily as its human counterparts, thereby enabling the teacher to concentrate time and energy on the more creative aspects of each teaching situation. (23)

Finally, it is recommended that future studies which incorporate the use of audio-monaural equipment consider effective listening techniques as a prelude to an audio investigation. Behavioral reactions commonly needed for listening, if redirected, could play
an important part in the success of any future studies.


22. Pearson, David C. An experiment with the Miller Dictaphone method of teaching typewriting. Iowa City, University of Iowa, 1926. 160p. (University of Iowa. Monograph in Education Research Series no. 7)


