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ABSTRACT

The effect of the use of interactive videodisc technology to present aural tests was studied in the context of college music appreciation classes. Both experimental and control groups were given study guides that identified the aural objectives for each test and specified the location of the musical examples that were to be used to illustrate the objectives. The experimental group was required to take aural tests on each unit in a supervised computer laboratory where a workstation consisting of a computer terminal connected to an interactive videodisc player was housed. The control group did not take the computer-administered aural tests. The effect of the computer-administered aural tests was measured by scores on unit exams taken in the classroom. A significant superiority was found in the scores on unit exams taken by the experimental group. It was concluded that under the conditions of the experiment, there was a significant advantage in requiring the taking of the computer-administered tests. It is noted that even though the video component of the videodisc player was not used, the videodisc technology was more cost effective to obtain and use, and provided more advantages, than the alternative compact disc technology. It is further noted that the individualized instructional method used in the study, Fred Keller's Personalized System of Instruction (PSI), was a significant factor in the increased achievement of the experimental group. (9 references) (Author/DB)

A Study of the Use of Interactive Videodisc Technology to Present Aural Tests to College Music Appreciation Students

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Running head: Computer-Administered Aural Tests

Abstract

The effect of the use of interactive videodisc technology to present aural tests was studied in the context of college music appreciation classes. Both experimental and control groups were given study guides that identified the aural objectives for each test and specified the location of the musical examples that were to be used to illustrate the objectives. The experimental group was required to take aural tests over each unit in a supervised computer laboratory where a workstation consisting of a VT125 computer terminal connected to a Pioneer LDV-6000A videodisc player was housed. The control group did not take the computer-administered aural tests. The effect of the computer-administered aural tests was measured by scores on unit exams taken in the classroom. A significant superiority was found in the scores on unit exams taken by the experimental group ($p<.05$). It was concluded that under the conditions of the experiment, there was a significant advantage in requiring the taking of the computer-administered tests.

A Study of the Use of Interactive Videodisc Technology to Present Aural Tests to College Music Appreciation Students

According to Reimer (1989, p.128), a respected philosopher of music education, a musical experience is one in which the listener perceives tonal relationships - melody, rhythm, etc. - and then reacts to their expressiveness. If one accepts this premise, it is obvious that a necessary part of the experience of music relates to the ability to perceive tonal relationships in the music. Therefore, an obvious goal of a music educator is to facilitate the improvement of listening perception by choosing music of quality for study and by using pedagogical techniques that focus on the experience of music.

Not only are the classroom techniques crucial to a student's improvement of listening skills, but listening outside class is necessary to make noticeable progress in the tonal comprehension of musical works. One of the major points made by Danziger (1984) is simply that repeated listening is how we make complex works more comprehensible.

Although it is quite common for teachers to expect outside listening, students often find that they are not successful with self-directed listening practice. It is also common to find that students will simply not take the time or make an effort to listen at all. The two-fold problem in this crucial area is (a) to provide students with a structured listening program that they can utilize on their own and (b) to structure the course in such a way that outside listening is rewarded.

Psychologist Fred Keller (1968), after many years as a college teacher, became dissatisfied with conventional teaching approaches. As

a result of his training in psychology it was natural for him to develop a means of applying reinforcement theory to the teaching process. The Personalized System of Instruction (PSI) model, which Keller developed is one that addresses both of the problem areas mentioned above. According to Ryan (1974, p. 3) the behavior-analysis elements of this teaching technique are found in giving close attention to two very important but often relatively ignored aspects of teaching which are (a) clearly describing what is to be learned and (b) effectively managing the reinforcement of study. PSI has been used successfully in the sciences (Kulik, Kulik, & Carmichael, 1974), and it is recommended by Greer (1980) for all types of music classes.

PSI is a competency-based approach that requires the division of a course into a number of manageable units or modules. The students are given specific objectives over these modules and are expected to master the content objectives at a predetermined criterion score. The format is individualized in that the students take the tests when they are ready and retake the tests until a criterion score such as 85% is achieved.

It is soon apparent to the would be user of a PSI model that a great amount of course preparation and proctoring of tests is required. This factor has undoubtedly kept many from adopting PSI even though it has a very favorable record of success. Much of the demand placed on the teacher using PSI can be reduced by using computer technology since the computer can tirelessly present multiple versions of tests, score them, and record the results.

The Electronic Campus project at Northwest Missouri State University has produced an environment which facilitates a computer

application of PSI. At Northwest, every student residence hall room and faculty office have been equipped with a computer terminal. This terminal is connected to a campus wide network supported by several Digital Equipment Corporation VAX computers. The use of this mainframe system to test strictly informational objectives in a PSI context was a fairly simple procedure. However, the testing of aural (listening) objectives, which involved presenting musical excerpts and questions over them, presented a challenge to the researchers. Since the VAX is incapable of presenting acceptable music quality, a peripheral device was sought to serve this need.

Bork (cited in Lambert and Sallis, 1987) proposed the use of an intelligent videodisc system "where real phenomena are essential for understanding" a given process (p. 22). In this study, although the video component of an interactive videodisc system was unnecessary, the high quality audio available was well-suited to the needs of this project. The computer program mentioned above and previously used to administer strictly informational questions was modified to allow control of the videodisc player. In this program after a question was presented to the student, the program caused the videodisc player to search for and play the appropriate musical example. The random access feature of the videodisc system permitted multiple versions of tests to be generated by the computer. Without this type of system, an instructor would have to physically prepare multiple versions of a test, prepare separate audio recordings for each one, and then hand grade them. The latter alternative is not only less attractive to the instructor but also more restrictive to the students who would be able to take the tests only when test proctors were available.

A CD-ROM player with audio outputs would have been a logical choice for the study, but we found that access to this type of player was limited. In addition, the cost of the production of a compact disc with the necessary musical examples was much higher than that of a videodisc It was found that a single videodisc using the recordable laser videodisc technology could be produced for approcimately $320 whereas the production of a single compact disc cost approximately $1500. As a result of these problems with CD-ROM, the videodisc format was chosen.

The purpose of this study was to determine the effect of computer generated aural tests in the setting of college music appreciation classes. A videodisc was produced containing relevant musical excerpts in order to conduct this study. The videodisc player was controlled by a computer program that randomly accessed musical examples correlated with teacher-prepared questions. The program selected one question for each of the aural objectives which were given to students as study guides. As students completed testing sessions the computer program gave them immediate feedback and recorded the results for the investigators.

Method

Subjects

Two sections of music appreciation students who were non-music majors at Northwest Missouri State University were available for a study of the use of interactive videodisc technology to present aural tests. The subject matter specialist taught both sections of music appreciation

that were used in the study, and the computer specialist designed the computer program that administered the tests.

Design

Section three of Music 201 which met at 9:00 a.m. on Monday, Wednesday, and Friday was designated the experimental group and section five, which met at 2:00 p.m. on the same days was designated the control group. Since intact groups were used for the investigation, the two sections were compared on the basis of ACT scores and years of previous musical experience (many students were first semester freshmen and therefore no college G.P.A. was available). A t-test was performed on the mean ACT scores and mean number of years of previous musical experience in order to determine whether there were significant differences between the two groups.

Both experimental and control groups were given study guides that identified aural objectives and specified the location of the musical examples for study in a record collection. The experimental group was required to take aural tests over each unit in a supervised computer laboratory. The workstation where the tests were administered consisted of a VT125 terminal with a Pioneer LDV-6000A videodisc player connected to it. Headphones were required for use by the students so that the musical examples would not disturb others who were using the same area. The control group did not take the computer-administered aural tests.

The effect of requiring the computer-administered aural tests was measured by the students' performance on five unit exams taken in class. The unit exams were based on the same objectives as the aural tests which were available to the experimental group on the computer. The mean scores on each of these unit exams were compared with a t-test.

Materials

The coursework for this study divided the aural objectives into 5 modules. Each module test had to be passed at the 85% level by midnight of the scheduled deadline before credit was awarded to the student. A total of 10% of the course grade was based on the timely completion of these module tests. Only one specially equipped terminal linked to a VAX 785 computer was available to administer the aural tests so the students reserved times to use the workstation.

The computer program was designed to meet several requirements. Firstly, it had to be able to generate a different version of a module test each time a student attempted it, and secondly, it had to produce one and only one question for each objective of the module test. The final task for the program was to access the appropriate musical example on the videodisc and play it when the student was ready to hear it. These requirements were achieved in a five hundred-line program written in VAX BASIC. Separate files for objectives and test items were also created for each module. When the program was executed, students entered their social security number and selected the module number they wished to study. The program then read the correct objective file and loaded one randomly selected question for each objective into a large virtual array. The matching question file contained text, four alternative answers and starting and stopping frame numbers for each question.

After the question array was built, the student was presented a question chosen at random from the array. The program played, on cue from the student, the indicated frames on the videodisc which contained the appropriate musical example. After the musical selection was

played, the student was asked to select the correct answer for the question. The program then judged the response and scored it appropriately.

Other requirements for the program related to reporting the results of each attempted test. It was suggested by Hermann (1982) that students using computers as test administrators could do so successfully if they obtained proper feedback; therefore, at the completion of a module test the student's score, the objectives missed, and the location of the missed objectives in the study guide were displayed for the students. The student's score, the time, and date of the attempt were written to an indexed file from which a report could be generated to provide the investigators with the necessary information for the awarding of credit to each student.

Results

Students in this study were not randomly assigned to their groups; therefore, the two groups were tested for similarity on the basis of mean ACT scores and years of previous musical experience. The mean ACT scores for both groups were 19.64 (experimental) and 17.67 (control), and the standard deviations were 5.25 and 5.35 respectively. Although this is a sizeable difference, the results of the t-test indicated no significant difference ($p<.05$) between the two mean scores, $t(52) = 1.2305$, $p>0.2241$.

The mean years of previous musical experience were 3.97 for the experimental group and 4.25 for the control group. The standard deviations were 4.14 and 4.03 for each group respectively. The t-test

indicated no significant difference in the mean years of previous musical experience, $t(57) = 0.2360$, $p>0.8143$.

At least on these two important variables the two groups were comparable. Therefore, it was assumed that a valid comparison of performance on exams could be made.

Mean scores for each of the unit exams is given for both groups in Table 1. Due to uncontrollable enrollment factors, the two groups differed considerably in size; however, the results of the t-test comparing all five unit test means were significant. Because the variances differed significantly on exam one, the data generated by using an unequal variance procedure was used. The data for exams two through five were based on the assumption of equal variance (Cody and Smith, 1987, p.95).

Insert Table 1 about here

Discussion

The investigators sought to determine whether or not the taking of computer-administered aural tests using interactive videodisc technology would influence unit exam scores. Traditionally students do worse on the aural portion of tests in a music appreciation class than they do on the portion that addresses the comprehension of informational objectives. The investigators expected that this testing program using interactive videodisc technology would create an increased awareness in students of their level of mastery of aural objectives thereby causing

them to prepare more effectively for unit exams taken in class. The data generated by this study did in fact suggest that students in the experimental group were better prepared for unit exams.

This study did not attempt to establish the validity of PSI as an instructional approach since many studies have provided sufficient evidence of its value. This study did provide data to support its use in encouraging the development of listening skills using the medium of interactive videodisc. Further, the study indicated that interactive videodisc was an expedient means of aural test administration. Its advantages are that it can facilitate the PSI approach by administering multiple test versions, giving the student feed back, and recording the results for the instructor. Therefore, the instructor is relieved of much of the labor involved in preparing and scoring tests.

While the testing program was successful, some problems arose which suggest further study. It was found that the videodisc system was not as user-friendly as might be desirable. Students often found that they needed help when communication problems developed between the videodisc player and the computer terminal. A more reliable reliable system needs to be developed.

A second area for further study is suggested by the number of attempts a student required to pass a module test. It was found that some of the students attempted the tests as many as seven times without achieving a passing grade. With some students requiring many repetitions in order to pass a test, the investigators believe that interactive optical disc technology has great potential for the development of tutorials. For example, a CD-ROM player connected to a computer terminal could utilize the commercially available compact discs

to train students to hear features contained in the musical works before they attempted to take a test. This would be of particular help to students who are unable to distinguish musical features on their own.

The investigators credit the increased achievement of the experimental group to the instructional design of PSI. The aural objectives were clearly specified, students were required to pass a test over all the objectives at a high criteriion score, and they were rewarded appropriately for timely completion of the aural tests. The investigators believe, however, that the contribution of the medium of interactive videodisc to this study is no less significant. Without the labor-saving feature of the computer-generated tests, it would be far more difficult to implement the successful instructional qualities of PSI in the development of aural skills in a music appreciation course.

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Table 1

Summary of t-test Results Comparing the Mean Scores on Two Unit Exams of the Control Group (1) and Experimental Group (2)

Exam	Group	N	Mean	Standard Deviation	t	df	p
1	1	18	65.94	19.52			
	2	41	77.66	10.25	2.40	21.2	.025*
2	1	18	65.89	12.97			
	2	41	78.39	15.18	3.04	57	.004*
3	1	18	48.22	23.49			
	2	40	72.50	24.76	3.50	56	.0009*
4	1	18	54.72	24.22			
	2	40	69.83	20.87	2.42	56	.019*
5	1	18	75.05	14.85			
	2	39	85.49	12.30	2.78	55	.007*

Note. *These results are significant at the $p<.05$ level.