Music Teaching Via the Microcomputer

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Article:

Until very recently, the use of computers in teaching music has been almost exclusively in the province of colleges and universities. An industrial paradox—increased technology combined with decreased costs—has made it possible for music teachers in nearly any school situation (and many private teachers as well) to take advantage of the potential benefits of computer-assisted instruction.

'The biggest change which has made this possible is the emergence of the microcomputer. Initially, computer systems required large mainframes which were housed in special rooms and could cost in the millions of dollars. Next came the minicomputer and finally, in the last four years or so, the microcomputer has made its appearance on the scene.

A microcomputer—sometimes called a stand-alone computer because no other computer support systems are needed—generally consists of the following components: a computer terminal which contains a typewriter-like keyboard, a video monitor or regular television set, and a cassette tape player or a disk drive. The terminal is small and lightweight and plugs 'into arty standard electrical outlet, These pieces of equipment are called the hardware; programs which tell the computer what to do are called the software. Programs are stored on regular cassette tapes and "played back or loaded into the computer via a tape player or they are stored on mini-disks (essentially recording tape fashioned in the shape of a small record) and loaded from a disk drive.

Basic microcomputer systems cost in a range from $200 to $2,000, with the final cost depending on several factors. For a good review of the commonly available systems, see the Doll and Staples entries in the Bibliography. Even at a cost of $2,000, a microcomputer is well within many school budgets. In fact, many school districts across the country have already purchased one or more microcomputers, which are usually found in the math/science classrooms or in the library or resource room.

The purpose of this article is to provide a positive introduction to the use of microcomputers in music teaching. The question and answer format represents questions commonly asked by music teachers who are interested in learning how microcomputers can he used in their situation and brief, nontechnical responses.

Q: Just what can the computer do to help me teach music?

A: The computer can be utilized in four major categories: record-keeping, tutorial, drill and practice, and testing; The computer can he used for an almost endless variety of record-keeping tasks, such as: attendance records, grades, instrument and equipment inventories, uniform or robe storage and check-out, 'budgets, library cataloguing, and mailing lists.

Q. Excuse me for interrupting, but could 1 get it to keep track of the money we collect in our fundraising activities?

A: Certainly. Or similarly, private teachers could use it to keep track, of student payment records or for billing purposes.

Q: You've got me excited already about using the computer, but actually I'm most interested in the instructional advantages. Can you tell me more about those other three categories?
A: In a tutorial lesson, one can learn about a topic with little or no previous experience. For example, a beginning music student might learn the names of the lines and spaces via the computer, an intermediate student could learn the differences between major and minor scales, and an advanced student might learn some basic principles of part-writing. In addition to the typical tutorial format, or what is commonly known as programmed instruction, other possibilities include games, problem solving, and simulations.

Drill and practice routines are useful once a student has learned about a topic by means of the tutorial or in a class or lesson. For example, once a student has completed the tutorial on major/minor scales, he could listen to as many examples of each as needed to practice aural identification.

Q: You mean the computer can play music, too?
A: Yes, it can. Although the number of voices possible, the control, of dynamics, range, intonation, and timbre will vary greatly depending on the equipment used.

Q: I want to come back to this later and learn more about how a computer plays music, But for now, will you finish your discus-con on instruction, please?
A: Taking a test on the computer is fairly straight-forward. The computer asks the questions, the student responds with his answers, and the computer evaluates the answers and stores the information—in terms of percent correct or other similar formats—for later inspection by the instructor.

Q: Can you give me an example of how these instructional categories might be used in a school situation?
A: Suppose you have an 80-piece hand and because you are in support of the ideals of comprehensive musicianship, you want to teach the students some fundamentals of music theory. You don't want to take up a great deal of rehearsal time, so in addition to the material yon include in your rehearsal comments, you have a series of graded computer modules to which the students are assigned.

Individually, or in small groups, the students work through each module in three stages--tutorial, drill and practice, and test. In the tutorial section, the instructional material is broken into a series of sequential steps. The student is required to respond to each one and thus gets immediate feedback on whether or not he is understanding correctly.

Once the student has worked through the tutorial, he can practice on the material as much as is Often, these practice exercises can be stratified into levels of difficulty and, of course, the student is once again provided h immediate feedback on how well he is doing. In addition to the self-pacing advantages, another important benefit is the non-threatening atmosphere provided by the computer. The computer doesn't care how many times you go over the same material nor does it give you the negative, nonverbal feedback — the well-placed sigh, the "putout" look, and soon—that sometimes comes from a teacher who has gone over and over the same material with a student.

Finally, when the student feels ready (or more precisely, when he has done a sufficient number of practice exercises at the required proficiency level-90% correct, for example), he can take the test. The computer will administer the questions using the same format in which the student has been practicing. (Sometimes students do poorly on teacher-made tests because they didn't know what the rest questions would he like.) As has already been mentioned, 'a record is made for the instructor to check at a later date. The computer can even assign grades on the basis of points achieved.

Q: Is this scenario you've just sketched out limited to older students?
A: Not at all. In fact, one of the strongest features of computer-assisted instruction is the flexibility that is possible. With careful programming, lessons can be written for students at all levels from pre-schoolers to graduate students. Within age levels, programs may be personalized to meet the needs of slower students or

more advanced ones. Such features as unlimited repetition, step-by-step progress in very small steps with much positive reinforcement, and so on, lend themselves very well to special education applications.

Q: It sounds almost too good to be true; surely there Must be some drawbacks. What do you see as the biggest problems facing the future of microcomputers in public school music programs?
A: Attitudes. Sometimes administrators, supervisors, and even music teachers have negative attitudes which must be overcome before any real progress can he made.

Q: What negative attitudes are most prevalent?
A: Because of the video game craze currently in vogue, many think of, the microcomputer as a toy, something which is not to be taken seriously. Then there is always the financial aspect, of course; people are often unwilling to "risk" money on what they perceive to be an unproven product. Finally, there are those who feel that the computer is anti-musical or that it poses a threat to music teaching by reducing human art to electronic science.

Q: How do you respond to those who have negative altitudes?
A: First, I would point to the ever-increasing acceptance of computers into education, the business world, and society in general. Like it or not, our children are growing up in a computer generation. If they remain "computer-illiterate", they are likely to encounter many difficulties in the future, or will at least be hampered by an inability to take advantage of the vast potential benefits. Many school districts are being far-sighted enough to buy microcomputers in lots of hundreds or even thousands. (The Houston Independent School District recently purchased 4,000 microcomputers.)

In terms of expense, microcomputers already represent a tremendous reduction in what was formerly a cost only large universities could afford. By parallel example, consider what has happened to hand-held calculators. Less than 10 years ago, it cost. nearly $200 to buy a calculator that would do what a ten-dollar one will do now! In all likelihood, the trend toward increasing capabilities and decreasing hardware costs will continue.

As to the anti-musical sentiments, consider the metronome by way of analogy. A musician who has never used one is a person who is likely to have rhythmic (or tempo stability) problems. A musician who depends upon the metronome constantly in practice is also one who may have problems. However, used appropriately, the metronome—or tuning devices, recording equipment, computers, and so on—can be a very effective learning aid. One of the greatest benefit s' of the computer is that it allows the teacher to spend more time on those aspects of music-making which necessarily require human interaction and sensitivity.

Q: Besides negative attitudes, what other problems do you foresee?
A: Persons interested in getting into this area ought to be aware of two primary concerns. One problem is that programs written to run on one type of computer won't run On another type without some modifications. Even though nearly all microcomputers use a language called BASIC, Apple's version of BASIC is slightly different from Atari's, which is slightly different from Radio Shack's, and so on. This is further complicated by the inclusion of such peripheral devices (hardware added to the main computer) as synthesizers. A music theory program written for an Apple computer using an Alf synthesizer won't run on an Apple using a Micro Music synthesizer. While this does not have to be a major problem in the long run, it will obviously be a while before complete standardization and inter-compatibility will he achieved.

Another major problem is the relative lack of quality software. While the situation is improving rapidly, the increasing capabilities of the hardware continue to outstrip the availability of the software.

Q: What music programs are and how can I obtain them?
A: The amount of music software available can vary tremendously from one brand of computer to another, Some of the most popular brands have a rather broad range of programs available, while others of equal popularity have almost none.

Local computer dealers can generally tell you what is available. Also, catalogues and journal advertisements. will help. With some instruction and practice, you can even learn to write usable programs yourself!

Q: Let's go back to that business about the computer playing music. How does that work?
A: I hate to repeat myself, but there are a number of possibilities depending on the equipment available. With some microcomputers it is possible to play a single melodic line with no additional equipment. Other computers have built in synthesizers which allow you to compose and play back music with one or more voices. Finally, it is possible to add synthesizers to the microcomputer.

Synthesizers added to the computer can come with or without keyboard attachments. Without the keyboard, music is entered from the computer terminal; with the keyboard, music may be played and stored for later playback. The various kinds of synthesizer devices provide differing amounts of control over the total range of pitches, intonation, timbre, envelope shaping, volume, and number, of voices. See the Lu bar, Mercuri, and Tubb entries in the Bibliography for excellent reviews of synthesizer peripherals.

Q: Isn't the timbre too inferior to be of any real musical value?
A: I suppose it's possible that some musicians might have trouble accepting or adjusting to computer sounds. However, in a way, it all goes back to one's attitude. Tone quality is a relative thing. No one expects a portable cassette player to produce the same quality of sound as a digital recording played on expensive stereo components; yet, the cassette player can bean immeasurably functional device.

Q: All of this sounds so promising, but somewhat confusing, too. Hon would you suggest I go about getting started in this area?
A: There are a number of ways to get involved and I Would suggest that a key element will he your persistence. We are not yet at the stage where access to this side of our profession is as commonly available as buying sheet music. However, here are some suggestions:

1. We have already talked about your local computer dealers. Most of them are quite willing to spend some extra time with you and to let you have some "hands-on" time with their equipment. If possible, try to find a dealer who sells more than one brand of computer so that you can make some comparisons.

2. Read an introductory book, such as Jack Taylor's Introduction to Computers and Computer Based Instruction in Music (1981) (available from the Center for Music Research at Florida State University in Tallahassee for $4.00).

3. Pick up some of the journals which are available and look through the articles and advertisements. Journals such as Byte Magazine, Creative Computing, and Interface Age can usually he found. in local book stores and at grocery store magazine racks.

4. Attend one of the sessions on computers that are held at every national MENC convention and at many state conventions.

5. Call or write one of the university music faculty members in your area. Even if not personally involved, he or she may be able to suggest someone who could help. Some colleges are beginning to offer courses in music programming and nearly all offer introductory computer science courses.

Q: Do you have any closing comments you would like to make?
A: Yes. I would like to urge all music educators to give serious consideration to the role that microcomputers could play in their teaching. Microcomputers are not a panacea to solve all our ills and I wouldn't pretend that we are even close to ironing out 41 the difficulties. However, the possibilities which have already been realized are so powerful that it would be a grave error for our profession to ignore the tremendous benefits which will be available in the very near future. Certainly, those who become engaged in this endeavor in the next few years

will feel like pioneers at limes. But they will correspondingly reap the rewards and feel the excitement of being at the forefront of educational developments which are going to revolutionize the entire school curriculum.

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