ONE COMPUTER *CAN* DELIVER WHOLE-CLASS INSTRUCTION

It's possible for one computer to meet the needs of an entire class. Here are some ways for teachers to incorporate technology into music courses despite limited resources.

BY KIRK KASSNER

One persistent myth about teaching with music technology is the belief that all students in the class need their own computers. Happily for music teachers, this notion is no longer valid, if it ever was. Teachers do not need thousands of dollars and sophisticated expertise nor do they need to purchase an expensive commercial technology curriculum. Even if teachers had a computer for every student, they would be confronted by a perplexing array of pedagogical problems: (a) what software should I purchase and how do I organize the software instruction into a curriculum that imparts meaningful musical skills and concepts, (b) what measures do I take to ensure that all students will hear only their own program's audio output, (c) how do I keep track of each student's progress through the curriculum, (d) how do I motivate the small number of students that do not enjoy learning with computers, (e) what provisions will I make to help students who have difficulty reading or understanding the instructions or performing the music skills, (f) what provisions can I make to mitigate the negative effects of isolation while promoting the social interaction that music instruction normally provides, and (g) having spent so much money, do I dare *not* use the technology for a few lessons in order to teach with other resources?

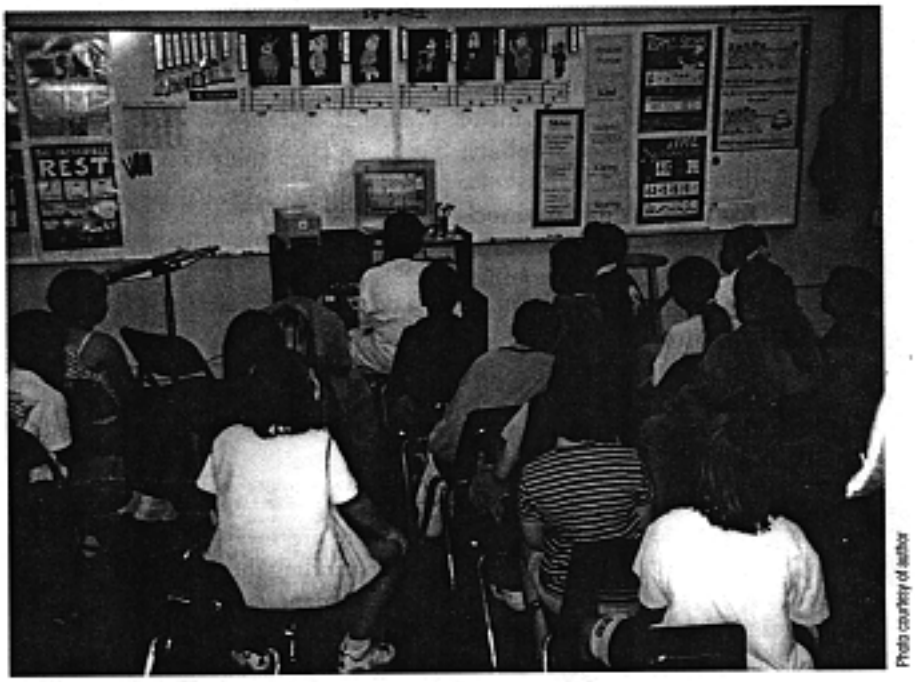

Photo courtesy of author

The attention of the class can be focused on a single computer screen during a music-based activity.

Single-Computer Concept

Using only one computer for an entire class can provide many benefits of learning through technology, as well as save money and reduce the need for technical expertise. Teachers can load buy-and-run software into one computer (see the Software Useful for Single-Computer Music Classrooms sidebar for an annotated list of software especially useful for whole-class presentations) and use it as they would use any other instructional resource (videotape, CD, picture book, learning chart, etc.). The exciting difference is that computer programs—especially

Kirk Kassner is a music teacher at Panther Lake Elementary School in Federal Way, Washington.

Software Useful for Single-Computer Music Classrooms

Software Program	Uses
Band-in-a-Box PG Music; 266 Elmwood Ave., Suite 111; Buffalo, NY 14222. 905-528-2368 or 800-268-6272.	Main: Accompaniment Auxiliary: Composition, aural skills, music history, music appreciation, music education
Beethoven Lives Upstairs Children's Group (Children's Book Store Distribution); 1400 Bayley St., Suite 7; Pickering, Ontario L1W 3R2, Canada. 800-668-0242.	Main: Music history, music appreciation Auxiliary: Music education
Cakewalk Twelve Tone Systems; PO Box 760, 44 Pleasant St.; Watertown, MA 02272. 617-926-2480 or 800-234-1171.	Main: Sequencing Auxiliary: Accompaniment, composition, aural skills, music education, orchestration
Making Music & Making More Music Arch Publishers Group; 12B West Main St; Elmsford, NY 10523. 800-556-9502. Info@archpg.com.	Main: Composition, music education Auxiliary: Orchestration
Master Tracks Pro Passport Designs; 100 Stone Pine Road; Half Moon Bay, CA 94019. 415-726-0280.	Main: Notation, sequencing Auxiliary: Accompaniment, composition, aural skills, music education, orchestration
Music Ace & Music Ace II Harmonic Vision. 847-467-2395, fax 847-467-3008.	Main: Composition, music education, notation
Peter and the Wolf Time Warner Interactive; 2210 West Olive Avenue; Burbank, CA 91506. 800-482-3766.	Main: Music appreciation, orchestration Auxiliary: Music education
Practica Musica Ars Nova; PO Box 637; Kirkland, WA 98083. 206-889-0927.	Main: Aural skills, music education, notation
Rhythmaticity MusicWare; 8654 154th Avenue NE; Redmond, WA 98052. 206-881-9797.	Main: Music education Auxiliary: Aural skills, notation, performance
Rock Rap'n Roll (SBG) Silver Burdett Ginn; 250 James St.; Morristown, NJ 07960. 800-631-8081.	Main: Composition, music appreciation, music education Auxiliary: Accompaniment, music history
Thinkin' Things I & II Edmark; PO Box 97021; Redmond, WA 98073-9721. 206-556-8484.	Main: Aural skills, music education, performance Auxiliary: Composition
Toney Games Illinois State University; Orat 5600; College of Fine Arts; Normal, IL 61790-6700. 309-438-5447.	Main: Aural skills, music education
Voyager Multimedia CDs Arch Publishers Group; 12B West Main St.; Elmsford, NY 10523. 800-556-9502. Info@archpg.com. (Beethoven, Mozart, Schubert, Strauss, Stravinsky)	Main: Music history, music appreciation, music education

Photo courtesy of author

Students can take turns using the computer while classmates watch in anticipation.

recent ones—get students involved with intriguing graphics and sounds and empower students to control many aspects of their learning. The behavioristic drill programs of the 1980s have largely been supplanted with much more appealing and engaging programs. A single computer can be a very effective tool for introducing, reinforcing, and reviewing most musical skills and concepts listed in the National Standards for Music Education.[1] By presenting the software to the entire class at the same time, teachers can take advantage of the powerful capabilities of well-designed, high-interest instruction at the most advantageous points in the overall curriculum. Like videotapes and other instructional resources, well-chosen computer software can add variety, spice, efficiency, and change of pace to the music teacher's repertoire of instructional techniques.

Class Structure

Simply having students take turns on a single computer will not work, however, unless the teacher establishes class structures that ensure all students will stay focused, attentive, and nondisruptive. One effective way to adapt programs to whole-class activities is the classroom game format: (a) divide the class into teams of four or five children (as in cooperative learning approaches),[2] (b) have each team send one member to the computer for a turn to select the answer, (c) award three points to the team whose member gets the right answer on the first try, two points for the correct answer on the second try, and one point for the correct answer on the third try, and (d) keep the rest of the class focused on the "game" by giving a bonus point to anyone who can supply the correct answer if the computer operator and team cannot. Many newer CD-ROM programs have built-in games that challenge children to identify differences in pitch, rhythm, timbre, contour, tempos, and so forth. Even though these software programs were designed to be used by one or two students working at a computer, they can be adapted for use as a game for the entire class. Programs that do not already have built-in games can be adapted to the game format. The teacher can give points when the operator "follows directions" correctly as he or she works through the lessons. In these ways, all children attend to and learn from the technology at the same time, even though they do not control the keyboard and mouse all the time. (See sample lesson using this approach in the Lesson Plan for Sequencing a Twelve-Bar Blues Progression sidebar. This lesson can be done in class, at home, or during lab time.)

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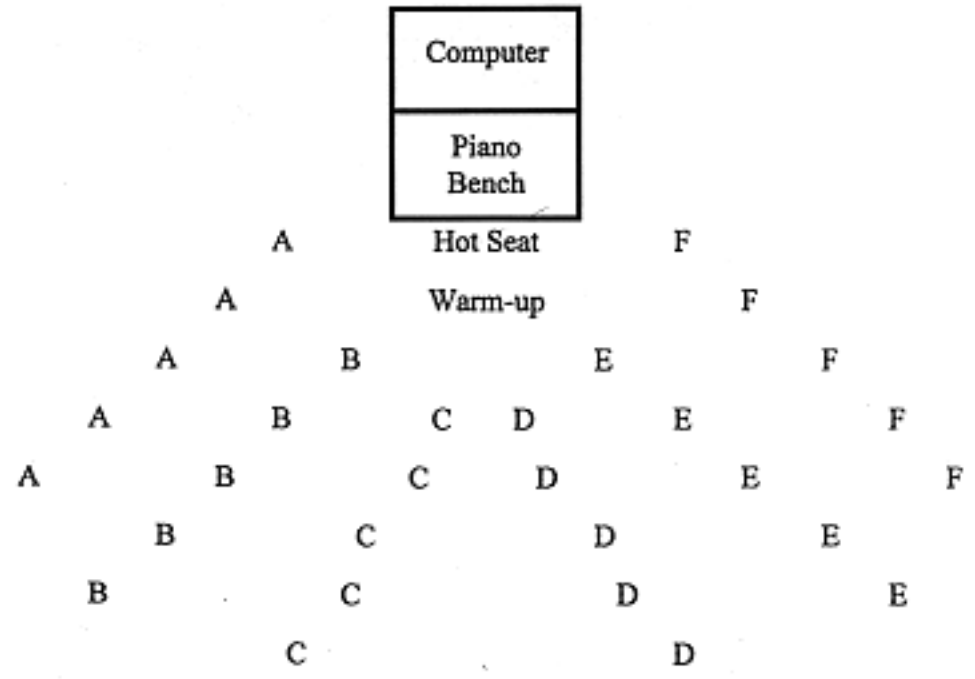
Physical Classroom Setup

Important decisions need to be made when using one computer for a whole classroom. One obvious but often overlooked fact is that all children need to be able to see the video output of the computer. While projection devices and large monitors make it easier, smaller monitors (17") can be used for whole-class viewing, provided the monitor is placed high enough (on a four-foot cart, for example) and students are arranged so that everyone can see the smallest details on the screen. One easy way to organize the class for whole-class viewing is illustrated in Figure 1.

The monitor is placed on a cart with a piano bench below for placing the keyboard and mouse. The "hot seat" chair is placed directly behind the piano bench for the operator, and the "warm-up" chair is behind the hot seat for the next operator. The rest of the class is seated in team rows radiating from the monitor like spokes on a bicycle wheel. The team members closest to the monitor take their turns first and then move to the last seat in the row, at which time everyone else moves up one seat (this not only gives

Figure 1. Seating plan for whole-class viewing of computer screen



Note: Teams, designated as letters A–F, are seated in rows radiating away from the computer monitor.

students different views of the screen, but relieves the boredom and fidgeting that can result from physical inactivity). Team rows can choose a team name at random or from a list supplied by the teacher, or the teacher can place pieces of differently colored paper under the captains' chairs and refer to the teams by color. If each student takes a turn of about one minute, almost all students can usually have a turn within one class period.

Audio Assistance

Another obvious but often overlooked consideration is the need for all students to be able to hear the audio output of the computer. Many programs are designed to be heard at close range through the computer's audio system and cannot be turned up loud enough for everyone to hear. Or, if the volume can be adjusted upward, the resulting sound is often distorted. Fortunately, most computers have a headphone jack or line-out jack, and most music classrooms have some type of sound amplification system. By connecting these two systems with a cable, the classroom can be filled with high-quality, undistorted sound. Cable connectors vary among systems, but all kinds of connectors and converters are available through local electronics stores or from on-line vendors. For those computers that do not have a headphone or line-out jack, a microphone can be placed next to the computer system speaker to amplify the microphone input.

Computer learning activities can be woven into the curriculum at many places to help students learn.

Learning Stations

Another method of using one computer in a class is the learning station model. The single computer can be one of the stations through which groups of students rotate for learning about different parts of a central topic. For example, when studying the instruments of the orchestra, the teacher may set up six hands-on learning stations: a video station where students watch instrument construction and performance, four playing stations where students produce simple sounds on one instrument from each family, and a computer station where students explore musical instruments of the world and write a list of similarities to and differences from orchestral instruments. A single computer could also be used with basal text resources in a learning station lesson such as "Compare and Contrast Selected Folk Music of America with the Folk Music of Africa." Many software programs ideal for use in learning station models exist for such topics as timbre, form, har-

Lesson Plan for Sequencing a Twelve-Bar Blues Progression

This project is suitable for grades 4 through 8. The estimated completion time is 120 minutes.
(This project relates to achievement standards 4a at the Grades 5–8 level and achievement standards 2b, 2c, 3d, 4b, and 4c at the Grades K–4 level of the National Standards for Music Education.)

Materials Needed: One computer (IBM 386 or better with sound card/speaker system, or Macintosh multimedia) with printer, a MIDI synthesizer or keyboard controller, a sequencing program, blank diskettes, blank audio cassettes, tape recorder, and project handout.

Procedure: Introduce the project guidelines. Evaluate student projects based on these questions: (a) How well-crafted is the melody (does it contain "blue notes" and change with the chords) (b) How effective/expressive are the choices of instrumentation, (c) Is the composition interesting, imaginative, fresh, and intriguing?[1]

Instructions: Give students the following set of directions (in the form of a handout):

1. This project requires some knowledge of the twelve-bar blues progression:

   The chord progression in the key of C is:

   Measure #: 1 2 3 4 5 6 7 8 9 10 11 12

   Chord: C C C C F F C C G F C C

   This pattern is repeated many times, with different melodies or words improvised over it.

   The simplest bass line to play is four beats of the chord root for each measure. A more interesting bass line starts on the chord root for each measure and then "walks" downward by steps (in C, the pattern is C-B-A-G). Other interesting bass lines usually begin each measure on the chord root.

   Blues melodies often have "blue" notes in them (pitches one-half step lower than pitches of the major scale, especially on the third, sixth, and seventh degrees of the scale). Thus, a melody based on the C scale might have these pitches: C, D, E-flat, E, F, G, A-flat, A, B-flat, and B.

2. Set the shortest note value to record. Set the tempo to 84. Activate the preparatory measure counter and metronome.

3. Select a bass sound for Track #5 and play and record a bass line for a twelve-bar blues progression in the key of C. Once finished, listen to your sequence. Save or re-record it.

   If your keyboard skills are limited, record the bass line as follows:

   (a) practice and record the first measure of your bass line (C chord)

   (b) copy and paste it to measures 2, 3, 4, 7, 8, 11, and 12

   (c) practice and record measure 5 (F chord) and copy it to measures 6 and 10

   (d) practice and record measure 9 (G chord).

4. Record chords on Track 4, setting **Program** to an instrument that produces sustained sounds (e.g., Hammond Organ) and begin recording. Hold down the keys of each chord for four beats (C chord: C-E-G, F chord; C-F-A; and G chord: B-D-G).

5. Record a chord accent track on Track 3, setting Program to an instrument with a piercing sound (e.g., a trumpet). Play the same chords as in number 4 above, but with a short, punctuating rhythm on and off the beat.

6. Record a bass drum/snare drum track. Set Track 6's channel and program. Play a low key on strong beats and a higher key on weak beats (e.g., on beats 1 and 3, play low C; on beats 2 and 4, play C an octave higher).

7. Record a cymbal ride track (Track 7). Play a shuffle rhythm of long-short for each beat.

8. Tracks 3–7 make up your background music. Copy and paste the musical lines until you have four repetitions of the blues progression.

9. Play your blues sequence on the computer and play an improvised melody on the keyboard. Try to include some "blue" notes as described in Part 1. When ready, set up Track 1 with a strong-voiced instrument (e.g., trombone) and record starting in measure 13. By doing so, the first statement of the blues will be played only by the background music and serve as an introduction for your "solo."

10. Beginning in measure 25, record a solo with a different instrument on Track 2 while the computer plays the background progression.

11. Starting in measure 37, copy both previous solos on their respective lines in measures 37–48. Then, create a technique that blues musicians call "trading twos": cut measures 1 and 2 of the solo on Track 2 so that only the Track 1 solo will play. Then cut measures 3 and 4 of the solo on Track 1 so that only the Track 2 solo will play. Alternate solos every two measures.

12. Make an ending on the C chord in all tracks.

13. Play your sequence and record the sound on a cassette tape player or DAT recorder.

14. Share your work with others—friends, relatives, or the public. If you keep a scrapbook or portfolio, be sure to include a copy of your tape.

Questions for Self-evaluation:

(a) How well did the composition meet the requirements of the assignment?
(b) Did you revise? What did you change? How did you change it?
(c) Did you hear music inside your head? When and how did this happen?
(d) What "worked" or was "interesting" musically about the composition?
(e) If you had more time to spend on the composition, is there anything you would change?
(f) How successful was the process? Does anything in it need to change?[2]

Notes:

1. The effectiveness of this exercise can be increased by including one or more of the SCAMPER compositional strategies as proposed by Maud Hickey. For further information, see Maud Hickey, "Teaching Ensembles to Compose and Improvise" *Music Educators Journal* 83, no. 6 (May 1997): 17–21.

2. Patricia Campbell and Carol Scott-Kassner, *Music in Childhood* (New York: Schirmer Books, 1995).

mony, melody, rhythm, notation, music history and style, keyboards, composition, and multicultural awareness.

Yet another way to use only one computer with a whole class of students is to set up a mastery learning curriculum, in which the desired musical concepts and skills are carefully sequenced in small steps and students proceed at their own pace through the activities designed to teach the skills and concepts.[3] Computer learning activities can be woven into the curriculum at many places to help students learn. An achievement chart can be used to keep track of students' progress through the curriculum. Students are encouraged to help each other, and the teacher's main roles are checker, helper, and adviser. Lessons learned through technology provide variety for students and relieve the teacher from some of the repetitive teaching chores.

Obstacles to the One-Computer Approach

Some teachers have tried to solve the one-computer problem by setting up the computer (fitted with headphones) in a corner of the music room and cycling all students, individually or in small groups, through programs while they present a regular lesson to the remainder of the class. Although this method gives students exposure to technology and allows for more individual control, pacing, and feedback, there are several practical and philosophical problems with it. While students are using the computer, they miss the music lesson of the day. This sends the message that learning in music class is not very important. Some students resent missing music class, particularly if the class activity that day is especially fun. It is also difficult for the teacher to monitor students' use of the computer or to answer questions without interrupting the lesson for the rest of the class. Some students need close supervision to stay focused on task and to be prevented from damaging equipment. Sound from the classroom lesson often mixes or overpowers computer sounds, making it difficult for students to focus on the computer lesson.

Making the Case for Resources

Just last year, MENC published the "Opportunity-to-Learn Standards for Technology in Music Education," developed by the MENC Task Force on Technology. You may be able to use these standards to promote discussion with administrators and other decision-makers about equipment, software, scheduling, and other elements you need to use technology effectively in your teaching. The standards can be found on the MENC web site at http:// www.menc.org/publication/books/techstan.htm

Movement activities in the classroom lesson also tend to distract computer users visually.

Finally, cycling students through a computer program takes a long time, limiting the number of programs teachers can expose students to and disrupting the logical flow of instruction and its connection to the rest of the curriculum. In this approach, learning through technology can provide ancillary enrichment experiences, but not a systematic development of skills and concepts within a broad-based sequential music curriculum. However, this approach to using technology can be effective in a limited way if it is modified to provide specialized instruction to specific groups of students with special needs, such as students with physical disabilities or gifted students needing greater challenges than regular music education usually provides.

Extra Software, Not Extra Computers

Teachers should also keep in mind that there are opportunities for students to use music software outside the music classroom. Most schools today have a computer lab in which the music teacher can place software once it is introduced to the whole class. A teacher could purchase multiple copies of software and set up a loan program through the media center so that students could check out software to take home just as they do books. Many students have computers at home, and parents (and grandparents) are grateful when teachers send home information about what their children are learning through music software, where they can purchase the software, and how much it costs. Music teachers can "assign" software homework (to be done during computer lab time or at home). The completion of this work can be verified by a printout (many software programs have built-in progress reports) or by the signature of the computer lab teacher or parent. By taking advantage of these and other learning venues, music learning time involving technology can be increased while not being substituted for other musical activities in the classroom.

By thoughtful use of scarce resources, music teachers can increase the effectiveness of one computer in their classrooms. Rather than purchase multiple computers, they might consider buying multiple copies of many kinds of software. Doing so will provide a large variety of lessons for students in the music classroom, the computer lab, and at home. The greater the variety of lessons, the more opportunities there are for the teacher to connect computer lessons meaningfully with other lessons in the curriculum, and the more students are able to explore areas of particular musical interest.

Notes

1. *The School Music Program: A New Vision: The K–12 National Standards, PreK Standards, and What They Mean to Music Educators* (Reston, VA: Music Educators National Conference, 1994).

2. Kirk Kassner, "Management Systems for Music Teachers," *Music Educators Journal* 82, no. 5 (1996): 34–41.

3. Kirk Kassner, "Effects of Computer-Assisted Instruction in a Mastery Learning/Cooperative Learning Setting on the Playing Abilities and Attitudes of Beginning Band Students" (dissertation, University Microfilms International, 1992). ■