THE EFFECT OF SELECTED PROGRAMMED INSTRUCTIONAL
PROCEDURES UPON THE DEVELOPMENT OF
TROMBONE AND EUPHONIUM RANGE

A Thesis Presented to the Faculty
of the School of Education
Morehead State University

In Partial Fulfillment
of the Requirements for the Degree
Master of Higher Education

by
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ABSTRACT OF THESIS
This study was conducted for the purpose of determining the effectiveness of selected programmed instruction upon development of trombone and euphonium range. An audio-tutorial program was designed for this study by Mr. Earle Louder, "Artist in Residence", Assistant Professor of Music at Morehead State University, and former euphonium soloist with the United States Navy Band, Washington, D.C.

The basic design of this study was "pretest-posttest control group". Students were randomly assigned to experimental and control groups for treatment. A performance of range exercises by each subject before a panel of qualified observers comprised the pretests. During the experiment, the experimental group was exposed to an independent variable in the form of a programmed instructional cartridge recording designed for range extremity practice. The control group expended practice time in an effort to
increase range but without the use of the recording. At the conclusion of the experiment, subjects were posttested with the same exercises and in the same manner as they were pretested. The results of these tests were analyzed by a "t-test" to determine any significant mean gain differences between control and experiment groups. Product moment correlation was utilized to compare group's practice times.

The following conclusions were reached:

(1) Students who practiced range studies with the aid of the programmed instructional recording experienced a greater gain in achievement than did those students who practiced without the recording. However, there were no significant differences revealed.

(2) There was no significant correlation between the control group's total practice time and the experimental group's practice time. However, the correlation of practice time was not specifically pertinent to the results of the study. Had significant differences been found between mean gain achievement scores, a significant correlation of the two group's practice times would have been needed to exclude the amount of practice as a factor causing achievement differences between groups.

(3) Based upon results of the study, the writer concluded that trombone and euphonium practice of range
studies without this study's programmed instructional cartridge recording is as effective as practice using the program.

Accepted by: 

[Signatures]

Charles F. Martini, Chairman

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Accepted by the faculty of the School of Education, Morehead State University, in partial fulfillment of the requirements for the Master of Higher Education degree.

William M. Byham
Director of Thesis

Master's Committee: Charles F. Martin, Chairman
William M. Byham
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July 19, 1972
(date)
ACKNOWLEDGEMENTS

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Chapter 1

PRESENTATION OF THE PROBLEM

INTRODUCTION

Programmed instruction is an emerging methodology in applied music education. Cybernetics, computerization, electronics, and automation have brought about rapid change of great consequence not only to music education but to our entire educational system. The demands placed upon today's music students have radically increased as compared with their colleagues of earlier generations. There is, today, a premium on learning speed and adaptability.

The Tanglewood Symposium of 1967, which was convened by the Music Educators National Conference in cooperation with the Berkshire Music Center, The Theodore Presser Foundation, and the School of Fine and Applied Arts of Boston University, dealt at length with the existing accelerated pace of change affecting the social sciences and humanities.¹ The symposium's committee on the "Impact

and Potentials of Technology" stated in its report that time is the most urgent factor as the gap widens between the availability of knowledge and the ability of the school to cope with it. Members of the committee on "Implications for Music in Higher Education and the Community" state recommendations for higher education regarding highly trained specialists in music. Among their recommendations were:

High levels of achievement and precise critical standards must be expected of everyone who enters music as a profession. A great nucleus of experts must be trained who can lead the profession in every area of responsibility, especially those requiring the greatest originality, invention, and imagination. Our passion for democracy is inimical to a corresponding passion for excellence. Music must be on the cutting edge of knowledge. The university must be a forerunner in experiment and research.

These observations on the part of the symposium bring to the forefront the basic question which this study attempts to explore. That is, can programmed instruction serve as a tool with which the music student can learn and develop his ability and yet meet levels of achievement and standards of excellence which the profession of music must expect?

This study focuses upon an area of music education referred to as applied instruction. It is normally a segment of the college music curriculum to include private, one-to-one, instruction in the student's principal performing instrument. This encompasses performance of method literature as well as solo literature.

2Ibid. 3Ibid., p. 135.
The concept of programmed instruction in applied music education is a touchstone to performance quality; but a touchstone in a creative, dynamic era of music cannot remain static, for it will tend to atrophy into a system as rigid as that which it seeks to replace. Programmed instruction must be incorporated into a functioning organizational structure with its thrust generated toward a sound commitment to flexible, differential treatment of students.

The experiment conducted as a part of this study dealt with only two instruments, the trombone and euphonium, which are both included in the brass family. Upon first consideration, programmed instruction for applied brass study might appear as a paradox. One of the goals of programming is to individualize instruction and the very nature of private study is already individualized. But a more plausible function of programmed instruction is the realization of the student's maximum potential. Any program which contributes to this goal for the student will have served a meaningful purpose. The design of the program used in this study is audio-tutorial and is self-instructional. Therefore, it does not in any way attempt to act as a substitute for private instruction. Its function is one only of augmentation to private instruction and is intended to maintain an adjunctive relationship with the private teacher.

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The audio-tutorial program designed for this study is an instructional cassette recording prepared by Mr. Earle Louder, "Artist in Residence" and Assistant Professor of Music at Morehead State University, Morehead Kentucky. Mr. Louder graduated from Michigan State University with the Bachelor of Music Degree having studied with Mr. Leonard Falcone. Mr. Louder was euphonium soloist with the United States Navy Band in Washington, D.C., for twelve years, before joining the Morehead State University staff in 1968.

As it has been the writer's privilege to be engaged in private euphonium and trombone study with Mr. Louder while attending Morehead State University, the benefits derived from instruction regarding brasswinds have provided the writer's motivation for this research study.

STATEMENT OF THE PROBLEM

The purpose of this study is to determine the effectiveness of selected programmed instructional procedures upon the development of range extremities of undergraduate applied trombone and euphonium students.

HYPOTHESES

Ho: There is no significant difference in mean gain performance scores of trombone and euphonium students who

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practice range studies with the aid of a programmed instructional cartridge recording and trombone and euphonium students who practice range studies without the aid of a programmed instructional cartridge recording.

Ho: There is no significant correlation between total practice time of those trombone and euphonium students who utilize a programmed instructional cartridge recording as an aid to range study and practice time of those trombone and euphonium students who do not utilize a programmed instructional cartridge recording as an aid to range study.

BASIC ASSUMPTION

Based upon the fact that the subjects' participation in ensembles, practice for class assignments, rehearsal of solo literature, etc. might have affected the results of this study, the writer makes the following basic assumption:

The possibility of subjects' practice (other than for the experiment) affecting performance scores is equally manifested in both experimental and control groups. This assumption can be made because of random selection of students to groups.

DEFINITION OF TERMS

For the purpose of this study the following definitions are used:

Practice: The routine conditioning of brasswind performance.
Applied Trombone and Euphonium Students: Undergraduates engaged in private trombone or euphonium instruction.

Brasswind Specialist: A person(s) skilled in the techniques of brasswind playing and instruction.

Audio-tutorial program: Programmed learning experiences in which a tape recording takes the place of a tutor for the student and leads him through a set of specified behaviors designed and sequenced to make it more probable that he will behave according to a given desired pattern in the future.

NEED FOR THE STUDY

Instruction in music intrinsically relates to the process of guiding creative talent. In order for the student to express creativity through music, he must first develop a mastery of skills which leads to technical competencies. Torrance, in his discussion of guiding creative talent, establishes that instruction leads to command of skills which, in turn, allows for expression of creativity.

Quite obviously, the psychological conditions (of creativity) cannot be maintained if the individual does not possess the minimum skills necessary for survival and for entry into situations where creativity can be expressed. Many possible causes might be cited for the failure of highly creative individuals to develop some of the fundamental skills essential to any kind of achievement. Perhaps one of the most frequent, however, is the popular fallacy that gifted
students do not need guidance and good instruction.\(^6\)

Although the problems inherent in overall development of performance abilities in brasswind students can be controlled with the aid of a competent musician and teacher, there are nevertheless many details and problems related to performance that require special attention and knowledge.\(^7\) Since the opportunity for individual study with the nation's most outstanding trombone and euphonium artists is limited, the writer concluded that a tutorial reference of professional instruction by automated means would be valuable to students aspiring to become accomplished trombone or euphonium performers.

The need for students of the trombone and euphonium to develop an adequate and consistent range is considered to be vital by leading brasswind specialists throughout the nation. Robert Weast, assistant professor of brass instruments at Drake University, states that "the development of range on a brass instrument presents a problem to most beginners and consistency and ease of performance constantly confronts many experienced players."\(^8\) The value of beginning


\(^{(7)}\)Louder, loc. cit.

to develop the player's range at an early age is emphasized by Dr. William Cramer, Associate Professor of Music at Florida State University. Dr. Cramer states that "practice for the sake of increasing muscle strength, playing range, or dexterity is most successful when started about the middle of the seventh grade."\(^9\)

Mr. Leonard Falcone, retired director of bands and Professor of Music at Michigan State University, regards the playing of the euphonium similar to the cello in relation to technique and style of playing. He bases this belief upon the technical range capabilities and the tonal expressiveness common to both euphonium and cello. Failure for the student to develop a considerable playing range on the euphonium, says Mr. Falcone, results in a weak and insipid approach to playing.\(^10\)

Mr. Howard Liva, instructor in the brass department and conductor of the brass choir at Purdue University, describes the general ability of students with regard to range.

The problem of getting the students in a high school, or for that matter, a college band to play the complete, practical range of their instruments is a universal one. For most of us, only the top chairs in the several brass sections can produce the top and bottom tones on their instruments with some measure of security. Directors are cautioned not to attempt to make

\(^9\)William Cramer, "Teaching the Brass" in Brass Anthology ibid., p. 423.

\(^10\)Leonard Falcone, "The Euphonium--Cello of the Band" in Brass Anthology ibid., p. 94.
radical changes in the playing techniques of their players without the opportunity of close supervision by a brass specialist.\textsuperscript{11}

In summary, a need for this study is established upon certain premises. First, a mastery of skills, which includes command of extensive range by trombone and euphonium students, is necessary for expression of creativity through music. Instruction by a brasswind specialist, particularly a professional artist is desirable and advantageous to the development of performance skills. Adequate and consistent range is vital to performance quality. The problem of students' insufficient command of range on the trombone and euphonium is considered to be universal and can best be conquered with supervision from a brass specialist. Finally, opportunity for individual study with the nation's leading brass specialists is limited.

LIMITATIONS

The design of this study was developed realizing that it would be conducted under the following limitations:

1. The study was conducted entirely within the Department of Music at Morehead State University.

2. Experimental and control groups were limited in number to five subjects each. It would have been more desirable to involve a larger sample of trombone and euphonium students, but this was beyond the scope and means

\textsuperscript{11}Howard Liva, "How to Develop Upper Brass Range" in Brass Anthology ibid., pp. 335-336.
of the investigator.

3. The study is limited to the achievement of students in private trombone and euphonium instruction at Morehead State University. Furthermore, the term achievement in this study pertains only to the students tested and indicates no other performance abilities except range.
Chapter 2

REVIEW OF RELATED LITERATURE

A review of the literature reveals that limited research has been done in the primary target area of this study. Programming is virtually foreign to instruction of instrumental performance. However, programmed instruction is known to many other areas of music instruction. A brief bibliography of materials on programmed instruction in music is found in Appendix A of this study.

The feasibility of teaching music by self-instructional and audio-tutorial methods has been investigated by numerous researchers. Fink's study dealing with the basic craft of chord connection by means of self-instructional methods yielded positive results. Fink concluded, after controlled experimentation, that subjects learned the basic craft of chord connection effectively by means of self-instructional materials.¹ Subjects in Fink's experiment who completed the self-instructional workbook achieved significantly better scores on the post-training test than the subjects who were trained by the teacher-

classroom approach. Crowder's study which developed a self-tutoring program in the fundamentals of orchestration recommended that further programs be developed which lead to the acquisition of musical competencies.²

Programmed instruction has been found to be effective in the teaching of skills when practice is necessary for achievement to occur. Norton established that there is a significant relationship between student dexterity and ability to learn psychomotor skills through the use of programmed materials.³

Academic disciplines other than music have shown programmed tape recordings to be effective teaching devices. Warner found that intermediate college typewriting can be taught effectively through the use of audio-tape recordings and programmed instructional materials.⁴ The results of a study by Hoffman established that college students who were taught slide rule by audio-tutorial methods performed


significantly better than students who were conventionally taught by lecture and practice method.\textsuperscript{5}

Studies similar to the writers have also been conducted in the professional field of dental education. The purpose of a study by Caska was to compare four methods of instruction used for the construction of minor orthodontic appliances. The first method of instruction was traditional lecture-demonstration. The second method was programmed with criterion-referenced emphasis. The third method was programmed with procedure-oriented emphasis, and the fourth method consisted of a combination of methods two and three. Results of the study were that students receiving programmed instruction constructed appliances which were equal or greater in quality than those constructed under the lecture-method of instruction.\textsuperscript{6}

Rowberry's study purposed to determine the usefulness of an adjunctive auto-instruction method for mastery learning in dental education. A regularly scheduled dental course at the College of Dentistry, University of Iowa was analyzed and an auto-instruction strategy of teaching devised. The strategy consisted of providing the student

\begin{flushleft}

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with instructional objectives and specific references wherein the information required to meet these objectives could be located. It was found that every individual in the class was able to attain mastery when willing to expend time and effort with the auto-instructional materials. The data of Rowberry's study indicated that subjects met the criteria established by the instructor and did so with no close supervision nor lecture time expenditure.  

In selecting the audio-tutorial method of instruction as the independent variable for this study, the writer questioned whether the mode of instruction itself might adversely affect student achievement. However, in a study by Gardner on the effects of the audio-tutorial mode of instruction on student achievement, attitudes and classroom behavior, it was revealed that significant gains at the .05 level and beyond in reading improvement were attributable to an individually prescribed, audio-tutorial presentation mode with each student responding individually to tapes and printed material.  

A comparison of self-instructional systems was the research problem contained in a study by Gabriel. The purpose of Gabriel's study was to investigate the effects on


performance of three self-instructional approaches in an educational media laboratory. The three self-instructional approaches were defined as (1) an each one-teach-one's self-instructional approach, (2) a sequenced self-instructional approach, and (3) a scrambled self-instructional approach. Results revealed no significant differences at the .05 level among the three self-instructional approaches. Gabriel concluded that all of the three systems tested are adequate for instructional programming. The system used in the program for the writer's study was a sequenced self-instructional approach.9

The specific manner in which items were sequenced for the program used in this study was hierarchical arrangement. Hierarchical sequence treatment has been shown by Headley to be a highly effective means of programming.10 The purpose of the study by Headley was to compare the effectiveness of three instructional sequencing treatments on learning and retention. The three treatments compared

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Chapter 3

METHODS AND PROCEDURES

DESIGN OF THE STUDY

Students who participated in the experiment for this study were assigned randomly to control and experimental groups. Hillway defines this method of grouping as the "parallel-group method".1 Wiehe employed the parallel-group method in his study of the use of a tape recorder in the teaching of solo trumpet literature to secondary school students.2 The Gage volume establishes that the parallel-group (pretest-posttest control group) is a true experimental design.3 The volume continues to state that the parallel-group design achieves control of intrasession of history (specific events occurring between the first and second measurement in addition to the experimental variable)

through testing students individually and through assigning the students at random to experimental or control conditions.\(^4\)

Maturation (the process within the respondents operating as a function of the passage of time per se) and testing (the effects of taking a test upon the scores of a second testing) are controlled in parallel-group design in that they should be manifested equally in experimental and control groups.\(^5\)

Statistical regression does not enter in the design of the writer's study as a variable since students were not selected for participation on the basis of extreme pretest scores.

Selection of subjects, as a variable, is ruled out as an explanation of difference in the achievement of experimental and control groups if the randomization has assured group equality at the time of the pretest.\(^6\)

Randomized selection of subjects produced equal groups in this study with regard to ability to perform range exercises. (see specific pretest scores in Chapter 4, Table 1) Groups were also considered to be equal with regard to subjects' age, playing experience, and academic level of study. However, equality of groups was not of major importance to this study since the investigator was concerned only with difference in gain scores.

\(^{4}\)Ibid., pp. 183-184. \(^{5}\)Ibid. \(^{6}\)Ibid., p. 185.
Since mortality did not occur in the experiment, it cannot be considered as a variable.

The writer's study is consistent with the above procedures. Based on the control of the above mentioned variables, this study has been shown to be internally valid.

The Gage volume lists factors which jeopardize external validity of experimental design. These are (1) reactive effect of testing, (2) interaction effects of selection bias and experimental variable, (3) reactive effects of experimental arrangements and (4) multiple-treatment inference. Reactive effect of testing refers to the possibility of the pretest causing increase or decrease in the student's responsiveness to the experimental variable. This reactive effect is likely to occur when highly unusual test procedures are used, or where the testing procedure involves deception, perceptual or cognitive restructuring, surprise, etc. The testing procedure in the experiment for the writer's study was not highly unusual. To the students who participated in the experiment, it was quite normal for them to render musical performance in the manner

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7 Ibid, p. 175.
8 Ibid, p. 188.
in which they were asked. Reactive effects of experimental arrangements refers to the possibility of students responses being affected by his knowledge of being in an experimental situation. The experimental situation for the writer's study was designed to be consistent with the music student's normal activities (routine instrumental practice) which would be expected during the normal course of private brasswind instruction. Multiple-treatment interference cannot be considered a variable in the writer's study due to the fact that subjects did not receive multiple treatments.

Based upon the control of variables mentioned and discussed above, this study has been shown to be externally valid.

DESCRIPTION OF THE PROGRAM

The experimental group was exposed, during the experiment, to an independent variable in the form of a programmed cartridge recording designed by Mr. Earle Louder. The program provided tutorial instruction in trombone and euphonium range. Written exercises were included as a part of the program. The text of the program and exercises are found in Appendix B of this study.

The control group, during the experiment, was to expend practice time in an effort to increase range

9Ibid., p. 190.
extremities. They were instructed to practice scales, arpeggios, and "long tones" (the same content ingredients of the program).

The length of the program in this study was approximately twenty minutes dependent upon individual differences. The program was designed for fifteen sessions. In a similar study by Schmalstieg, the length of the program was eighteen to twenty thirty minute sessions. 10

Prior to the experiment, Mr. Louder exposed the program to advanced trombone and euphonium students and concluded that the program was suitable for the intended purpose of this study. 11

The program used in this study utilized "wash-back" branching. According to Fry, wash-back branching of a program is simply a return to an earlier part of the program for review. 12 Wash-back may occur at the student's request. Following is a portion of the program's text which describes the manner in which opportunity for wash-back is offered the student:

"It may not be possible for you to play each exercise in its entirety. If this is so, in the first practice

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12 Fry, Teaching Machines and Programmed Instruction op. cit., p. 167.
session, play only as high or low as you can without injuring your lips. With each new practice session, attempt to play one phrase or line further into each exercise than you were able to do in the previous session.\textsuperscript{13}

Branching, according to Fry, gives individuality to a learning program. It allows each student a unique path through the program based upon his ability and learning speed.\textsuperscript{14}

The machine used to administer the program used in this study was a simple cartridge tape player. It was of concern to the writer whether complexity of the equipment used would affect the students' learning. However, a study by Duane investigated the effectiveness of four treatment conditions which differed in the amount and complexity of stimulus material presented to the learner. The study did not reveal any significant differences in performance among the treatment conditions, suggesting that it would be feasible for learners to use the least complex treatment while still maintaining the desired level of performance. The study indicated that complex and expensive self-instructional programs are not any more effective than simplified and less expensive self-instructional programs. Without such information, materials and personnel may be poorly allocated and much time may be wasted at the expense of both

\textsuperscript{13}extracted from Appendix C of this study.

\textsuperscript{14}Fry, op. cit., p. 165.
the learners and the institution.15

Diehl, in his discussion of technology and instrumental music, gives suggestions for programming with automated tape recorders. He states that, when using a control panel of PLAY-BACKUP-REPEAT, it is good to follow a basic prompting sequence. The prompting procedure allows the student to hear a model before he plays.16 The program used in the writer's study was consistent with Diehl's suggested procedure.

EXPERIMENTAL PROCEDURE

The experiment for this study was conducted during the spring semester, 1972 on the campus of Morehead State University. The duration of the experiment was five weeks (twenty-five days) and was conducted from March 28, 1972 through May 1, 1972. Students in the control group kept individual records with regard to time spent on range studies as did those students in the experimental group with regard to time spent with the program.


Selection of Subjects

Subjects for the experiment were selected from those enrolled (spring semester, 1972) in private applied trombone or euphonium study with instructors, Mr. Earle Louder or Mr. Eugene Deaton, both of Morehead State University. All private euphonium and trombone students were asked to volunteer for the experiment. Volunteers were selected randomly to control and experimental groups. All subjects' principal performing instrument was either trombone or euphonium. Schmalstieg, who developed a tutorial program for the singing of correctly produced vowels, utilized fifteen subjects\(^ 17 \); the writer's study made use of ten subjects.

Administering the Pretests

A performance of range exercises (designed by Mr. Earle Louder, see Appendix B) by each student in both groups comprised the pretests for the experiment. Tones on the pretest were assigned numeric digits for the purpose of calculative evaluation. A panel of two observers, both brasswind specialists, evaluated individual performances by indicating each item missed by the student. Both

\(^{17}\)Schmalstieg, op. cit.
Schmalstiege and Wiehe utilized observers for the measuring instrument in their experiments in the same manner as was done in this study. The observers were kept unaware of the treatments each student received, experimental or control.

Validity of the pretest was established by exposing the test to a panel of three experts in the field of instrumental performance for their consideration. The panel consisted of Professor Everett Kisinger, Director of the University of Illinois Marching Band; Professor Robert Hawkins, Director of Bands at Morehead State University; and Mrs. Fay Hanson, Head of the Brass Department at Weber State College, Ogden, Utah.

Reliability of the pretest was determined by using the statistical technique of "split-halves". The calculations yielded a correlation coefficient of .406 which is significant at the .05 level.

Administering the Posttests

The same exercises which were used for the pretests were used for the posttests. In the same manner as the pretest, students performed individually before a panel of

18 Ibid.


two brasswind specialists. The specialists still had no knowledge as to which students had received experimental or control treatments. Evaluation of performances was done in the same calculative manner as the pretests.

**STATISTICAL TECHNIQUE**

The analysis of data for the pretest and posttest scores was subjected to the "t-test" of significance in order to find any significant difference in mean gain between control and experimental groups. The formula for the t-test between independent means is as follows: 21

\[ t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2 + \sum x_2^2}{N_1 + N_2 - 2} \left(\frac{1}{N_1} + \frac{1}{N_2}\right)}} \]

Product moment correlation was computed between control and experimental practice times in order to find any significant correlation between the two group's amount of practice. This statistical technique was utilized in an effort to keep the factor of practice time from affecting achievement results. The formula for product moment correlation is as follows: 22

\[ r = \frac{N\sum x y - (\sum x)(\sum y)}{\sqrt{N\sum x^2 - (\sum x)^2} \sqrt{N\sum y^2 - (\sum y)^2}} \]

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21 Iibid., p. 380.

22 Iibid., p. 356.
Chapter 4

PRESENTATION OF RESULTS

PRETEST SCORES

Table 1 reveals the pretest scores achieved by students in the experimental and control groups.

Table 1

Subjects' Pretest Scores*

<table>
<thead>
<tr>
<th>Control Subject</th>
<th>Items Missed</th>
<th>Experimental Subject</th>
<th>Items Missed</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>7</td>
<td>AA</td>
<td>32</td>
</tr>
<tr>
<td>B</td>
<td>8</td>
<td>BB</td>
<td>4</td>
</tr>
<tr>
<td>C</td>
<td>13</td>
<td>CC</td>
<td>14</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>DD</td>
<td>25</td>
</tr>
<tr>
<td>E</td>
<td>28</td>
<td>EE</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

*No significant difference between control group's pretest score and experimental group's pretest score.
POSTTEST SCORES

Table 2 reveals the posttest scores achieved by students in the experimental and control groups.

Table 2
Subjects' Posttest Scores

<table>
<thead>
<tr>
<th>Control Subject</th>
<th>Items Missed</th>
<th>Experimental Subject</th>
<th>Items Missed</th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>7</td>
<td>AA</td>
<td>14</td>
</tr>
<tr>
<td>B</td>
<td>5</td>
<td>BB</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>6</td>
<td>CC</td>
<td>1</td>
</tr>
<tr>
<td>D</td>
<td>8</td>
<td>DD</td>
<td>9</td>
</tr>
<tr>
<td>E</td>
<td>12</td>
<td>EE</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td></td>
<td>25</td>
</tr>
</tbody>
</table>

MEAN GAIN SCORES

Table 3 reveals the mean gain scores of both experimental and control groups. Deviations from the mean and the deviation's squares are calculated and included in Table 3.
Table 3

Subjects' Mean Gain Scores

<table>
<thead>
<tr>
<th>Control Subject</th>
<th>Gain</th>
<th>d</th>
<th>$d^2$</th>
<th>Experimental Subject</th>
<th>Gain</th>
<th>d</th>
<th>$d^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>5</td>
<td>25</td>
<td>AA</td>
<td>18</td>
<td>7</td>
<td>49</td>
</tr>
<tr>
<td>B</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>BB</td>
<td>3</td>
<td>8</td>
<td>64</td>
</tr>
<tr>
<td>C</td>
<td>7</td>
<td>2</td>
<td>4</td>
<td>CC</td>
<td>13</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>D</td>
<td>0</td>
<td>5</td>
<td>25</td>
<td>DD</td>
<td>16</td>
<td>5</td>
<td>25</td>
</tr>
<tr>
<td>E</td>
<td>16</td>
<td>11</td>
<td>121</td>
<td>EE</td>
<td>5</td>
<td>6</td>
<td>36</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>26</strong></td>
<td><strong>11</strong></td>
<td><strong>121</strong></td>
<td><strong>Totals</strong></td>
<td><strong>55</strong></td>
<td><strong>178</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mean = 5</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>Mean = 11</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The data from Table 3 were used in the following formula:

$$
t = \frac{M_1 - M_2}{\sqrt{\frac{\sum x_1^2}{N_1} + \frac{\sum x_2^2}{N_2} + \frac{1}{N_1} + \frac{1}{N_2}}}
$$

where:

- $M_1 = 11$
- $M_2 = 5$
- $N = 5$
- $EX_1 = 179$
- $EX_2 = 178$

As a result of the above calculations, it was determined that the t statistic was equal to 1.42. The area of rejection, using an alpha level of .05 with 8 degrees of freedom, was found to be 2.306. Therefore, the null hypothesis being tested cannot be rejected. Failure to reject the null hypothesis would seem to indicate no significant difference in mean gain of performance scores of those students practicing with the instructional cartridge recording and those students practicing without the instructional cartridge recording.

CORRELATION OF PRACTICE TIME

Table 4 reveals the practice times of students in experimental and control groups.

---

1 VanDalen, ibid., p. 465.
Table 4
Correlation of Practice Time Between Groups

<table>
<thead>
<tr>
<th>Control Subject</th>
<th>X</th>
<th>X²</th>
<th>Experimental Subject</th>
<th>Y</th>
<th>Y²</th>
<th>XY</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>345*</td>
<td>119,025</td>
<td>AA</td>
<td>160</td>
<td>25,600</td>
<td>55,200</td>
</tr>
<tr>
<td>B</td>
<td>390</td>
<td>152,100</td>
<td>BB</td>
<td>352</td>
<td>123,904</td>
<td>137,280</td>
</tr>
<tr>
<td>C</td>
<td>295</td>
<td>87,025</td>
<td>CC</td>
<td>290</td>
<td>84,100</td>
<td>85,550</td>
</tr>
<tr>
<td>D</td>
<td>545</td>
<td>297,025</td>
<td>DD</td>
<td>230</td>
<td>52,900</td>
<td>125,350</td>
</tr>
<tr>
<td>E</td>
<td>250</td>
<td>62,500</td>
<td>EE</td>
<td>230</td>
<td>52,900</td>
<td>52,500</td>
</tr>
<tr>
<td>Totals</td>
<td>1,825</td>
<td>717,675</td>
<td></td>
<td>1,262</td>
<td>339,404</td>
<td>460,880</td>
</tr>
</tbody>
</table>

*Total practice time expressed in minutes
The data from Table 3 were used in the following formula for product moment correlation.

\[
 r = \frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}
\]

where:

\[
\begin{align*}
N &= 5 \\
\sum XY &= 460,880 \\
\sum X &= 1,825 \\
\sum Y &= 1,262 \\
\sum X^2 &= 717,675 \\
\sum Y^2 &= 339,404
\end{align*}
\]

The above calculations resulted in a correlation coefficient of .008. "A positive correlation of .30 or higher may normally be considered sufficient evidence of a positive degree of relationship".\(^2\) Therefore, the null hypothesis being tested cannot be rejected. A correlation coefficient of .008 indicates no significant correlation between the control group's amount of practice time and the experimental group's amount of practice time.

\(^2\)Hillway, op. cit., p. 213.
Chapter 5
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

This study was conducted for the purpose of determining the effectiveness of selected programmed instruction upon development of trombone and euphonium range. The need for students to develop an adequate and consistent range was established in Chapter 1. In addition, it was emphasized that instruction with regard to trombone and euphonium range can best be rendered by a brass specialist. An audio-tutorial program was designed for this study by Mr. Earle Louder, "Artist in Residence", Assistant Professor of Music at Morehead State University, and former euphonium soloist with the United States Navy Band, Washington, D.C.

A review of literature relating to the study was presented in Chapter 2. Research of the related literature established that the audio-tutorial method of instruction has been found to be effective not only in music, but other disciplines as well.

This study was designed according to accepted procedures in educational research. The basic design used was "pretest-posttest control group". Chapter 3 establishes
that "pretest-posttest control group" is a true experimental design. Students were assigned randomly to experimental and control groups for treatment. A performance of range exercises by each subject before a panel of qualified observers comprised the pretests. During the experiment, the experimental group was exposed to an independent variable in the form of a programmed instructional cartridge recording designed for range extremity practice. The control group expended practice time in an effort to increase range but without the use of the recording. At the conclusion of the experiment, subjects were posttested with the same exercises and in the same manner as they were pretested.

The following null hypotheses were tested:

Ho: There is no significant difference in mean gain performance scores of trombone and euphonium students who practice range studies with the aid of a programmed instructional cartridge recording and trombone and euphonium students who practice range studies without the aid of a programmed instructional cartridge recording.

Ho: There is no significant correlation between total practice time of those trombone and euphonium students who utilize a programmed instructional cartridge recording as an aid to range study and practice time of those trombone and euphonium students who do not utilize a programmed instructional cartridge recording as an aid to range study.
Chapter 4 presented the data and calculations used to test the hypotheses.

CONCLUSIONS

In terms of the null hypotheses tested and analysis of the data collected, it is concluded that:

1. Null hypothesis number one is accepted. There is no significant difference in mean gain performance scores of trombone and euphonium students who practice range studies with the aid of a programmed instructional cartridge recording and trombone and euphonium students who practice range studies without the aid of a programmed instructional cartridge recording.

Although no significant differences were revealed in this study, students utilizing the program experienced a greater gain in achievement than did those students who practiced without the program. Comments from subjects who used the program indicated that it consistently held their interest and challenged them during each practice session. A majority of subjects in both groups indicated interest in obtaining duplicated recordings of the program for further use.

2. Null hypothesis number two is accepted. There is no significant correlation between total practice time of those trombone and euphonium students who utilize a programmed instructional cartridge recording as an aid to
range study and practice time of those trombone and euphonium students who do not utilize a programmed instructional cartridge recording as an aid to range study.

The purpose of correlating practice times between experimental and control groups was to keep the factor of practice time from affecting achievement results. However, since the hypothesis number one was accepted (no significant differences found between mean gain scores), the correlation of practice time was not specifically pertinent to the results of the study. Had significant differences been found between mean gain scores, a significant correlation of the two group's practice times would have been needed to exclude the amount of practice as a factor causing achievement differences between groups.

3. Inability to reject null hypothesis number one led the writer to conclude that trombone and euphonium practice of range studies without this study's programmed instructional cartridge recording is as effective as practice using the program.

RECOMMENDATIONS

The evidence from the review of the literature contained in Chapter 2 reveals that this study is the first conducted in the field of programmed instruction and its applications to the development of trombone and euphonium range. Unquestionably, further research is needed which is relevant to this study's topic. Suggestions for this research include:
1. Studies which utilize a considerably large subject population.

2. Studies which precisely control the amount of practice time.

3. Studies which involve trombone and euphonium students at the secondary level.

4. Follow-up studies which investigate long-term retention of range extremity achievement.
APPENDIXES
APPENDIX A

A BIBLIOGRAPHY OF PROGRAMMED INSTRUCTION IN MUSIC
A BIBLIOGRAPHY OF PROGRAMMED
INSTRUCTION IN MUSIC


1This bibliography is solely intended to give the reader a perspective of materials available for use in music teaching. A review of research on programmed instruction related to this study is contained in Chapter 2.
APPENDIX B

PRETEST/POSTTEST
PRETEST/POSTTEST

PART A*

*circled notes indicate test items.
PART B*

* circled notes indicate test items.
APPENDIX C

TROMBONE AND EUPHONIUM RANGE: A PROGRAMMED PRACTICE SESSION
TROMBONE AND EUPHONIUM RANGE: A PROGRAMMED PRACTICE SESSION

by

Earle L. Louder

Morehead State University

1972
This cassette tape has been prepared as an instructional guide for your practice session. Instructions and examples for each exercise are given as the tape progresses. After each example, a bell will ring at which time you will stop the tape and commence your individual practice on each exercise. It may not be possible for you to play each exercise in its entirety. If this is so, in the first practice session, play only as high or low as you can without injuring your lips. With each new practice session, attempt to play one phrase or line further into each exercise than you were able to do in the previous session.

Although exercise no. 1 can be used as a warm-up, it is suggested that a less strenuous warm-up precede your practice on the first exercise. During this exercise, use the entire amount of breath for each two measure phrase and attempt to cover the extremes in dynamic range. With each practice session, also attempt to extend the length of each two-measure phrase and take frequent breaks between these two-measure phrases to allow the lips to regain strength and stability. (examples performed by Mr. Louder)

*The program itself is in the form of a cassette tape recording; this appendix includes the text of that tape and exercises to be used with the tape.
This has been an example of the manner in which you should practice exercise no. 1. When the bell rings, stop the tape and commence the practice for approximately five to ten minutes, after which time you may again turn on the cassette player and follow the instructions for exercise no. 2. (Bell)

As with exercise no. 1, take plenty of time; use the entire amount of breath and encompass the extremes in dynamic range for the first two measures of each line of exercise no. 2. The arpeggio following each long tone is designed to flex and relax the lips and does not necessarily have to be played in a strict metronomic meter. As you progress higher in this exercise, take frequent breaks to allow the lips to rest. If they become too tight, play a chromatic scale from low B-flat down to low E and back up again and repeat it several times before moving on to the next line in this exercise. (examples performed by Mr. Louder)

This has been an example of exercise no. 2 with the suggested chromatic scale for flexibility. (Bell)

Proceed with exercise no. 3 which is the inversion of exercise no. 2. Trombones with F-attachments and euphoniums with four valves may play the complete arpeggio on each line of this exercise. The following examples will show both methods of practice for the first three lines of exercise no. 3. When the examples have been played and the
bell rings, please rewind the cassette tape back to the beginning before leaving the practice room. (examples played by Mr. Louder) (Bell)
*Use entire amount of breath on each two measure phrase. Cover extremes in dynamic range also. As practice progresses attempt to extend the length of each two measure phrase.
EXERCISE NO. 2
BIBLIOGRAPHY
BIBLIOGRAPHY


________. Personal interview, March 24, 1972.


