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THE EFFECT OF THE USE OF A RECORDED SOLOIST AS AN AID TO THE
TEACHING OF SIGHT READING ACCOMPANIMENTS AT THE PIANO

The University of Oklahoma

Ph.D. 1984

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE EFFECT OF THE USE OF A RECORDED
SOLOIST AS AN AID TO THE TEACHING OF
SIGHT READING ACCOMPANIMENTS AT THE PIANO

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

By

ALICE JAN WATKINS

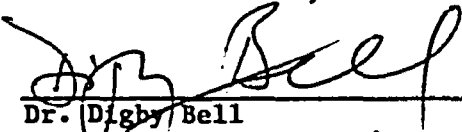
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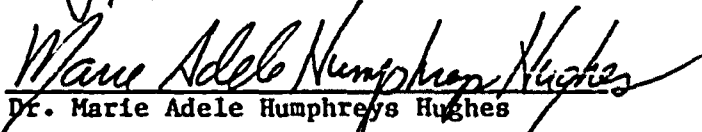
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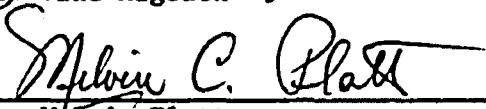
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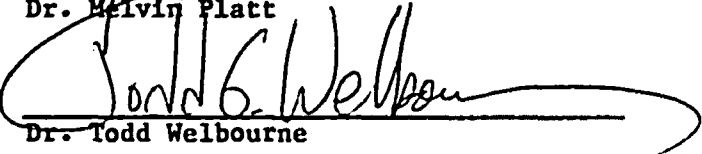

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THE EFFECT OF THE USE OF A RECORDED
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CHAPTER I

INTRODUCTION

Music educators at higher learning institutions strive to prepare vocal and instrumental music majors to meet the demands of educating young student musicians from elementary through high school levels. One widely imposed requirement of music education majors is proficiency in piano sight reading. In addition, the ability to accompany a soloist or group of musicians is highly beneficial to the music major. Much research has been done on the methods and techniques of teaching sight reading, but to the knowledge of this researcher, no research has been done that combines these two important skills required of music teachers.

For a number of years, the development of sight reading skills has been regarded as one of the major functions of piano instruction for non-keyboard music majors. Accompanying should be recognized as an equally important skill by music educators and should be included in the curriculum for vocal and instrumental music teachers. Requests from schools and the community for accompanists for various functions illustrate this importance. If the music teacher is to meet these

demands, one must be able not only to accompany but also sight read accompaniments. This study was concerned with the problems of preparing music educators to sight read accompaniments.

The importance of developing both sight reading and accompanying skills is stressed in the research and writings of several leading music educators. James B. Lyke¹ composed a rating scale of twenty important keyboard musicianship items which was sent to general music teachers and class piano teachers throughout the United States. The purpose of this scale, wherein teachers were asked to rank items in order of importance by number, was to determine which items should receive high priority in class piano instruction. Music educators from across the nation cited the following as the most important keyboard musicianship items:²

- | | |
|-----------------------|--------------------------|
| 1) Harmonization | 7) Analysis |
| 2) Sightreading | 8) Transposition |
| 3) Accompanying | 9) Technical development |
| 4) Critical listening | 10) Improvisation |
| 5) Playing by ear | 11) Development of style |
| 6) Chord progressions | |

In the same study class piano teachers indicated the following rankings in order of importance:³

- | | |
|-------------------|-----------------------------|
| 1) Sightreading | 6) Critical listening |
| 2) Playing by ear | 7) Accompanying |
| 3) Harmonization | 8) Development of technique |
| 4) Transposition | 9) Chord progressions |
| 5) Improvisation | 10) Analysis |

¹James B. Lyke, "An Investigation of Class Piano Programs in the Six State Universities of Illinois and Recommendations for Their Improvement" (Ed.D. dissertation, Colorado State College, 1968).

²Ibid., p. 104.

³Ibid., p. 105.

Both groups noted sight reading as either first or second in importance and music educators ranked sight reading and accompanying in second and third place as the most important skills.

A study conducted by Gillian Buchanan⁴ illustrates the necessity of emphasizing practical keyboard skills in the college piano class. Based on the results of a survey representing band, orchestral, and choral teachers as well as music supervisors, it was concluded that more attention to functional skills is needed in the training of music educators. The following keyboard competencies were cited by the respondents as being important in their teaching situations: (1) accompanying (2) score playing (3) sight reading (4) improvising (5) playing by ear and (6) harmonizing.⁵

Often the instructional materials used for teaching sight reading skills do not include accompaniments in the repertoire and rarely if ever, according to research studies investigated by this author, do they involve an actual accompanying situation. Although some methods do include accompaniments in their repertoire, this researcher believes that unless students are involved in actual accompanying situations, they tend to concentrate on the accompaniment part as a solo piece and not as a segment of the whole musical picture.

Purpose of the Study

The purpose of this study was to investigate the effect that

⁴Gillian Buchanan, "Skills of Piano Performance in the Preparation of Music Educators," Journal of Research in Music Education 12 (Summer 1964): 134.

⁵Ibid., p. 136.

accompanying a tape-recorded soloist has on the ability of collegiate music students to sight read vocal and instrumental accompaniments at the piano. Specifically, the study examined a tape-recorded accompanying situation and its effects on the accuracy of the following sight reading skills: pitch, rhythm, and expression.

Need for the Study

Much research has been conducted in the areas of sight reading and methods for the teaching of sight reading skills. These methods will be discussed in the following chapter on related literature. While investigations in the areas of sight reading and accompanying are available, the author has not found research studies which explore the effect of utilizing actual accompanying situations to teach basic sight reading skills. This study attempted, through the use of a tape-recorded soloist, to provide research data in this area.

Procedure of Investigation

Some methods of instruction utilize discovery learning in the teaching of sight reading. In that approach the student becomes actively involved by thoughtful examination of and response to a set of questions before beginning to play. These questions generally lead the student to discover and carefully analyze main characteristics of the composition. While most piano methods have differing preparatory suggestions, they generally agree that the preparatory procedure must be meticulous, comprehensive, and mandatory.

In this study a preparatory procedure was employed to focus the student's attention on important musical information before he/she began

to play. The following sight reading procedure suggested by Bastien, for example, is typical of the advice given in many piano methods:

1. Analyze the composition before beginning to play it through. Check the key and time signatures, rhythm patterns, slurs, ties, and rests. Look through to see where the shifts in hand position occur.
2. Read by patterns in units, rather than by individual note by note sequence.
3. Listen carefully to perceive the harmonic changes.
4. Constantly look ahead to comprehend new patterns before actually playing them.⁶

Another example of this type of preparatory questioning is advocated by Denes Agay:

Before starting to play, be sure to know the piece's title, tempo mark, and key signature. This may seem to be an elementary and superfluous reminder, but it is not. All too often the student plunges into playing before being aware of these essential facts about the piece.⁷

The researcher of this study asked the student to answer a list of questions before sight reading an accompaniment. This list entailed a comprehensive list of the basic characteristics of the score to be performed. This procedure was designed to aid in a better understanding of the accompaniment and stimulate active involvement in the process. These questions were compiled from the various methods advocated by the authors surveyed in the related literature chapter and can be found in Appendix A.

⁶James W. Bastien and Jane Smisor Bastien, Beginning Piano for Adults (Park Ridge, Illinois: General Words and Music Company, 1968), p. 63.

⁷Denes Agay, Teaching Piano (New York: Yorktown Music Press, Inc., 1981), p. 216.

The subjects involved in the study consisted of two Level III piano classes of non-keyboard music majors at the University of Oklahoma. Subjects had completed two semesters of class piano or its equivalent and were enrolled, at the time of the experiment, in Level III of group piano. The experiment was conducted over a ten-week period during the 1983 fall semester. A different accompaniment was taught each week of the experiment to both classes. The only difference in the treatments of the two classes was that the experimental group had the advantage of a tape-recorded accompanying situation. All ten accompaniments used in the experiment are included in Appendix B. Fifteen minutes of each of the two weekly class periods for ten weeks was devoted to this sight reading experiment. This was considered ample time to teach the two procedures and develop skill in them. If the experiment could have been continued into the next semester (Level IV piano class), perhaps the validity of the findings would have been enhanced. A pretest and posttest were used to determine whether significant differences developed between the sight reading skill of the two groups as a result of the two differing treatments. Since all other factors were the same for all students, any differences observed was attributed to the use of a tape-recorded accompanying situation.

The difficulty level of the pretest and posttest was based on the students' sight reading proficiency at the beginning and end of the experiment. To establish these levels, the researcher consulted with members of the class piano faculty at the University of Oklahoma, and utilizing their expertise in this area, selected accompaniments at the appropriate levels. Two pieces were chosen from standard group piano

texts and solo collections for instruments and voice. Both of these examples are presented in Appendix C.

The following is a description of the classroom procedures employed during the experiment:

(1) Control Group. Subjects in this group were asked to answer the preparatory questions concerning the accompaniment of each piece to be performed. Each student's answers were written on a form provided by the instructor. The student was then given a study period to analyze each component of the checklist. Next each student performed the accompaniment at a designated tempo. The example was a typical accompaniment selected from standard group piano texts and collections or from vocal and instrumental solos used with high school and junior high students. The examples studied and played represented various musical style periods.

(2) Experimental Group. Subjects in this group followed the same preparatory procedure as did the subjects in the control group. The questions to be answered and the study time allotments were identical for both groups. In addition, the vocal and instrumental accompaniments selected were the same ones used with the control group. The only difference between the classroom procedures employed for the two groups was that the students in the experimental group performed the accompaniment with a tape-recorded soloist. This allowed subjects in the experimental group to have the advantage of an accompanying situation.

A more detailed analysis of the procedures used in this investigation can be found in Chapter 3, Design of Study.

In this study the tape recorder was used as an educational tool. All types of media equipment, especially the tape recorder, are excellent teaching aids for class piano instructors as well as private piano teachers. According to E.L. Lancaster:

Education has adopted such media into the teaching process. As a result, planning for the instructor has become more structural and teaching has often become more efficient and effective.⁸

Ylda Novik considers the tape recorder an indispensable teaching aid. She contends that many private piano teachers consider tape recorders a necessary part of their teaching equipment.⁹

Hypothesis

The purpose of this study was to test the hypothesis that the utilization of a tape-recorded soloist can make the teaching of sight reading accompaniments to non-keyboard music majors more effective than the traditional procedure involving playing the accompaniments without the soloist. Three elements of performance were tested in the experiment, pitch accuracy, rhythm accuracy, and expression accuracy. The following null hypotheses were tested:

H₀: There will be no significant difference between the average¹⁰ posttest pitch accuracy scores of the control and experimental groups at the .05 level of significance.

⁸E.L. Lancaster, "Instructional Media for the Piano Class," in Creative Piano Teaching by Yvonne Enoch and James Lyke (Champaign, Illinois: Stipes Publishing Company, 1977), p. 244.

⁹Ylda Novik, "The Recorder: An Indispensable Teaching Aid," in Teaching Piano, Vol. II by Denes Agay (New York: Yorktown Music Press, Inc., 1981), pp. 627-630.

¹⁰The word "average" is used as a generic term for central location. This is done so that the statement of the hypotheses will be appropriate for either a parametric or a nonparametric test of central location.

H_0 : There will be no significant difference between the average posttest rhythm accuracy scores of the control and experimental groups at the .05 level of significance.

H_0 : There will be no significant difference between the average posttest expression accuracy scores of the control and experimental groups at the .05 level of significance.

The null hypotheses in this study were tested by the following statistical procedures: (1) Student's t test (a parametric test), (2) Mann-Whitney U test (a nonparametric test that is also referred to as the Mann-Whitney-Wilcoxon test)¹¹, and (3) Analysis of Covariance (a parametric test). The data consisted of pretest and posttest scores for pitch accuracy, rhythm accuracy, and expression accuracy for each student. Posttest scores will be the dependent variable and pretest scores will be used as covariates in the Analysis of Covariance. If the null is accepted, it will be concluded that there are no differences between teaching methods which employ a tape-recorded accompanying situation and those which do not employ one with respect to the achievements of pitch, rhythm, or expression accuracy. If the null is rejected, it will be concluded that there are significant differences.

Conclusions will be based on the differences in the three accuracy scores from a posttest administered at the end of the experiment. The test adjudication forms and the scoring procedure are included in Appendix C.

¹¹Wayne W. Daniel, Applied Nonparametric Statistics (Boston: Houghton Mifflin, 1978), pp. 82-86.

Definition of Terms

Sight reading. The ability to read and perform music at first sight.

Accompanying. The musical background provided for a solo part.

Preparatory Procedure. A set of questions to be answered by the student concerning the pitch, rhythm, and expression of the composition to be sight read.

Tape-Recorded Soloist. A tape recording of the solo part (vocal or instrumental) of a musical example.

Pitch Errors. Any note which is played on the wrong pitch, omitted, or repeated.

Rhythm Errors. Any note or rest that is not sustained long enough or that is sustained too long.

Expression Errors. Any failure by the performer to (1) observe differences in dynamic indications, (2) to observe crescendo, decrescendo, ritardando, and accelerando indications, (3) playing legato notes staccato, (4) playing staccato notes legato, or (5) playing nonlegato under a slur.

Summary

After investigating research conducted in the areas of sight reading and accompanying, the author failed to locate any studies concerning the teaching of these two skills simultaneously. Therefore, this study attempted to determine the instructional effectiveness of employing a tape-recorded accompanying situation to teach sight reading skill in the piano class.

CHAPTER II

REVIEW OF RELATED LITERATURE

For the purpose of this study, literature pertaining to the basic skills involved in sight reading as well as specific instructional methods for teaching sight reading was examined. Also, materials were examined which relate to accompanying skills and to the teaching of accompanying.

Almost all the literature reviewed advocated the use of a dedicated procedure or system to aid in the development of actual sight reading skills. One of the most important aspects found, which related to students being able to perform a piece of music at sight (without previous study of the piece), was the need for a gradual development of certain skills. Most authors agreed that the learning process of any skill requires continuous maturation.

Although theory and practice have not always been in agreement, improvement in piano instruction can result from the utilization of certain findings of research in the psychology of learning. One learning theory, the Gestalt psychology, advocates that students will learn more advantageously by the whole method than by dividing the materials to be mastered into a number of parts. One of the important principles in the Gestalt theory is the factor called pacing. In one of

his articles, Louis P. Thorpe discusses the steady development of insight by the pupil at all levels of maturation.¹ He relates from the research of Wheeler and Perkins the following conclusion:

If the stimulating situation is adequately controlled, the learner should be able readily to solve a new problem the first time it is attempted. If he must resort to fumbling or so-called trial-and-error behavior, it is evident that he is not sufficiently mature regarding the problem to be in a position to handle it adequately. In such an instance, the pupil, of necessity, will need to resort to the gradual development of maturity (insight) in relation to the problem.²

James Mursell also believes a student's musical understanding, i.e., his grasp of music as an expressive organized pattern, improves gradually as the student studies and systematically learns the uses of various musical symbols. He believes that sight reading is an ability that develops gradually.

Little by little he [the student] finds himself more and more able to tell how a piece of music will sound just by looking at it. Eye, ear, and understanding have been brought closely enough into relationship so that he can 'hear with his eyes,' as is often said. Or he can sing or play it right away, if it is within his technical capacity, for his fingers or his voice are steered by the musical effects that his mind tells him have to be produced.³

A gradual development of skills is a universal concept which can apply to almost all pedagogical procedures. Much research still reveals the general lack of understanding of the sight reading process itself. An understanding of more efficient and effective procedures must be

¹Louis P. Thorpe, "Learning Theory and Music Teaching," in Basic Concepts in Music Education, ed. Nelson B. Henry (Chicago: University of Chicago Press, 1958), p. 172.

²Ibid., p. 173.

³James L. Mursell, Music Education Principles and Programs (New York: Silver Burdett, 1956), p. 146.

accomplished before any development of skills can take place. One common strategy employed by most music educators for the teaching of sight reading skills is a type of preparatory procedure.

Preparatory Procedures

Most authors investigated in this study support the concept that before a student attempts to sight read a piece of music, the composition should be examined closely. This preparation should include a survey of the obvious characteristics and problems of the piece such as an appropriate tempo and, if necessary, a determination of what elements may be omitted. Harry Jenkins⁴ refers to these obvious characteristics as signposts. He suggests that the first thing a student should do when sight reading an unfamiliar piece is to look at the key signatures, time signatures, and tempo markings. According to Jenkins, one must have in mind a general outline of the piece before beginning to actually perform. Most methods pertaining to the teaching of sight reading include some type of preparatory procedure because an initial examination of the piece will result in a better understanding of certain aspects of the music.

Denes Agay⁵ recommends that the student scan the piece before playing to discover those characteristics that could aid in the performance. For example, he believes just knowing the title can often convey not only the mood but the approximate tempo and basic rhythm of

⁴Harry Jenkins, "Techniques for Better Sight Reading," The Instrumentalist 37 (February 1983): 42.

⁵Denes Agay, Teaching Piano, Vol. I (New York: Yorktown Music Press, Inc., 1981), p. 216.

the work. He also recommends that before the student begins to play, he should quickly glance at the music to perceive conspicuous repetitive and other characteristic features of melody, rhythm, harmony and accompaniment patterns.

To enhance sight reading skills, Bastien and Bastien⁶ suggest a preparatory procedure be utilized because of the essential knowledge the student can acquire before beginning to play. Key and time signatures, rhythm patterns, slurs, ties, rests, and shifting of hand positions are cited as some of the essential facts to know in preparation for sight reading a piece.

While most teachers advise against playing through the entire piece without first examining some facts about the composition, they do encourage the student to silently read through the work. McLain⁷ advocates looking through the piece as a preliminary survey to identify some basic problems before the player confronts them in an actual performance. For example, she believes problems such as an unexpected density of rests and notes that could cause the performer to stumble can be clarified beforehand by this silent reading technique.

Dorothy Bishop⁸ supports this same concept. She feels that by looking through the entire piece the student will set up aural and kinesthetic expectations as to how the music will sound. Some aspects

⁶James W. Bastien and Jane Smiser Bastien, Beginning Piano for Adults (Park Ridge, Illinois: General Words and Music Company, 1968), p. 63.

⁷Margaret Starr McLain, Class Piano (Bloomington: Indiana University Press, 1974), pp. 34-35.

⁸Dorothy Bishop, "Sight-Reading in the Piano Class," Clavier 3 (January-February 1964): 50.

that might be troublesome can therefore be clarified and analyzed to facilitate the playing. She feels the reading that follows such careful preparation can then proceed with a reasonable degree of accuracy.

Thomas Johnson⁹ uses a technique of actually playing the piece on the lid of the piano or on a table. He believes this type of preparatory procedure will enable one to "get the feel" of any particular passage before actually playing the notes on the keyboard. Through this "shadow playing" (as Johnson refers to it), the student can go through the motions of playing the entire piece silently upon the lid or even the keyboard itself without depressing the keys. Through this process, the student should be able to locate some of the trouble spots in the piece before beginning to perform.

Kurt Michaelis, in his systematic training procedure of sight reading skills, gives the student a detailed check list of musical items to examine and understand before he plays the piece.

- Clefs and their changes
- Key signature, accidentals
- Time, changes in time, rhythmic difficulties
- Tempo, determined by musical contents and degree of technical difficulty
- Form (a-b-a)
- Observing of separate phrases:
 - a) Scale formations
 - b) Broken chords
 - c) Repeats of motives
 - d) Sequences
- Fingering
- Leaps
- Dynamics and expression marks¹⁰

⁹Thomas A. Johnson, Read and Play: A Series of Graded Albums, Grade 1 (London: Peters Edition, Ltd., 1964), p. 2.

¹⁰Kurt Michaelis, Introduction to Sight Reading, Vol. 2 (London: Peters Edition, 1978), p. 27.

If the student strictly follows the set sequence, Michaelis believes that the ability to locate danger areas before playing will become automatic. By memorizing all of the items included on the list, the student can develop fast reactions in grasping important features of the piece to be performed and eventually recognize obstacles simultaneously while sight reading. Never, according to Michaelis, should any item on the list be neglected. Sight reading methods which utilize preparatory procedures usually incorporate a check list such as the one mentioned above, to which the student responds. By examining a list of items or answering a set of questions, the student becomes actively involved in a thoughtful examination of the music and learns through his own discoveries. Jerome Bruner maintains that within a learning sequence based on discovery the student becomes more involved and committed to a task, more interested in completing the task and achieving his reward as a direct result of his work. He believes

that it is possible to present the fundamental structure of a discipline in such a way as to preserve some of the exciting sequences that lead a student to discover for himself.¹¹

According to Guy Duckworth, the concept of discovery learning is based on concepts, and teaches universals, patterns, plans, or designs, and with these the character or genre of a thing is classified. From the very beginning the learner is given an opportunity to interpret, collate, verbalize, and make this new classification 'fit' with his individual experience.¹²

¹¹Jerome S. Bruner, Process of Education (Cambridge: Harvard University Press, 1966), p. 20.

¹²Guy Duckworth, "Discovery Learning in Piano Instruction," Music Educators Journal 12 (February 1968): 54.

Because of the lack of interest among students in becoming proficient with the skills of sight reading, teachers are continuously searching for alternative methods to teach sight reading. Many authors believe the discovery learning concept is one way to create incentive in the sight reading learning process.

After music educators create an incentive for students to improve their sight reading skills, there must be an overall understanding of all the specific skills needed. Learning to read music at sight demands total mental concentration combined with complete physical control. Most authors agree that to be able to sight read at a proficient level students must develop a concept of both intellectual and physical responses through hearing, seeing, and kinesthetic sense.

Through this investigation of related literature, many studies were found which investigated methods for developing the skills needed for sight reading. Much research has been done in the area of perception, especially visual perception. On the following pages literature concerning perception skill studies will be presented.

Perception Skill Studies

One concern with visual perception is the focus point. When reading a line of print the eyes focus on words and clauses instead of on each letter. Similarly, in reading music the eyes focus on groups of notes instead of individual notes. The eye's ability to perceive larger groups enables the student to form a recognizable visual pattern or musical passage.

McLain¹³ recognizes a collection of notes as a single symbol and believes that clusters or note-group reading is analogous to the simultaneous perception of several words or even sentences by a rapid reader of books. Only a poor reader would spell out each word letter by letter.

In discussing music reading, Mursell points out that the "musical score is not a wilderness of notes, any more than a page of print is a wilderness of letters."¹⁴ He believes that when reading a page of print, a student must see groups of words as opposed to individual letters for the information to be meaningful. If the letters are observed individually and there is no connection between them, it is meaningless. Mursell relates this process to reading a page of music. If the student looks at the score intelligently, the notes are seen in groups which will result in meaningful musical effects.

Reading notes in groups rather than individually is viewed as the best procedure by other authors surveyed in this study. Jenkins suggests that students "think not of isolated notes as you read but of groups: rhythmic, melodic, harmonic and phrases."¹⁵

William S. Newman discusses Leonhard Deutsch's method for developing sight reading skills. In this approach, the student does not learn inductively, step by step, but reaches at once for a total result by imitating the teacher.¹⁶ Newman believes that this approach is

¹³McLain, p. 34.

¹⁴Mursell, p. 182.

¹⁵Jenkins, p. 44.

¹⁶William S. Newman, Pianist Problems (New York: Harper and Row, 1974), pp. 194-197.

adequate in the beginning stages, but results in only a broad keyboard experience. For perfection in a performance situation, the student is required to engage in the traditional step-by-step learning process. One aspect of Deutsch's approach that is in agreement with Newman as well as other authors surveyed for this study, is the fact that he advocates reading by groups and note values in the same way children are taught to read words.

In the reading of piano music many horizontal, vertical, and diagonal eye movements are required to perceive music written on two staves. The student must train the eyes to move vertically as well as horizontally in order to adequately read chords. One study which dealt with visual perception skill was the investigation by Young.¹⁷ She studied the eye movements and eye-hand temporal relationships of successful and unsuccessful piano sight readers. An eye-movement camera was used to photograph corneal reflex eye movement. She discovered that successful sight readers usually began their fixation of a chord in the treble areas of the chord and concluded in the bass areas resulting in a general vertical pattern from treble to the bass. Successful sight readers usually surveyed all areas of the chord whereas unsuccessful sight readers concentrated on the central area or horizontal eye movement of the chords.

Another problem relating to visual perception cited by researchers

¹⁷Leonora Jeanne Young, "A Study of the Eye-Movements and Eye-Hand Temporal Relationships of Successful and Unsuccessful Piano Sight-Readers While Piano Sight-Reading" (Ph.D. dissertation, Indiana University, 1971).

concerns the necessity of keeping the eyes on the music. Victor Seroff¹⁸ makes reference in his book to this needed skill. He contends that sight reading should not be handicapped by the search for keys. Therefore the ability to play without looking at the keys is essential. Most authors agree that permitting the eyes to drop their gaze results in discontinuity and loss of place. Having the ability to "feel" the keyboard enables the hands to find their way over the keys without having to look. Without this ability the pianist will have to glance back and forth from the printed page to his hands, invariably losing his place in the score as well as on the keyboard. There will be times in sight reading when the eyes glance down at the keyboard to aid in such procedures as changes in keyboard locality, but these sequences should be planned in advance to aid in the performance.

Research in sight reading has resulted in the investigation and testing of techniques or devices designed to help one overcome the difficulty of keeping one's eyes on the music. Some authors believe that when students sight read they should always look at the music and not at their hands. Often recommended are such devices as a sheet of cardboard, towel or piece of cloth to cover the keys to avoid the eyes dropping their gaze from the music. Another tactic cited in methods reviewed for this study is to have classmates or the teacher tally the number of times the gaze shifts downward. Rita Fuszek¹⁹ believes that by allowing

¹⁸Victor Seroff, Common Sense in Piano Study (New York: Funk and Wagnalls, 1970), p. 50.

¹⁹Rita Fuszek, "Sight Reading at the College Level - Part III," Keyboard Arts (Autumn 1977): 10.

students to take turns counting the eye movements of their peers, it becomes a challenge to reduce the times they look at their hands. This procedure will force the student to become aware of the frequency of eye movement and will cause the pianist to use his will power to maintain the eye focus on the page.

Eaton's²⁰ study proves the necessity of avoiding looking at the keyboard. He analyzed the previous training of his subjects and tested their note-reading and memorization skills in relation to keyboard sight reading facility. The psychomotor skill section of his testing instrument presented the same types of materials as the note reading skill section. However, they were performed with the subject's vision of the keyboard obstructed. The notes, intervals, and chords to be played were presented both by visual command (printed notes) and oral command. Scoring was based on the speed of response with a penalty for errors. One conclusion of the study was that the relationship of key-board psychomotor skill was determined to possess the strongest relationship with sight reading facility.

Visual perception is assumed to be essential for reading. Most of the research that has been done on sight reading shows that researchers agree that eye movements must be studied as one function of visual perception. The lapse of time that occurs between the instant the eyes perceive an image and the moment the pianist reacts to it can be minimized by the employment of special devices.

²⁰Jack Lyman Eaton, "Correlation Study of Keyboard Sight-Reading Facility With Previous Training, Note-Reading, Psychomotor, and Memorization Skills" (Mus.Ed.D. dissertation, Indiana University, 1978).

One mechanical tactic employed by experimenters since the mid-nineteenth century is the tachistoscope. When this procedure is used, a machine projects visual images on a screen either by film strips or slides. The images are flashed at differing durations ranging from several seconds to less than one second. The teacher may adjust the complexity of the image to the skill level of the student. When the time involved for the student to retain an accurate fixation and make the appropriate response is reduced, then the device and training procedure has caused an increase in visual capacity and accuracy.

One study involving tachistoscopic training was completed by Fjerstad.²¹ He investigated whether tachistoscopic or metronomic (forced response) training is more effective in the teaching of piano sight reading. In the tachistoscopic training procedure, the duration of the projected image functioned as the experimental variable while in the forced response training procedure the metronomically controlled tempo functioned as the experimental variable. He concluded that both approaches were equally effective, but both groups were found superior to a non-participating group.

Another related device incorporated in reading training is a specially designed projector. The projector moves a slot across the screen covering and uncovering material as it goes, forcing the student to achieve quicker word recognition and improve in his ability to think and associate more rapidly. Since this technique forces the student to

²¹Clinton Dale Fjerstad, "A Comparison of Tachistoscopic and Metronomic Training for Developing Sight Reading of Harmonic Notation Within Class Piano Instruction" (M.Ed.D. dissertation, Indiana University, 1968).

keep his eyes moving in a forward direction (thus developing a better directional attack), the result is a more thorough and systematic approach.

Modifications of the controlled reader device have been incorporated into studies in music reading. O.C. Houston²² developed an investigation in which a reading accelerator was used to test for any significant improvement in the sight reading abilities of twenty-one organ students. Although he found no significant difference between the mean sight reading scores of an experimental group employing the reading accelerator device and a group which was taught by the conventional approach, the result may have been affected by the brief training periods. Each student received only ten minutes each week for one semester. The short training interval within each session may have accounted for the lack of significant results.

Another area of literature pertaining to the teaching of sight reading skills was research and writings relating to physical responses. The following section discusses various physical response skill studies.

Physical Response Skill Studies

Because hand and finger movement is directly related to eye movement, some studies were examined which involved physical response skills. One such study was the investigation undertaken by Jerry Lowder.²³ which involved relating perception to physical response

²²Oliver Clifton Houston, Jr., "An Experimental Study of the Use of the Reading Accelerator in the Teaching of Keyboard Sight Reading" (Ed.D. dissertation, University of Colorado, 1963).

²³Jerry Elwood Lowder, "An Experimental Study of Teaching Reading Concepts and Fingering Patterns to Freshman College Piano Classes" (M.Ed.D. dissertation, Indiana University, 1971).

(fingering patterns). The students in the experimental group were taught to think of steps on the staff as representing adjacent fingers and of skips as disjunct fingers. The control group was taught by a conventional approach. He concluded that both approaches were equally effective.

A number of researchers have investigated another physical response skill — the relationship of eye movement organization to playing accuracy. They measured the time interval between presentation of the stimulus and the subject's response to it. Some authors contend that the response time involved in sight reading can be controlled with certain mechanical devices. One aspect of Fjerstad's²⁴ study involved the utilization of a metronome to force the student to respond rather than allowing a free, uncontrolled, reflex type of response. The scores of those in the forced-response group were found to be superior to the scores of those in non-participating groups. Therefore it was decided that certain mechanical devices can aid in the development of physical response skills.

After examining materials relative to the area of physical response skills in sight reading, one of the main difficulties found dealt with rhythm. Teachers have to be concerned with the procedures students use in reading rhythms as well as reading notes. One concept is that sight reading is a rhythmic process in which the eye moves forward toward rhythmic points such as the strong beats of a measure or the high point of a phrase.²⁵ As with the reading of notes, the eyes

²⁴Fjerstad, p. 80.

²⁵Bishop, p. 48.

must be trained to move forward and notice details in advance of playing. Students must read rhythms in groups or patterns instead of individual beats just like reading clusters or groups of notes or sentences instead of individual words.

The purpose of a study by Charles Elliott²⁶ was to investigate the relationships between instrumental sight reading ability and seven selected variables, one of which was rhythm reading ability. Students involved with the experiment were given the Rhythm Reading Test, a procedure for measuring instrumental rhythm-reading ability, and the Watkins-Farnum Performance Scale which consists of fourteen graded sight reading exercises. A multiple correlation was completed and the strongest single relationship exists between the Watkins-Farnum scores and those scores obtained by the Rhythm Reading Test. According to Elliott, the findings of this study "support the contention already held by many instrumental music educators that the regular practice of reading rhythm patterns is likely to be beneficial for improving sight reading ability."²⁷

Another author who believes rhythm is the basis of good sight reading is Abby Whiteside. In her book she says, "rhythm produces the measured slowness which makes fast playing beautiful -- something more

²⁶Charles A. Elliott, "The Relationships Among Instrumental Sight-Reading Ability and Seven Selected Predictor Variables," Journal of Research in Music Education 30 (1982): 5-14.

²⁷Ibid., p. 14.

than just being fast."²⁸ Therefore, good rhythm is necessary for projecting musical ideas.

Many techniques have been tried by authors to develop a strong organizational concept of rhythm patterns. Because of the complexity of rhythm notation, many students have difficulty in this area. Learning to read quickly and physically respond to basic rhythm patterns is essential in the sight reading process. A number of methods surveyed include some type of flash drill in which rhythm patterns are displayed on cards, slides, or in group situations on an overhead transparency. One method utilizing this approach is the series by Lorina Havill.²⁹

One of the main concerns with the problem of rhythm in sight reading is maintaining a steady tempo. Some musicians contend that a steady tempo must prevail even at the expense of pitch accuracy. Jerry Lowder³⁰ cites absolute rhythmic evenness as a major objective in sight reading practice. He believes this is true even at the expense of pitch accuracy. Another writer, Joseph Rezits agrees with this concept and employs it in his teachings. In discussing the group sight reading approach, he comments that "one is forgiven for a certain quantity of wrong notes if the rhythm is reasonably accurate, but if overconcern

²⁸ Abby Whiteside, Indispensables of Piano Playing (New York: Charles Scribner's Sons, 1961), p. 8.

²⁹ Lorina Havill, You Can Sight Read: The Pleasures of Piano Sight Reading Through Keyboard Harmony and Technique (Bryn Mawr, Pennsylvania: Theodore Presser Company, 1967).

³⁰ Jerry Lowder, "Evaluation of a Sight-Reading Test Administered to Freshman Piano Classes," Journal of Research in Music Education 21 (Spring 1973): 68-73.

with the correct notes means that the player hesitates before playing, let us accept wrong notes before wrong rhythm."³¹

In Fjerstad's³² study the metronomically controlled tempo proved to be successful. In his book on piano playing, William Newman³³ discusses the improvement of visual reaction speed by the use of a metronome. He contends that, although the use of the metronome proves satisfactory, a more musical method of achieving a steady tempo while sight reading is produced through ensemble playing.

Many teachers, in their quest for a continuous steady tempo while sight reading, have advocated ensemble playing. Joseph Rezits³⁴ maintains the ideal method of teaching sight reading skills is through group instruction, ideally ten in one group. He does point out that group sight reading need not be limited to large classes, but can be advantageous to the private piano teacher with only one piano available. According to Rezits, ensemble sight reading, whether the instruction be with a large class or limited in number, can maintain a rhythmic momentum in a way that an individual player would find impossible to match.

Most authors agree that ensemble experiences are beneficial to the teaching of sight reading skills. The most obvious advantage is that it forces the student to maintain a steady forward rhythmic flow. In

³¹Joseph Rezits, "Everyone Should Try Ensemble Sight Reading," Clavier 11 (September 1972): 34.

³²Fjerstad, p. 80.

³³Newman, pp. 23-24.

³⁴Rezits, p. 33.

an ensemble situation, the common problem of stopping to correct mistakes while sight reading can be eliminated.

Yvonne Enoch³⁵ agrees that ensemble playing is a valuable teaching tool and emphasizes the advantage of learning to listen to one another. She believes ensemble playing encourages students to play as a team, to give and take with the other. The type of musical experience ensemble playing creates can be accomplished in a variety of ways, one of which is accompanying.

Accompanying Skills

In a study by Gillian Buchanan³⁶ a survey of basic skills of piano performance in the preparation of music educators was conducted. According to the survey, the highest ranking keyboard skills needed in all areas of music are accompanying, score playing, sight reading, improvising, playing by ear, and harmonizing. Both choral and instrumental directors indicated that accompanying was the one skill in which they most wished they were more proficient. According to the results that study produced, the combination of teaching sight reading and accompanying could prove very valuable to the music educator.

In an article designed to prepare students for college admission, Patricia Taylor Lee³⁷ advises that a solid keyboard background is

³⁵Yvonne Enoch, Group Piano Teaching (Oxford: Oxford University Press, 1978), p. 37.

³⁶Gillian Buchanan, "Skills of Piano Performance in the Preparation of Music Educators," Journal of Research in Music Education 12 (Summer 1964): 136.

³⁷Patricia Taylor Lee, "Preparing Your Students for College Admission," Clavier 22 (December 1983): 45-47.

important if pursuing a degree in music education. Because there is always a need for highly skilled accompanists, all music education students should be trained in this area. Therefore, the piano is a vital tool for both learning and teaching.

Accompanying is a necessary part of every musician's training. Many believe that while learning to become a good accompanist, the student will become a more conscientious pianist. According to Madelyn Parsons, "teachers may fail to realize that the extra practice which is necessary to gain accompanying proficiency will also contribute toward other pianistic accomplishments."³⁸ By being exposed to all types of music and adjusting to various styles, the pianist becomes a more comprehensive musician.

In her discussion of the major skills needed by every accompanist, Judith Solomon³⁹ cites technical skills as a necessity. The accompanist must be able to produce a wide range of tone qualities and articulations and translate feelings and expression into sound. She also emphasizes the need for knowledge of rhythm and tempo; the pianist should have an impeccable sense of rhythm and the ability to adjust the tempo during a performance. Also according to Solomon, accompanists must have a thorough knowledge of music theory, form and analysis, ear-training, and interpretation. The conclusion of her study is that the

³⁸Madelyn Parsons, "The Art of Accompaniment," Music Journal 30 (February 1972): 20.

³⁹Judith Solomon, "The Pianist as Vocal Accompanist Servant or Partner?" The American Music Teacher 31 (September-October 1981): 10.

piano technique skills must be backed up by thorough musicianship.

Deon Nielsen Price devoted an entire article to the special skills needed to be an efficient accompanist. She discusses several skills, one of which is rhythmic accuracy. According to Price, "the accompanist must have both an instant recognition of rhythmic notation, and a feeling for the rhythmic pulses and flow of the music."⁴⁰ Price also recognizes sight reading as one of the basic pianistic skills that must be developed by an accompanist. Her advice for securing these sight reading skills included the following guidelines: 1) engage in a preparatory procedure in order to locate any difficult areas, 2) examine the score for recurring patterns and dynamics and articulations, and 3) play at a slow tempo and omit the less important notes.

Another skill Price discusses is listening. She contends that every accompanist must be able to hear the balance of the ensemble situation. The pianist must have as his primary aim the production of a beautiful tone that blends with the soloist.

The advantages gained by an ensemble approach to performing are invaluable to the young pianist. The student must have an understanding of the partnership situation employed when accompanying a soloist. In an article by Sektberg,⁴¹ he contends that the accompanist is a true collaborator with the soloist and discusses the partnership situation.

⁴⁰Deon Nielsen Price, "The Special Skills of an Accompanist," Clavier 17 (October 1978): 37.

⁴¹Willard Sektberg, "Make it Sound Beautiful," Music Journal 29 (April 1971): 38.

The pianist must establish the mood and tempo by playing the introduction. Then the artist sings the melody and the accompanist subsides, becoming only background. The pianist may create new listener interest in the interludes and the music of the accompaniment near the end often sums up the entire work. This is the ideal ensemble situation that soloist and accompanist strive to attain.

Most authors agree that accompanying requires some of the same basic skills as those needed for sight reading. The most common concept found is that students should progress steadily in their training sequences. In sight reading teachers advise students to omit certain notes or simplify the material in some way to maintain a steady tempo. These techniques can prove helpful in accompanying if not abused to the point of losing or adding essential notes. C.P.E. Bach advises on the refinements of accompanying:

The accompanist should not avail himself until his insight has progressed to the point where he knows precisely when and where refinements may be introduced. He should not ascend higher than his wings will carry him.⁴²

Some authors believe that the abilities required of an accompanist are the same as the solo pianist, plus some additional techniques. Command or control of the keyboard is essential because accompaniments are not always different from solo piano music. Musicianship is important to the accompanist because the effect of the ensemble situation most often is the responsibility of the accompanist.

⁴²C.P.E. Bach, Essay on the True Art of Playing Keyboard Instruments (New York: W.W. Norton and Company, 1949), p. 386.

In conclusion, the review of related literature for this study concerning sight reading has shown many projects involved with perception and the physical response skills. Further, various methods and techniques for teaching sight reading were examined as well as studies concerned with the skills and abilities needed to be an accompanist or to teach piano students how to become efficient at accompanying. A review of the literature which relates to both sight reading and accompanying shows that teaching methods which involve the student in an actual musical experience result in an improved learning experience.

CHAPTER III

DESIGN OF THE STUDY

Introduction

This chapter discusses various logistical and procedural aspects of the study. The following details are examined: (1) the setting of the experiment, (2) the size and formation of the sample groups, (3) the establishment of group equivalence, (4) the design of the experiment, (5) the selection, development, administration and scoring of the pre-test and posttest, and (6) the analysis of the data.

Setting of the Experiment

The study was conducted at the University of Oklahoma during the fall semester of 1983. The class piano program at this institution consists of a four-semester course of study for non-keyboard music majors. The classes meet three hours per week during the first two semesters of study and two hours per week during the final two semesters of study. The teaching staff of the class piano program is coordinated so that basically the same content and materials are used for all classes of each level. The broad objectives of the program are to develop competency in the following skills: (1) keyboard theory and technique, (2) sight reading, (3) harmonization, (4) improvisation, (5) playing by ear,

(6) transposition, (7) accompanying, (8) score reading, and (9) performance of solo and ensemble repertoire. Upon completion of the basic four-semester course of study, supplementary private instruction is provided for those who need or desire further pianistic skills.

Sample Groups

The study employed two third-semester piano classes. The two classes were formed during pre-enrollment for the fall semester by the process of random selection. Twenty-four music majors were selected for the experiment. These twenty-four students were divided into two classes through the utilization of a random table of numbers.¹ All twenty-four were pretested, but two students dropped the class within the semester leaving a total of twenty-two students involved with the experiment. Twelve students were in the control group and ten students were in the experimental group.

Third-semester piano students, rather than those with less experience, were employed because of the prerequisite knowledge and skills required for the purposes of the experiment. The students, for example, needed to be familiar with the following in order to effectively participate in the study: note names, intervals, music reading, fingering, major, minor, and modal pentachord scales, major, minor, and modal tetrachord scales, chord types, diatonic chords of the key, staccato and legato styles, pedaling, dynamic indications, tempo indications, phrases, and texture. More advanced students were not employed because

¹Deobold B. Van Dalen and William J. Meyer, Understanding Educational Research (New York: McGraw-Hill Book Company, 1966), p. 299.

of the problem of overcoming long-established habits.

Group Equivalence

Because the class piano program is coordinated so that the same basic content and materials are used for both the first- and second-year class piano students, all students engaged in this study were thought to be essentially equal in their sight reading and accompanying skills. However, to further reduce the likelihood that students in one group might be significantly different in ability from students in the other group, students were assigned to each group by random assignment. According to Campbell and Stanley, random assignment of subjects to groups is a necessary condition for a "true experiment" since "the most adequate all-purpose assurance of lack of initial biases between groups is randomization."²

Experimental Design

The purpose of this study was to investigate the effect that accompanying a tape-recorded soloist has on the ability of collegiate music students to sight read accompaniments at the piano. In order to accomplish this, a tape-recorded accompanying situation was compared to sight reading an accompaniment without the soloist. The independent variable, thus, was the taped soloist. The dependent variable was piano sight reading skill.

The experiment was conducted during ten weeks of the fall semester. During that period, the control group was directed to employ only

² Donald T. Campbell and Julian C. Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally College Publishing Co. 1963), p. 25.

the prescribed preparatory procedure, while the experimental group was instructed to use the same preparatory procedure, in conjunction with tape-recorded solos. The taped soloist was recorded at two different tempos (slower than indicated and as indicated) to aid with the instruction. The preparatory procedure is described on page four of Chapter One and presented in Appendix A. All conditions, except for the independent variable, remained constant for each class. The researcher taught both classes in an electronic piano lab and the same lesson plans and materials were used for both classes.

A different accompaniment was taught to both classes each week of the ten-week experiment. In consultation with members of the music faculty at the University of Oklahoma, these examples were selected from the accompaniments listed in standard group piano texts and collections, and the widely used Music Educators National Conference list of vocal and instrumental repertoire for high school students. These examples represent varied textures and styles. All ten examples used are included in Appendix B.

Fifteen minutes of each class period were devoted to sight reading accompaniments; classes met twice a week. This was considered ample time to teach the two sight reading procedures and develop skill in their use.

In order to increase the precision of measurement of experimental effects and to control for various types of experimental errors that might occur, a before-after (i.e., pretest-posttest) experimental design was employed in this study. This design can be represented symbolically as follows:

Experimental	(R)	T_1	X	T_2
Control	(R)	T_1		T_2

In this diagram, letters assume the following meaning:

- R = random assignment of subjects to each group;
- T_1 = pretest, i.e., measurement of dependent variables (pitch, rhythm, and expression accuracy) prior to the introduction of the independent variable (a tape-recorded accompanying situation);
- X = treatment, i.e., the introduction of the independent variable;
- T_2 = posttest, i.e., measurement of dependent variables after the introduction of the independent variable.

The pretest data was used for two purposes in this study. First, in the univariate analyses, they were used to determine whether the control and experimental groups were initially equal in mean achievement levels. Second, in the analyses of covariance, they were used to increase the precision of the estimate of the effects of the experimental treatment variable. A statistical estimate of any effect is subject to errors in estimation. The smaller these errors the more precise is the estimate (on average). The precision of an estimate can be increased by (1) increasing the sample size, and (2) reducing error variance in the dependent variable(s).

Analysis of covariance is used to increase the precision of estimation by partitioning out the variability in the dependent variable(s) accounted for by the covariate. Thus the researcher can more accurately assess the influence of the independent (experimental) variable.

The gain in precision from covariate adjustment depends on the degree of correlation between the covariate and the dependent variable(s). The higher this correlation, the larger the variation attributable to

the covariate, and the more effective the analysis of covariance will be in reducing the error variance and thus increasing the precision of the estimation of the effects of the experimental variable.

Since both groups were exposed to the same pretest, any changes in the groups caused by this premeasurement should have influenced both groups equally. Thus the design employed in this study controlled for direct premeasurement effects. History (the impact of extraneous, i.e., non-controlled variables on the dependent variable) and maturation (biological or psychological processes that systematically vary with the passage of time, independent of specific external events and that affect the measurement of the dependent variable) should also have affected both treatment and control groups equally. Thus the study design controlled for these potential sources of measurement error. Since there was no reason to expect that the pretest would in any way sensitize or increase the responsiveness of the students to the independent variable, interaction error was of no concern in this study.

Since control for possible selection error was important and interaction error was extremely unlikely, the before-after with control group design proposed for this study was the optimal design in terms of both cost and error control.³

Development of the Pretest and Posttest

In order to objectively measure the two sight reading procedures, it was necessary to develop a test which could measure a class piano

³ Donald S. Tull and Del L. Hawkins, Marketing Research (New York: Macmillan, 1976), pp. 435-440.

student's ability to sight read accompaniments before and after the ten-week experiment. As far as this researcher could determine, no standardized test was currently available that measured this particular skill. Therefore it was necessary to develop a test specifically for this study that could be scored objectively and serve as a reliable measuring instrument. This requirement was fulfilled by devising an objective error detection type scoring procedure. This procedure is presented in detail in Appendix C (scoring directions).

Another condition that had to be met was that the difficulty level of the two tests had to be based on what the students would be able to sight read at the beginning and the end of their third semester of class piano. To meet this requirement, expertise in this area was sought. This researcher, in consultation with Dr. E.L. Lancaster, Coordinator of Group Piano, and Dr. Jane Magrath, Professor of Piano, at the University of Oklahoma, selected the following accompaniments to be used as the pretest and posttest: Ah! Vous dirai-je, maman by W. A. Mozart and Scotch Dance by L. van Beethoven, both examples arranged for flute and piano. These examples are presented in Appendix C.

Administration of the Pretest and Posttest

The researcher administered the pretest at the beginning and the posttest at the end of the ten-week experiment. Tests were given individually, and each student's performance was electronically recorded. Each student was instructed to read the same preparatory procedure used throughout the experiment and carefully answer all questions for this particular example. Each student was given ten minutes to complete this task. The following instructions were read to each student before he or

she was directed to play:

In this test you are to play this accompaniment exactly as written. Be sure you play correct notes and correct rhythm and observe all markings and signs. If you make mistakes keep on playing. Since this is an accompaniment you cannot back up or correct any mistakes. Before you begin to play, the examiner will set the tempo at which the example should be played.

Scoring of the Pretest and Posttest

The same quantitative scoring procedure was employed in the grading of both tests to evaluate the sight reading performance of the students. Adjudicators evaluated each student based on the number and type of errors that each student made on the test; the highest score represents no errors. The student's objective was to achieve the highest possible score. The following types of errors were evaluated: (1) pitch errors, (2) rhythm errors, and (3) expression errors. Instructions for marking errors and a detailed description of what constitutes an error, the two accompaniments to be used for the pretest and the posttest, and the scoring sheet for the adjudicators are all given in Appendix C. Because piano skills vary from student to student, not every student was expected to play the piece at the exact tempo established by the examiner. Therefore, a tempo scale was recorded on both the pretest and posttest scoring sheets. The adjudicators were to mark the scale from one to five to indicate the extent of deviation from the indicated tempo. A test was performed to determine whether the mean ability of students in the two groups to play at the indicated tempo was equal.

The pretest and posttest were scored by three members of the piano faculty from the University of Oklahoma who provided pitch,

rhythm, and expression scores for each student. They were not advised as to whether they were grading an experimental or control group student. The recorded performances were played a minimum of three times for the adjudicators to score the three areas. However, adjudicators were permitted to play the tape as many times as necessary to produce an accurate evaluation. No information concerning the identity of the performing student was provided; performances were arranged by number on the tape.

At the conclusion of the pretest and posttest, an assessment of inter-rater reliability was made (using the Kendall and Pearson correlation coefficients) to determine the extent of agreement in the ratings (scores) provided by the three adjudicators on each of the three areas tested.⁴ The final selection of adjudicators was based on the criterion of obtaining three expert adjudicators who would be expected to exhibit inter-rater reliability.

Analysis of the Data

For each achievement measure (i.e., pitch, rhythm, and expression accuracy), the pretest and posttest scores were transformed to percentage scores by dividing each student's score by the maximum possible score for that test.

Several statistical tests exist to answer questions similar to those posed in this study. Depending on the assumptions which the reader wishes to accept, the following tests are appropriate to test

⁴Wayne W. Daniel, Applied Nonparametric Statistics (Boston: Houghton Mifflin, 1978), p. 326-331.

hypotheses concerning univariate differences in averages: the Student's t test and the Mann-Whitney U test. The Student's t test (a parametric test for which the arithmetic mean is the appropriate statistic) requires that the assumption of normality of the sampling distribution be satisfied. The Mann-Whitney U test (a nonparametric test for which the median is the appropriate statistic) does not require the assumption of normality.

For completeness in this study, both tests were performed. A brief description of the assumptions underlying each test and the analyses which were performed is given below. Appendix D contains a more complete technical description and comparison of the two tests.

Student's t test, if the assumptions necessary for its applicability were satisfied, tests the hypotheses that the mean posttest scores are equal across the two populations, i.e., that the mean for the control group is equal to the mean for the experimental group. The use of the Student's t test is predicated on the following assumptions:

- 1) The data consist of random independent samples of observations from two separate populations.
- 2) The variable observed is a continuous random variable.
- 3) The measurement scale employed is an interval scale.
- 4) The two populations are distributed normally.
- 5) The variances of the two populations are equal.

The Mann-Whitney U test (sometimes referred to as the Mann-Whitney-Wilcoxon test) tests the hypotheses that the median⁵ posttest

⁵The median is defined as the middle measure when measurements have been rank ordered by magnitude. It is a measure of central tendency and is the nonparametric analog of the mean. If a population distribution is roughly symmetrical, the median is approximately equal to the mean.

scores are equal across the two populations, i.e., that the median for the control group is equal to the median for the experimental group.

The use of the Mann-Whitney U test is predicated on the following assumptions:

- 1) The data consist of random independent samples of observations from two separate populations.
- 2) The variable observed is a continuous random variable.
- 3) The measurement scale employed is at least ordinal.
- 4) The distribution functions of the two populations differ only with respect to location, if they differ at all.⁶

This test is the nonparametric analog of the Student's t test. It was more appropriate than the Student's t test in this instance if one believes that the sample sizes in this experiment were not of sufficient magnitude to support the Student's t test assumption of approximate normality.

The finding that the groups are initially not significantly different with respect to achievement in pitch, rhythm, and expression accuracy would justify the comparison of unadjusted posttest scores. However, for completeness, tests of differences between posttest scores, each adjusted for its corresponding pretest score, were also performed. This was accomplished by using an Analysis of Covariance which statistically adjusts each of the posttest scores for any variation that may have resulted from initial achievement level differences before testing for posttest differences.

The experimental hypothesis of this study was that the use of an

⁶Daniel, p. 82.

actual recorded accompanying situation could make the teaching of sight reading accompaniments to music majors more effective than the traditional procedure involving playing the accompaniments without the soloist. If the experimental hypothesis was true, then the students in the experimental group should have shown more improvement in pitch, rhythm, and expression accuracy than students in the control group. That is, one expected that the average scores would be greater for the experimental group than for the control group. For this reason one-tailed tests of the hypotheses were appropriate.

Summary

The study sought to determine the effect that accompanying a tape-recorded soloist has on the ability of collegiate music students to sight read accompaniments. The following procedures were included in the experiment: (1) the random assignment of students and treatments to the two groups, (2) the employment of a randomized pretest-posttest control-group design, (3) the development and implementation of an objective piano sight reading rating scale, (4) a test of concordance among the judges, and (5) the analysis of posttest score differences using Student's t test, the Mann-Whitney U test, and Analysis of Covariance.

CHAPTER IV

RESULTS, ANALYSIS, AND INTERPRETATION

This study examined the effectiveness of the use of a recorded soloist in teaching the sight reading of accompaniments to music majors, compared with the traditional procedure of playing the accompaniments without the soloist. The findings and a discussion of findings are presented in this chapter.

Results

The three measured achievements tested in the experiment were pitch accuracy, rhythm accuracy, and expression accuracy. A pretest-posttest experimental design was employed and the analysis of the data involved techniques of summarization and comparison. The findings and interpretations are based on parametric tests, which require the assumption of normality of the sampling distribution be satisfied, and on nonparametric tests, which do not require the assumption of normality. For completeness in this study, all three null hypotheses were tested with both parametric and nonparametric tests. When both tests agree with regard to accepting or rejecting the null hypotheses, added weight can be given to the validity of the findings.

The major steps of the analysis were (1) examination of the extent of agreement among judges; (2) examination of initial differences

between control and experimental groups; (3) univariate tests of differences between control and experimental groups on posttest; and (4) tests of differences between control and experimental groups on posttest scores adjusted for initial achievement. To enhance the visual comparison of the pretest and posttest scores, the raw scores were transformed to percentages by dividing each score by the maximum number possible for each measure. The percentage scores were then used in all statistical tests. This transformation in no way affects the statistical test results.

Both the pretest and posttest involved a preparatory procedure in which each student answered a list of questions relating to the musical example to be played. Each student was given ten minutes to complete this task. Instructions were then read to each student before he or she was directed to play. At the conclusion of the instructions the examiner set the tempo at which the example should be played. Because keyboard skills vary among second year music education majors, not every student has the ability to play the exact tempo indicated. Therefore, a tempo scale was recorded on both the pretest and posttest scoring sheets. The three adjudicators circled number three on the scale when the student played the example at the indicated tempo. If the student played the example too slow, the adjudicators circled number one or number two on the scale to indicate the extent of deviation from the indicated tempo. If the student played the example too fast, the adjudicators circled number four or number five on the scale to indicate the extent of deviation from the indicated tempo. These scores, transformed to percentage scores, are presented in Table 1. There was no significant

difference between the mean scores of the control and experimental groups. Therefore, the extent of deviation from the indicated tempo was judged to not be a factor in analyzing the scores of pitch accuracy, rhythm accuracy and expression accuracy.

TABLE 1
AVERAGE TEMPO SCORES
FOR BOTH GROUPS

	Control Group	Experimental Group
	Mean	Mean
<u>Pretest</u>		
Tempo	.422	.487
<u>Posttest</u>		
Tempo	.533	.560

Extent of Agreement Among Judges

Scores given by the three judges were first examined to determine the extent of agreement among the judges. Since the scores were within sufficient agreement, then the use of an average score (over the three judges) was justified as a reliable and valid measure of the student's achievement with respect to pitch, rhythm, and expression accuracy.

Tables 2 through 7 contain the correlations between the judges' scores. The Pearson's Correlation Coefficient was used as the parametric measure of agreement, and the Kendall's Tau Correlation Coefficient was used as the nonparametric measure of agreement. It should be noted that restriction in the ranges of variables will generally tend to attenuate (i.e., cause to be lower) correlation coefficients.

Regarding inter-judge agreement for the pretest and the posttest,

TABLE 2
CONCORDANCE OF JUDGES FOR PRETEST
PITCH ACCURACY SCORES

	Judge No. 1 Pitch Scores	Judge No. 2 Pitch Scores	Judge No. 3 Pitch Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Pitch Scores	1.00000	0.86777	0.84058
Judge No. 2 Pitch Scores	0.86777	1.00000	0.99093
Judge No. 3 Pitch Scores	0.84058	0.99093	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Pitch Scores	1.00000	0.81069	0.75390
Judge No. 2 Pitch Scores	0.81069	1.00000	0.87611
Judge No. 3 Pitch Scores	0.75390	0.87611	1.00000

TABLE 3
CONCORDANCE OF JUDGES FOR PRETEST
RHYTHM ACCURACY SCORES

	Judge No. 1 Rhythm Scores	Judge No. 2 Rhythm Scores	Judge No. 3 Rhythm Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Rhythm Scores	1.00000	0.87360	0.89665
Judge No. 2 Rhythm Scores	0.87360	1.00000	0.92937
Judge No. 3 Rhythm Scores	0.89665	0.92937	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Rhythm Scores	1.00000	0.72324	0.83039
Judge No. 2 Rhythm Scores	0.72324	1.00000	0.81532
Judge No. 3 Rhythm Scores	0.83039	0.81532	1.00000

TABLE 4
CONCORDANCE OF JUDGES FOR PRETEST
EXPRESSION ACCURACY SCORES

	Judge No. 1 Expression Scores	Judge No. 2 Expression Scores	Judge No. 3 Expression Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Expression Scores	1.00000	0.32551	0.00957
Judge No. 2 Expression Scores	0.32551	1.00000	0.08930
Judge No. 3 Expression Scores	0.00957	0.08930	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Expression Scores	1.00000	0.22788	0.30812
Judge No. 2 Expression Scores	0.22788	1.00000	0.14234
Judge No. 3 Expression Scores	0.30812	0.14234	1.00000

TABLE 5
CONCORDANCE OF JUDGES FOR POSTTEST
PITCH ACCURACY SCORES

	Judge No. 1 Pitch Scores	Judge No. 2 Pitch Scores	Judge No. 3 Pitch Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Pitch Scores	1.00000	0.80726	0.74269
Judge No. 2 Pitch Scores	0.80726	1.00000	0.97748
Judge No. 3 Pitch Scores	0.74269	0.97748	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Pitch Scores	1.00000	0.81917	0.80350
Judge No. 2 Pitch Scores	0.81917	1.00000	0.88403
Judge No. 3 Pitch Scores	0.80350	0.88403	1.00000

TABLE 6
CONCORDANCE OF JUDGES FOR POSTTEST
RHYTHM ACCURACY SCORES

	Judge No. 1 Rhythm Scores	Judge No. 2 Rhythm Scores	Judge No. 3 Rhythm Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Rhythm Scores	1.00000	0.77272	0.76242
Judge No. 2 Rhythm Scores	0.77272	1.00000	0.93586
Judge No. 3 Rhythm Scores	0.76242	0.93586	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Rhythm Scores	1.00000	0.63842	0.61197
Judge No. 2 Rhythm Scores	0.63842	1.00000	0.85908
Judge No. 3 Rhythm Scores	0.61197	0.85908	1.00000

TABLE 7
CONCORDANCE OF JUDGES FOR POSTTEST
EXPRESSION ACCURACY SCORES

	Judge No. 1 Expression Scores	Judge No. 2 Expression Scores	Judge No. 3 Expression Scores
PEARSON CORRELATION COEFFICIENTS			
Judge No. 1 Expression Scores	1.00000	0.74837	0.64123
Judge No. 2 Expression Scores	0.74837	1.00000	0.59532
Judge No. 3 Expression Scores	0.64123	0.59532	1.00000
KENDALL TAU B CORRELATION COEFFICIENTS			
Judge No. 1 Expression Scores	1.00000	0.63375	0.50114
Judge No. 2 Expression Scores	0.63375	1.00000	0.50906
Judge No. 3 Expression Scores	0.50114	0.50906	1.00000

both the pitch accuracy scores and the rhythm accuracy scores were judged to be in reasonable agreement considering the attenuation due to restricted range. Coefficients of correlation ranged from .61 to .99 with most coefficients lying between .80 and .89 (Tables 2-7). In the case of the expression accuracy scores of the pretest, the scores of judge number 2 was of sufficient disagreement that additional analyses were performed when these scores were involved to ensure that the difference would not substantially affect the findings.

The only disagreement among judges involved expression accuracy scores. This suggests that of the three variables tested, the most difficult to objectively and reliably score is expression.

Pretest Comparisons

Immediately following the formation of the control and experimental groups, a pretest was administered to determine whether statistically significant differences in pitch, rhythm, and expression existed between the control and experimental groups. Appendix E presents the pretest raw pitch, rhythm, and expression accuracy scores for both the control and the experimental groups. In the case of the expression accuracy scores of the pretest, one of the judge's scores was of sufficient disagreement that additional analyses were performed when these scores were involved to ensure that the difference would not substantially affect the findings. These raw scores, after being transformed to percentage scores, were analyzed by the Student's *t* test and the Mann-Whitney *U* test.

If the control and experimental groups are not initially

equivalent in achievement, the comparison of posttest scores could be misleading as an indication of changes in achievement over the experiment. Table 8 presents the results of the Student's *t* tests for the hypotheses of no initial differences between control and experimental groups. Table 9 presents the results of the Mann-Whitney U test for determining the significance of the differences between sample means.

TABLE 8
SUMMARY OF PRETEST DATA FOR BOTH GROUPS
PARAMETRIC TEST
STUDENT'S *t* TEST

	Control Group		Experimental Group		<i>t</i>	DF	p-value
	Mean	Std. Dev.	Mean	Std. Dev.			
Pitch	.814	.211	.860	.206	-.5082	20	.6169
Rhythm	.715	.230	.767	.123	-.6395	20	.5297
Expression	.406	.169	.446	.166	-.5527	20	.5866

TABLE 9
SUMMARY OF PRETEST DATA FOR BOTH GROUPS
NONPARAMETRIC TEST
MANN-WHITNEY U TEST

	Control Group		Experimental Group		<i>z</i>	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Pitch	.814	.211	.860	.206	.6264	.5378
Rhythm	.715	.230	.767	.123	.3300	.7447
Expression	.406	.169	.446	.166	.7624	.4543

The results of analyzing the pretest percentage scores by both parametric and nonparametric tests show the control and experimental groups to be initially equivalent in achievement of pitch accuracy, rhythm accuracy, and expression accuracy.

Appendix F presents the results for the tests of equality of mean expression scores for expression using only the two judges whose scores were judged to be in agreement (i.e., without judge no. 2 scores). This test also shows control and experimental groups to be equivalent in achievement of expression.

Univariate Posttest Comparisons

Appendix G presents the posttest raw pitch, rhythm, and expression accuracy scores for both the control and the experimental groups. The statistical posttest summary of both the control and experimental groups using the Student's *t* test is presented in Table 10. The results of analyzing the posttest percentage scores by the Mann-Whitney *U* test are presented in Table 11.

Both tests show no statistically significant differences in the mean pitch accuracy and expression accuracy scores on the posttest. This is not the case with the mean rhythm accuracy scores. The mean of the control group compared with the mean of the experimental group shows a significant difference. The .05 level of significance was selected for use in this phase of the analysis. The one-tailed probability value of .0097 on the *t* test and .0167 on the *U* test, show a significantly higher mean value for the experimental group's rhythm accuracy scores.

Comparisons Utilizing Adjusted Posttest Scores

The finding that groups were initially not significantly

TABLE 10

SUMMARY OF POSTTEST DATA FOR BOTH GROUPS
PARAMETRIC TEST
STUDENT'S *t* TEST

	Control Group		Experimental Group		<i>t</i>	DF	p-value
	Mean	Std. Dev.	Mean	Std. Dev.			
Pitch	.847	.109	.890	.078	-.7774	20	.2230
Rhythm	.668	.216	.849	.068	-2.5417	20	.0097
Expression	.515	.175	.553	.139	-.5607	20	.2906

TABLE 11

SUMMARY OF POSTTEST DATA FOR BOTH GROUPS
NONPARAMETRIC TEST
MANN-WHITNEY U TEST

	Control Group		Experimental Group		<i>z</i>	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Pitch	.847	.109	.890	.078	-.6268	.2688
Rhythm	.668	.216	.849	.068	-2.2761	.0167
Expression	.515	.175	.553	.139	-.7587	.2283

different with respect to initial mean achievement in pitch, rhythm, and expression justifies the comparison of unadjusted posttest scores. However, for completeness, a final test of adjusted differences was performed. This test, an Analysis of Covariance, is a more stringent test of differences in that it statistically adjusts each of the posttest scores for any variation in each score that may result from initial achievement levels in the corresponding pretest measure. The three

pretest scores are called covariates. The results of this analysis are shown in Table 12.

In order for each difference in adjusted posttest means to be considered statistically significant, both the overall univariate analysis of covariance test (labeled Model in Table 12) and the test for the coefficient of the effect of interest (differences between posttest mean scores which have been adjusted for the covariates) must be significant. The p-value reported for the Model is based on an F-statistic. The p-value reported for the Comparison of Groups is based on a one-tailed t test. As can be seen in Table 12 only the dependent variable rhythm meets both of these tests.

Appendix H presents an additional analysis using only scores of the two judges who were in agreement. This supplemental test performed without the scores of judge no. 2, agrees with the results obtained when the scores of all three judges are used (Table 12).

TABLE 12
SUMMARY OF ANALYSIS OF COVARIANCE RESULTS

<u>Variable</u>	<u>p-values</u>		
	<u>Model</u>	<u>Comparison of Groups</u>	
Pitch (adjusted)	.0246	.2853	NOT SIGNIFICANT
Rhythm (adjusted)	.0273	.0141	SIGNIFICANT
Expression (adjusted)	.6090	.3292	NOT SIGNIFICANT

Additional Analysis

In an attempt to determine how students of both groups perceived

the effectiveness of the experiment, they were asked to answer two questions at the conclusion of the posttest. The questions' format is presented in Appendix I and the raw scores are presented in Table 13. The first question concerned the effect the experiment had on the student's overall interest in learning sight reading skills. The second question asked the student to compare this semester of sight reading instruction with past semesters and indicate whether this semester had been more beneficial. After statistically analyzing the results of both questions using two-tailed tests, it was determined that students from the experimental group showed no significant difference in their average ratings than did the students from the control group (see Tables 14 and 15). Both groups gave above average ratings on the two questions. These results show that students in both control and experimental groups believe that this semester was more beneficial than previous instruction the students had experienced and that their interest was slightly higher during this semester.

Discussion

An analysis and interpretation of the data obtained from this study was used to test the hypothesis that the utilization of a tape-recorded soloist can make the teaching of sight reading accompaniments to non-keyboard music majors more effective than the traditional procedure involving playing the accompaniments without the soloist. The relative effect of the recorded soloist was determined by comparing average scores from two separate groups. The control group was taught with the traditional techniques and the experimental group utilized the recorded soloist. Both groups were tested before and after the

TABLE 13
RESULTS OF PERCEIVED EFFECTIVENESS OF STUDY
(RAW SCORES OF BOTH GROUPS)¹

Student	QUESTION NUMBER ONE	QUESTION NUMBER TWO
	How did the instruction used in this semester of piano class affect your interest in sight reading?	Compared with other semesters of instruction in sight reading, how much do you think you benefitted from this semester?
Experimental Group		
1	4	5
2	3	5
3	4	5
4	4	4
5	4	4
6	4	X ²
7	5	X ²
8	4	5
9	5	5
10	5	5
Control Group		
1	4	5
2	4	5
3	3	4
4	4	4
5	4	4
6	5	X ²
7	3	3
8	4	X ²
9	3	4
10	4	5
11	4	3
12	4	4

¹The Rating Scale used for each question is listed below.

Question No. 1: 1=Decreased Considerably; 2=Decreased Somewhat; 3=Neither Stimulated nor Decreased; 4=Moderately Stimulated; 5=Considerably Stimulated.

Question No. 2: 1=Considerably Less; 2=Slightly Less; 3=About the Same; 4=Slightly More; 5=Considerably More.

²Some students had not been involved in any previous sight reading training.

TABLE 14
SUMMARY STATISTICS CONCERNING
EFFECTIVENESS OF STUDY
(BOTH GROUPS)

Questions	Control Group		Experimental Group	
	Mean	Std. Dev.	Mean	Std. Dev.
Question No. 1	3.83	.5773	4.22	.4409
Question No. 2	4.10	.7378	4.55	.7264

TABLE 15
STATISTICAL TESTS CONCERNING
EFFECTIVENESS OF STUDY
(PARAMETRIC AND NONPARAMETRIC TESTS)

Questions	Parametric Test			Nonparametric Test	
	t	DF	p-value	z	p-value
Question No. 1	1.750	19	.1089	1.5654	.1332
Question No. 2	1.353	17	.1936	1.3791	.1848

experiment by three measured achievements: pitch accuracy, rhythm accuracy, and expression accuracy.

Several techniques were employed in testing for significance of the differences between groups. These tests included the Student's t test, the Mann-Whitney U Test and an Analysis of Covariance. Agreement among all three tests was obtained.

The first null hypothesis stated that there will be no significant difference between the average posttest pitch accuracy scores of the control and experimental groups at the .05 level of significance. Since the difference was not considered significant under any of the tests, the hypothesis was accepted.

The second null hypothesis stated that there will be no significant difference between the average posttest rhythm accuracy scores of the control and experimental groups at the .05 level of significance. A significant difference was found between the mean average rhythm scores of the control and experimental groups under all tests, therefore the null hypothesis was rejected. For this part of the experiment, it was concluded that the utilization of a tape-recorded soloist does have an effect on the teaching of sight reading accompaniments.

The third null hypothesis stated that there will be no significant difference between the average posttest expression accuracy scores of the control and experimental groups at the .05 level of significance. There was no significant difference in the mean average expression scores of the control and experimental groups under any test. Therefore, the hypothesis was accepted.

Most of the research described in the Related Literature Chapter

supports the concept that rhythm accuracy is the most important aspect of sight reading and is especially important in the sight reading of accompaniments. Most authors agree that by being forced to accompany a soloist (actual accompanying situation), students tend to keep the rhythm at a continuous flow, therefore improving their rhythm accuracy.

By analyzing the data produced by this study, it has been found that the tape-recorded soloist did aid rhythm accuracy in sight reading accompaniments. Pitch accuracy, which some pedagogues believe can be sacrificed for rhythm accuracy when sight reading accompaniments, did not improve by the actual accompanying situation. Expression has always been a problem to judge objectively with any music performance. Certainly in the case of sight reading accompaniments, this variable is the least important of pitch, rhythm, and expression accuracy. The study did show no significant difference in expression accuracy scores of the group utilizing the tape-recorded soloist.

Summary

This chapter presented and analyzed pretest and posttest data. The control and experimental groups were shown to be initially equivalent in mean achievement of pitch, rhythm, and expression accuracy. Statistical tests for mean differences in pitch, rhythm, and expression posttest scores were performed. The treatment group that employed a tape-recorded soloist as an aid to the teaching of sight reading was found to have significantly higher rhythm accuracy scores than did the group that employed no taped soloist. In contrast, the pitch accuracy and expression accuracy mean posttest scores of the two groups were not significantly different.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to investigate the effect that accompanying a tape-recorded soloist has on the ability of collegiate music students to sight read vocal and instrumental accompaniments at the piano. Research involving methods and techniques of teaching sight reading was examined, but no investigations into the effects of utilizing actual accompanying situations to teach basic sight reading skills were found. This study provides research data in this important area of piano pedagogy.

The study employed two third semester piano classes of non-keyboard music majors. Both groups were involved with this experiment for fifteen minutes of each class period. The ten-week experiment was conducted in the fall semester of 1983. One group was taught to sight read accompaniments by a traditional procedure; in the other group accompaniments were performed with a tape-recorded soloist. A different accompaniment was taught each week of the experiment to both classes. A pretest-posttest research design was used to determine whether significant differences developed between the sight reading skills of the two groups as a result of the two differing treatments.

Three judges were used to score the pretest and posttest. An examination was performed to evaluate the extent of agreement among judges. The Pearson's Correlation Coefficient was used as the parametric measure of agreement, and the Kendall's Tau Correlation Coefficient was used as the nonparametric measure of agreement. The only disagreement among judges involved expression scores, therefore, additional analyses were performed to ensure that the disagreement among the judges would not affect the findings.

Three measured achievements were tested in the experiment—pitch accuracy, rhythm accuracy, and expression accuracy. The three null hypotheses for the study were tested by the Student's *t* test (a parametric test), the Mann Whitney U test (a nonparametric test), and an Analysis of Covariance (a parametric test). For completeness in this study, both parametric and nonparametric tests were performed. Since the results of all three tests agreed, the validity of the findings were enhanced.

Validity of Design

Two of the most important considerations when drawing conclusions from experimental studies are the internal and the external validity of the experimental design.

Internal validity concerns the kinds of statements which can logically be made about the particular sample of observations actually obtained in the experiment. To assess internal validity, the researcher must ask whether the observed effects could have been due to factors other than those explicitly manipulated in the experiment. The factors

that limit what can be concluded about the effects of the experiment on the obtained sample are those that limit the internal validity of a study.

External validity concerns the generalizability of the results to variations in the particulars of the treatment (e.g., the particular instructor and materials used in the study), to variations in the experimental subjects, and to variations in methods of measurement. Any study, no matter how well designed, can yield only a limited degree of external validity. Although the researcher may present logical arguments that the results should not be expected to differ when other treatment particulars, experimental subjects or methods of measurement are used, generality of results is firmly established only when similar results are obtained in subsequent studies, each of which is internally valid.

Internal Validity

There are several factors that may affect internal validity. Among these factors are (1) premeasurement, (2) maturation, (3) history, (4) instrumentation, (5) selection, (6) mortality, and (7) measurement timing. The possible effects of each in the validity of this study are discussed below.

Premeasurement is a major concern of any pretest-posttest design. The subjects of the experiment may be influenced by the pretest and this may cause some alterations of responses on the posttest whether or not any treatment is applied. In this study a pretest was used to determine whether the control and experimental groups were initially equal in

achievement level. A pretest-posttest design controls this potential source of measurement error.

Maturation processes within the subjects may result in a change during the experiment which can affect the responses on the posttest. The students used with this experiment may have performed better or worse on the posttest, not because of the treatment but because of some biological or psychological processes. If there were a biological or psychological change during the progress of the experiment then it should have affected the control and treatment groups equally. Thus the pretest-posttest design controls this potential source of measurement error.

Another major concern with experimental designs is history. This factor refers to an experience to which the subjects are exposed (besides the treatment of the experiment) that may affect the dependent variable. In developing the design for this study, the researcher attempted to limit the instruction of sight reading skills to this sight reading method only during the experiment. The possibility of the dependent variable being affected by any experience other than the treatment was therefore greatly reduced.

The researcher personally conducted the sight reading sessions for both the control and the experimental groups using identical music and lesson plans. Although great care was taken not to favor one group or method of teaching, the possibility of unintentional experimenter bias still exists.

Another factor to consider with any experimental design is the changes that occur between the pretest and posttest which may have

resulted from the testing instrument and judges and not the independent variable. To control for this effect with this study, the scoring procedure for both the pretest and the posttest was performed objectively by counting pitch, rhythm, and expression errors and subtracting from the total possible points. Three judges were used and tests of concordance among the judges were performed to examine inter-rater reliability. Also, this system controlled for any one judge becoming more experienced and discriminating, or more careless after judging both tests. All the student's performances were recorded by number and each judge did not know to what group any student belonged.

Selection error occurs when the two groups selected for the experiment are not initially equal with respect to the dependent variable. With this experiment, both parametric and nonparametric tests were performed to initially determine whether statistically significant differences in pitch, rhythm, and expression existed between the control and experimental groups. These tests showed the control and experimental groups to be equivalent in achievement, therefore preventing one group from being more advanced sight readers before the independent variable was applied.

Mortality error was not a concern with this experiment because none of the students refused to continue with the experiment because of the independent variable. Two students did drop out of the piano classes but not because of this experiment. The pretest scores of these two students approximated the mean on the three measured achievements.

Measurement timing errors occur when the posttest measurement is not made at an appropriate time to accurately measure the effects of the

dependent variable. There are two possible sources of error related to measurement timing in this experiment. First, this experiment was only conducted for one semester and other course requirements had to be met during that semester. Students in the experimental group were exposed to the tape-recorded soloist accompanying situation for fifteen minutes during each period for a duration of only twenty class periods. It is possible that, if the experimental treatment had been of longer duration, different results would have been obtained. Second, it is possible that the effects which were observed could be of short duration and thus if students were measured at a later time the average achievement levels of experimental and control groups would not be different.

External Validity

The researcher was also concerned with the representativeness of the experimental findings, i.e., the external validity of this study. What effect does the independent variable have beyond the confines of this experiment? In order to strengthen the validity of this study, the random samples were selected from a predetermined population. Third-semester class piano students were chosen because of the prerequisite knowledge and skills required for this study. The students who are representative of this level have all had basically the same training and have relatively the same competency in specific skills needed to sight read. Therefore, the effect the independent variable had on this study should be the same for third-semester class piano students of equal training and background. Since there was no reason to expect that the pretest would in any way sensitize the responsiveness of the students to the taped soloist, interaction error was of no concern in this study.

Also, the music examples used with this study are representative of the materials used for teaching sight reading and accompanying skills in the first two years of class piano at the college level. All examples were selected from the accompaniments listed in standard group piano texts and collections, and the Music Educators National Conference list of vocal and instrumental repertoire for high school students.

Another concern with the validity of the design was that the tape recorder used with the experimental group might affect the student's behavior. Since most students have been involved in the electronic piano class situation before, most have previously used equipment of this type. Therefore, the use of any electronic equipment should not have affected the attitudes of the students toward the experiment.

Conclusions

The conclusions of this study were based upon the results of comparing two methods of teaching the sight reading of accompaniments to non-keyboard music majors: 1) a traditional method and 2) a method utilizing a tape-recorded soloist to provide an actual accompanying situation. The conclusions were based upon small samples since the classes were conducted in an electronic piano laboratory which accommodates up to twelve students within the same class.

Within these limitations the conclusions were as follows:

1. In developing pitch accuracy, the procedure of utilizing a tape-recorded soloist to aid in the teaching of sight reading accompaniments was no more effective than teaching sight reading accompaniments with a traditional method. All three tests showed no statistically

significant difference in the mean pitch accuracy scores on the post-test.

2. In developing rhythm accuracy, the procedure of utilizing a tape-recorded soloist to aid in the teaching of sight reading accompaniments was more effective than teaching sight reading accompaniments with a traditional method. All three tests showed that the treatment group was found to have statistically significant higher rhythm accuracy scores than did the group that employed no taped soloist.

3. In developing expression accuracy, the procedure of utilizing a tape-recorded soloist to aid in the teaching of sight reading accompaniments was no more effective than teaching sight reading accompaniments with a traditional method. All three tests showed no statistically significant difference in the mean expression accuracy scores on the posttest.

Recommendations

This study performed an experiment with the teaching of sight reading skills. The findings indicated that rhythm accuracy was significantly affected by the independent variable which involved a tape-recorded soloist. The experiment showed that creating an actual accompanying situation for students improves rhythm accuracy.

As indicated in the review of the literature, rhythm accuracy is an important factor in the sight reading process. It is especially crucial in the sight reading of accompaniments where the pianist must strive to keep a continuous rhythmic flow to the performance. If the rhythm accuracy skills of collegiate class piano students are improved

by this method, then actual accompanying situations might be used effectively in the teaching of sight reading skills to various ages of students. Therefore, further investigation should be made using this method of teaching sight reading with the following populations: junior high pianists, senior high pianists, and collegiate piano majors. Also, if the students responded as a group to this technique, possibly this method of teaching sight reading skills could benefit the private piano teacher. A study utilizing the taperecorded soloist with teaching sight reading skills and accompanying skills in the private piano studio could produce valuable research data.

The experiment might have been more definitive if the instruction had lasted for a longer period of time. Since pitch accuracy and expression accuracy were not significantly affected by the experiment, a similar experiment conducted over two semesters, as opposed to ten weeks, might affect the accuracy of these two skills.

Further studies involving performing with tape-recorded partners should be made to determine the effectiveness in teaching rhythm accuracy in other situations. The results of this experiment suggest the possibility that problems with rhythm accuracy can be corrected with the ensemble performance situation. A similar study could be done using piano duets with various populations. By allowing students to practice with one part of the duet pre-recorded, the researcher could determine any significant differences in pitch and expression accuracy as well as rhythm accuracy.

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APPENDIX A
Preparatory Procedure

PREPARATORY PROCEDURE

1. Visually scan the top stave and circle any clef changes on your score.
2. Visually scan the bottom stave and circle any clef changes on your score.
3. Indicate the key, mode, or other means of tonal organization.
 - a. _____ major
 - b. _____ minor
 - c. _____ mode
 - d. _____ other
4. Scan the score and circle any key signature changes.
5. Indicate the general length of the phrases throughout the score.
 - a. _____ two measures
 - b. _____ three measures
 - c. _____ four measures
 - d. _____ other
6. Draw a diagram of the formal structure of the score using capital letters to indicate each section.
7. Write the meter signature(s) below in the order they occur:

Circle any meter changes on your score.

8. Scan the score and mark any complex or complicated rhythm patterns. Clap these rhythms.
9. Write the main tempo indications below:

Circle on the score any terms which would affect the overall tempo such as *ritardando* and *accelerando*.

10. Scan the score for dynamic indications and circle any changes that occur.

11. Indicate the predominant type of articulation that is present,
 - a. _____ legato
 - b. _____ staccato
12. Indicate the predominate type of texture that is employed.
 - a. _____ melody and accompaniment
 - b. _____ contrapuntal
 - c. _____ chordal
13. Study the fingering that is given and notate any changes or additions on the score that would improve your performance.

APPENDIX B

Ten Musical Examples Used With Study

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APPENDIX C

Pretest and Posttest (Musical Examples, Scoring Directions, and Scoring Sheets)

SCORING DIRECTIONS

The scoring procedure will be to score the student based on the number of errors that the student makes during the performance. The following types of errors will be evaluated: (1) pitch errors, (2) rhythm errors, and (3) expression errors. A description of each of the three types of errors is given below:

(1) Pitch Errors

Pitch errors constitute the following: (1) a note played on the wrong pitch, (2) a note omitted, or (3) a note that is repeated.

(2) Rhythm Errors

Rhythm errors constitute the following: (1) a note or rest that is not sustained long enough, or (2) a note or rest that is sustained too long.

(3) Expression Errors

Expression errors constitutes the following: (1) failure to observe differences in dynamic indications, (2) failure to observe crescendo, decrescendo, accelerando and ritardando indications, (3) playing staccato notes legato, (4) playing legato notes staccato, or (5) playing non-legato under a slur.

For both the pretest and posttest the exact number of notes have been recorded on the scoring sheet. When the tape of the performer is played for the first time, the three adjudicators will circle on the musical score provided, any wrong notes they hear. They will then subtract the total wrong notes from the number of possible notes to gain the student's score on the note accuracy category of this test.

For both the pretest and posttest the exact number of beats have been recorded on the scoring sheet. When the tape of the performer is

played for the second time, the three adjudicators will circle on the musical score provided, any wrong rhythms they hear. They will then subtract the total wrong beats from the number of possible beats to gain the student's score on the rhythm accuracy category of this test.

For both the pretest and posttest the following expression indications have been recorded on the scoring sheet: (1) any change in dynamics, (2) any staccato or legato indications, (3) any time the words crescendo, decrescendo, accelerando and ritardando appear, and (4) any time there are slur indications. When the tape is played for the third time, the three adjudicators will circle on the musical score provided, any expression marks that are not properly observed. They will then subtract the total errors from the number of possible expression marks to gain the student's score on the expression accuracy category of this test.

Because keyboard ability may vary from student to student, not every student may be able to play the exact tempo indicated. Therefore, a tempo scale has been recorded on both the pretest and posttest scoring sheets. The three adjudicators will circle number three on the scale if the student plays the example at the indicated tempo. If the student plays the example too slow, the adjudicators will circle number one or number two on the scale to indicate the extent of deviation from the indicated tempo. If the student plays the example too fast, the adjudicators will circle number four or number five on the scale to indicate the extent of deviation from the indicated tempo.

SCORING SHEET
FOR PRETEST

SUBJECT'S NUMBER _____

ADJUDICATOR'S NAME _____

<u>Category</u>	<u>Score</u>	<u>Total Possible Points</u>
Note	_____	143
Rhythm	_____	64
Expression	_____	8

Too Slow Tempo		Indicated Tempo	Too Fast Tempo	
1	2	3	4	5

**SCORING SHEET
FOR POSTTEST****SUBJECT'S NUMBER** _____**ADJUDICATOR'S NAME** _____

<u>Category</u>	<u>Score</u>	<u>Total Possible Points</u>
Note	_____	227
Rhythm	_____	64
Expression	_____	32

	Too Slow Tempo		Indicated Tempo		Too Fast Tempo
1	2	3	4	5	

APPENDIX D
Description of Tests Used

PARAMETRIC AND NONPARAMETRIC TESTS OF CENTRAL LOCATION:
A BRIEF DESCRIPTION AND COMPARISON

Assumptions

The mathematical derivations of sampling distributions on which statements of statistical inference are made are based on the complete satisfaction of all assumptions made. However, inferences based on a statistical test may sometimes remain valid despite the violation of one or more of the basic assumptions necessary for the theoretical development of the test. Under these circumstances a statistical test is said to be robust to the assumption or assumptions.

Two assumptions necessary for the mathematical development of the Student's *t* test which are of concern in this study are:

1. that the populations of measures be normally distributed and
2. that the variances of the populations be equal.

When the sample size is fairly large, and the parent population is roughly unimodal and symmetric, the *t* distribution gives an adequate approximation to the exact and unknown probabilities associated with the sampling distribution of the differences in means. The most commonly cited rules-of-thumb suggest that sample sizes of 25-30 are usually adequate for a good approximation.

For samples of approximately equal size, relatively big differences in the population variances have relatively small consequences for the conclusions derived from a *t* test.¹ In this study, the experimental group consisted of ten individuals and the control group consisted of twelve students.

¹William L. Hayes and Robert L. Winkler, Statistics: Probability Inference and Decision (New York: Holt, Rinehart and Winston, 1971), p. 347.

If the assumption of normality is not held to be tenable, the nonparametric analog of the Student's *t* test, the Mann-Whitney U test is appropriate. The mathematical development of this test does not require the relatively stringent assumption of normality and, therefore, there is no minimum sample size required for this test to be valid and reliable.

Relative Performance

Power and robustness are often used as objective criteria for measuring performance in hypotheses testing. The issue of robustness was discussed above. Power is defined as the probability of rejecting the null hypothesis when it is false. In this study power is the probability of inferring that the use of an accompanying situation will improve average sight reading performance when it, in fact, does make a difference.

When all the assumptions necessary for the development of the parametric tests are met, they are more powerful than their nonparametric counterparts. (This is as would be expected since they are based on more stringent assumptions.) However, it must be noted that when these assumptions are not met, the parametric tests may not even be valid, because the sampling distribution on which the inferences are based may not be accurate.

In considering which type of test (parametric or nonparametric) to use, one needs to compare the power of analogous tests.

Most comparison studies are made on the basis that if the conditions of the parametric test are met but an analogous nonparametric test is used instead, how much power is lost? If such loss is small and a nonparametric test is used in a

situation where the validity of the assumptions is not determinable, the investigator can have confidence that (a) if the parametric assumptions are satisfied, there will be little loss in power, whereas (b) if the assumptions are not satisfied, the nonparametric test is still absolutely valid and its power is unchanged. In the latter case, the actual power cannot be determined because there is little, if any, information about the true situation. However, the nonparametric test may well be the more powerful, especially if the sample size is small.

In case (a) above, the relative loss in power (called relative efficiency) is small for many non-parametric test when the sample size is large. The decrease can frequently be compensated for by taking a slightly larger sample for application of a non-parametric technique of analysis. The asymptotic relative efficiency (called the ARE) provides a single measure of relative performance of two tests, both using large sample sizes.²

The ARE of the Mann-Whitney U test is .955 for the normal distribution. Loosely interpreted, this means that the nonparametric test based on 100 observations is as efficient as the corresponding parametric test based on 95.5 observations if the assumptions required for the strict validity of the parametric test are met and if those sample sizes are large enough to reflect their asymptotic properties. The ARE does not provide a definite guide to choice of statistic since it reflects relative performances only in large samples and when the fixed distribution assumptions of the analogous parametric test are satisfied. In many cases, for example, nonparametric tests are equal to or more efficient than their parametric counterparts given certain distributional assumptions. For example the ARE for the Mann-Whitney U test is 1.000 for the continuous uniform distribution.³

²Jean Dickinson Gibbons, Nonparametric Methods for Quantitative Analysis (New York: Holt, Rinehart and Winston, 1976), p. 27.

³Ibid., p. 193.

APPENDIX E
Pretest Raw Scores

PRETEST RAW SCORES FOR
PITCH, RHYTHM, AND EXPRESSION ACCURACY

Student	Average of All Three Judges			Average of Only Two Judges ¹
	Pitch Scores	Rhythm Scores	Expression Scores	Expression Scores
Control Group				
1	122	57	4	5
2	130	32	2	1
3	116	31	2	2
4	136	25	3	3
5	143	63	6	6
6	119	26	3	3
7	137	39	4	3
8	95	49	2	2
9	138	61	4	5
10	141	63	4	3
11	64	40	3	3
12	53	58	2	2
Experimental Group				
1	139	58	4	4
2	73	47	2	2
3	157	51	5	8
4	138	60	4	3
5	120	32	3	3
6	134	51	5	5
7	134	43	5	4
8	138	54	3	2
9	67	47	2	2
10	126	46	1	2

¹In the case of the expression accuracy scores of the pretest, one of the judge's scores was of sufficient disagreement that additional analyses were performed when these scores were involved to ensure that the difference would not substantially affect the findings.

APPENDIX F

Tests of Equality of Pretest Scores (Two Judges)

TEST OF EQUALITY OF PRETEST MEAN SCORES
STUDENT'S t TEST
(SCORES OF ONLY TWO JUDGES)

	Control Group		Experimental Group		t	DF	p-value
	Mean	Std. Dev.	Mean	Std. Dev.			
Expression	.365	.190	.412	.243	-.5190	20	.6095

TEST OF EQUALITY OF PRETEST MEAN SCORES
MANN WHITNEY U TEST
(SCORES OF ONLY TWO JUDGES)

	Control Group		Experimental Group		z	p-value
	Mean	Std. Dev.	Mean	Std. Dev.		
Expression	.365	.190	.412	.243	.3989	.6940

APPENDIX G
Posttest Raw Scores

AVERAGE POSTTEST RAW SCORES FOR
PITCH, RHYTHM, AND EXPRESSION ACCURACY

Student	Pitch Scores	Rhythm Scores	Expression Scores
Control Group			
1	222	62	25
2	198	35	16
3	169	12	10
4	169	54	18
5	225	58	19
6	190	50	16
7	216	28	14
8	155	36	8
9	209	48	19
10	222	37	26
11	191	44	13
12	166	45	11
Experimental Group			
1	216	59	20
2	188	49	18
3	179	48	8
4	203	60	19
5	196	58	17
6	227	57	21
7	217	54	13
8	207	51	23
9	172	54	16
10	211	51	22

APPENDIX H

Analysis of Covariance Results (Two Judges)

SUMMARY OF ANALYSIS OF COVARIANCE RESULTS
(USING SCORES OF ONLY TWO JUDGES)

<u>Variable</u>	<u>p-values</u>		
	<u>Model</u>	<u>Comparison of Groups</u>	
Expression (adjusted)	.8599	.2997	NOT SIGNIFICANT

APPENDIX I

Questions Concerning Effectiveness of Study

EFFECTIVENESS OF SIGHT READING INSTRUCTION

These questions should be answered only with respect to the SIGHT READING PORTION of your piano class this semester.

1. How did the instruction used in this semester of piano class affect your interest in SIGHT READING?
 - A. Decreased considerably
 - B. Decreased somewhat
 - C. Neither stimulated nor decreased
 - D. Moderately stimulated
 - E. Considerably stimulated

2. Compared with other semesters of instruction in SIGHT READING, how much do you think you benefited from this semester?
 - A. Considerably less
 - B. Slightly less
 - C. About the same
 - D. Slightly more
 - E. Considerably more