Teaching Music with Technology

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Chapter 1

Technology in Music Education: An Overview

Technology is everywhere in our culture. The word technology applies to and describes a wide variety of devices and applications in music and music education. By general definition, technology is anything that uses science to achieve a desired result. Technology has assisted performers and music educators for centuries. The organ, harpsichord, piano, and phonograph are all examples of technologies that were as amazing to those who originally used them as computers are to us today. The trumpet was played without valves throughout the Baroque era. In the Romantic period, the valve was incorporated into the design of the trumpet and this technology revolutionized the instrument. Likewise, the invention of the silicon chip and computer microprocessor in the late twentieth century have had as great of an impact on music and music education.

Technology

The term technology, as it will be used throughout this text, refers to the most recently invented state-of-the-art devices such as computers, electronic keyboards, CDs, CD-ROMs, and DVDs. Other devices such as the overhead projector, phonograph record player, cassette recorder, and filmstrip projector are no longer considered cutting edge. In the last 20 years many tools have become available to music educators that can significantly enhance student learning. These devices include computers and electronic keyboards plus all
the high-tech equipment listed above. It is important for music educators to be aware of the full capabilities of these tools that can help students to better perform, create, and understand music.

**Types of Technological Devices**

Technological devices are either passive or interactive. A passive device merely plays music or displays information. Passive devices include the phonograph record player, cassette tape deck, television, video cassette player, DVD player, and overhead projector. With passive devices, the student perceives the material but there is no interaction with the device or medium. For example, a class listening to a recording of a musical composition is taking part in a passive exercise. Tape and CD players are passive devices—they merely play an audio recording of a piece of music. If the goal is simply to play a musical recording, then a CD player is a fine choice. Certainly, music lessons and classes can be enhanced with the use of passive devices such as videos of performances, instrument demonstrations, and the like.

Devices that engage the user directly are referred to as interactive. Playing a video game and using a computer are interactive activities. We know from experience and years of educational research that interactive learning is much more effective than passive learning. Technology offers many forms of interactive learning. When the term technology is used in this text, it will be in reference to devices such as the computer and other computer controlled interactive instruments.

**Implications of Technology**

In the past 100 years, technology has had a huge impact on music in general and music education in particular. Neil Gershenfeld, in his book *When Things Start to Think*, states:

It used to be that people played music, because that was the only way to hear it. When mass media came along, society split into a small number of people paid to be artistically creative and a much larger number that passively consumes their output. Reducing the effort to learn to play an
instrument... points to the possibility that far more people will be able to creatively express themselves. Improving the technology for making music can help engage instead of insulate people.

This suggests that new technology has the potential to engage students in making music in more and varied ways. Therefore, technology, when used appropriately, can be used to enhance the musical experience.

Technology in Education
Since the time of John Dewey, educational researchers have been advocating active participation as a key ingredient of effective learning. Music teachers have embraced the philosophy of “learning by doing” for decades. Students can use technology to compose, perform, and learn music. Technology provides ideal media for music education.

Technology is having a broad impact on education. In 1983 the Carnegie Foundation published A Nation at Risk. This publication cited that changes must be made in our approach to education. One of the suggestions the Carnegie Foundation offered was to embrace technology. Then, in 1994, music became part of the Government sponsored Goals 2000: Educate America Act. As part of this act the National Standards for the Arts were developed. With the development of national standards, a high priority was placed on using technology in all subject areas.

Teaching Strategy 1
Use technology to implement the National Standards for the Arts as defined by MENC. Technology can be used to enhance all nine music standards.

Technology can be used to enhance the national standards. This is supported by a study that found that the majority of all American teenagers are comfortable using a range of technological devices, including computers, compact disc players, fax machines, and cell phones.
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One thing has been constant over the past ten years: technology continues to improve and gain popularity at all levels. School districts have been integrating computers into the curriculum beginning at the elementary level and technology is being supported in many subject areas. If used appropriately technology can "...extend the reach of both the art form and that of the learner."  

Technology and Music Education

The place and purpose of technology in music education must be found before beginning to properly apply the technology. Simply making technology available is not enough.

For the arts, technology thus offers means to accomplish artistic, scholarly, production, and performance goals. But the mere availability of technology cannot ensure a specific artistic result: the pencil in a student's hand ensures neither drawing or competency nor a competent drawing.  

David Mash, Vice President for Information Technology at Berklee College of Music, states that technology has created new opportunities in the field of music and that we, as music educators, must prepare students to interact with and utilize these tools. Chamberlin, Clark, and Svengalis, in their article, “Success with Keyboards in the Middle School” state that if “music is to stay a viable part of the school curriculum and meet the needs of students, it must combine technology with traditional skills as other subjects are doing.” Teachers have found that technology can enhance cross curriculum teaching, hands-on learning, cooperative learning, independent study, and higher level thinking skills as well as provide an excellent assessment tool.

Research has been conducted on the effects of technology on music learning. Yamaha Corporation conducted research relating to music education and the use of technology. The result of the study included several key findings resulting from successful use of the technology in music education. These include:
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- Student attitudes toward classroom music are not only positively enhanced, but levels of interest and motivation are sustained across multiple academic years.
- Long and short term music achievement, as evidenced in standardized tests, is significantly increased when compared to existing approaches of classroom music.
- Students who received hands-on instruction had greater comprehension of musical concepts compared with students taught with traditional approaches and methods.
- Music instruction provided through a technology assisted program contributes to a sense of professional development and personal growth on the part of the music educators.
- Additional outcomes of the study showed that technology improved student concentration, maximized time on-task, developed and enhanced cooperative learning, and fostered higher level thinking skills. Classroom teachers and building administrators noted that these aspects carried over to learning in non-music classrooms.\(^1\)

I have found similar results to those stated above with the integration of technology both through my teaching and my interactions with many music educators over the past 15 years. At Haverford Middle School we use a lab of electronic keyboards for general music and our middle school students have shown a significant increase in their motivation and enthusiasm toward general music class. Furthermore, electronic instruments and computers provide a tool for creativity at all levels. Music teachers throughout the country report similar findings.\(^2\)

Technology Applications: Tutor, Tool, Tutee

There are three ways to use interactive technology in education: tutor, tool, and tutee.\(^3\) Each of the three modes offers a wide range of possibilities. Incorporating technology into the music curriculum can create exciting and productive classes, lessons, and outcomes.

Education experts feel that technology can be used to support the theories of "Dewey, Montessori, and Piaget that children learn by doing and by thinking about what they do."\(^4\) A combination of the tutor, tool, and
tutee applications of technology can be tremendous teaching and administrative tools for music education.

In the tutor mode, the device (usually a computer) presents information to the student in an interactive manner. First, the software is programmed by an expert. The lesson or information is then delivered by the computer. The difference between a computer and a video tape is that the computer can interact with the user. The student enters a correct or incorrect answer and the computer gives appropriate feedback. The majority of music education applications lie in this area.

Technology also has many functions as a music education tool. The tool role includes a computer using technology to record, play back, and/or print music and as an electronic typewriter to assist with administrative duties.

The tutee, or learner, mode offers powerful capabilities. Here the user programs a computer with an authoring language. Applications in the tutee mode include designing new computer software and creating multimedia presentations and projects.

The Crayons of Music Education

There are essentially two types of students in our music programs: performers and consumers. The performers are students who choose to participate in chorus, band, orchestra, and other related performing organizations. They perform and are active participants in the music program. We also have the consumers—our general music students. Technology can be used to benefit every music student, both the performers and consumers. Computers and electronic instruments can be used to enhance performance and classroom music experiences for every age student.

Music technology can be compared to the art supplies used in art education. Undoubtedly, art education was enhanced when materials such as crayons, proper papers, and modeling clay became available. Computers and electronic keyboards can be viewed as modeling clay, construction paper, and crayons for music. Technology allows students of all abilities and ages to compose, perform, and create music in new and exciting ways.

Computers and computer-controlled instruments are crayons for music class. Just as art students create successfully using crayons and other creative
tools, so, too, all can music students create, compose, and perform music with the aid of technology.

Technology and the Music Curriculum
The best way to select the ideal use for technology is to first focus on the curricular goals and desired educational outcomes and then select the materials or devices that will best accomplish the stated goals. There are two general categories of goals for music curricula at all levels: skills and knowledge. Skills refers to the ability to play musical instruments, sing, create, and perform music. Knowledge refers to understanding and comprehending information about music such as a composer's biographical information, music theory concepts, and so forth.

Teaching Strategy 2
Establish the goals of the music curriculum. Then ask how technology can best serve the desired outcomes.

The National Standards for the Arts as developed by MENC contain nine distinct areas. These are:

1. Singing, alone and with others, a varied repertoire of music.
2. Performing on instruments, alone and with others, a varied repertoire of music.
3. Improvising melodies, harmonies, and accompaniments.
4. Composing and arranging music within specified guidelines.
5. Reading and notating music.
6. Listening to, analyzing, and describing music.
7. Evaluating music and music performances.
8. Understanding relationships between music, the other arts, and disciplines outside the arts.
9. Understanding music in relation to history and culture.

Technology can serve virtually all of the above areas to enhance learning. Specific applications will be addressed throughout the chapters that follow. State of the art technology is a complex subject and has many different
levels of application. It is helpful to organize the various applications into seven distinct areas.

**The Seven Areas of Music Technology**

The Technology Institute for Music Educators, or TI:ME, has divided technology into seven areas. They are:

1. Electronic instruments
2. Music notation software
3. MIDI/digital audio sequencing
4. Instructional software
5. Telecommunications and the Internet
6. Multimedia and digital media
7. Information processing and lab management

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**Teaching Strategy 3**

Review the seven areas of music technology when searching for ways to find unique applications of music technology.

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Each of the seven areas above have been grouped into either teacher or student applications. For example, with regard to electronic instruments, the text states:

Music teachers need to know how MIDI connections are made among instruments, how to use MIDI in the classroom, and how to connect MIDI instruments with computers. They need to understand how to create layered and split keyboard sounds for performances. They also need to be able to choose and edit sounds from stored libraries and create sounds using an electronic instrument.

Students can use electronic instruments as musical crayons creating simple to complex musical pieces while gaming dexterity and technique. They can learn musical processes with electronic keyboards and have fun at the same time.
Electronic instruments can also be used in performance to enhance traditional and electronic-acoustic ensembles."\textsuperscript{16}

Thinking of technology in reference to student and teacher needs can help in identifying the most appropriate applications. In the chapters that follow, many applications of technology will be visited with specific reference to student and teacher application.

**NETS Standards (National Education Technology Standards)**

In addition to the MENC National Standards for Music Education, there are also the National Education Technology Standards (NETS). These standards were developed by the International Society for Technology in Education (ISTE, www.iste.org) and can be applied to any and all subject areas. The ISTE organization states that our educational system has a responsibility to produce technology-capable students. Six areas of technology standards (NETS) were created to address this goal.

The NETS standards for students are divided across these six broad categories. Standards within each category are to be introduced, reinforced, and mastered by students. Teachers can use these standards and profiles as guidelines for planning technology-based activities in which students achieve success in learning, communication, and life skills. The six NETS standards are:

1. Basic operations and concepts
   a. Students demonstrate a sound understanding of the nature and operation of technology systems.
   b. Students are proficient in the use of technology.

2. Social, ethical, and human issues
   a. Students understand the ethical, cultural, and societal issues related to technology.
   b. Students practice responsible use of technology systems, information, and software.
c. Students develop positive attitudes toward technology use that support lifelong learning, collaboration, personal pursuits, and productivity.

3. Technology productivity tools
   a. Students use technology tools to enhance learning, increase productivity, and promote creativity.
   b. Students use productivity tools to collaborate in constructing technology-enhanced models, prepare publications, and produce other creative works.

4. Technology communications tools
   a. Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences.
   b. Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.

5. Technology research tools
   a. Students use technology to locate, evaluate, and collect information from a variety of sources.
   b. Students use technology tools to process data and report results.
   c. Students evaluate and select new information resources and technological innovations based on the appropriateness for specific tasks.

6. Technology problem-solving and decision-making tools
   a. Students use technology resources for solving problems and making informed decisions.
   b. Students employ technology in the development of strategies for solving problems in the real world.

For more information, visit the NETS web site at http://cnets.iste.org/.

Music educators can make connections between the use of technology in the music curriculum and the National Education Technology Standards. By showing the connection to the NETS standards, music teachers can build support with administrators to support the use and purchase of technology in the music classroom. In the chapters that follow, many of the music technology activities support the NETS standards.
Integrating Technology into the Curriculum

A sound approach to integrating technology into the curriculum is by first identifying an educational goal or selecting one of the National Standards. Then choose the appropriate technology to accomplish the goal. After reading the chapters that follow, this process will become simple. Technology must not be the end in itself, but rather a means to an end. Teachers can use technology to enhance the national standards in many ways.17

Although there is some crossover in each of the nine areas, they are basically standards of skills or knowledge areas. Technology can be used to enhance all the skills and knowledge areas of the nine standards. For example, electronic keyboards make exceptional classroom and ensemble instruments, and computers can be used to create, compose, and perform music—making them excellent tools to enhance the skills/performance areas of music education.

Once the skills and knowledge based goals are in place using the National Standards as a guideline, technological applications can be selected to help students to achieve these goals. For example, if the music curriculum identifies specific knowledge areas as presented in Standards 6-9, technology can be used to help present, reinforce, and test this information. If, perhaps, it is determined that students will be able to perform, create, and improvise music, as mentioned in Standards 1-5, technology can be incorporated to help realize these goals as well. Specific examples of how to accomplish this end will be introduced in the chapters that follow.

Not a Panacea

Technology is not a panacea for music education. It will not solve all of the existing problems, and, as with any new educational tool, it will introduce some problems of its own. Technology works best when it is perceived as an enhancement or teaching device rather than the driving force of an entire music curriculum.

The emphasis of music education is not changing with technology. A teacher who attended one of my summer workshops asked if now she had to write a computer curriculum. My response was an emphatic, “No!” Rather, use technology to enhance the existing performance and classroom curriculum and to provide new technology-based programs that will advance
curricular goals. Some subject areas that were not practical using traditional means, such as composition, can be now offered with the aid of technology.

The main benefit of using technology is that it offers an enticement to attract students to engage in the arts. "In the end, however, the use of technology in the arts instruction is meaningful only to the degree that it contributes to competence, and the contribution comes through instruction and study". Music teachers must find ways to integrate technology so that it is not the end in itself.

Dr. Peter Webster has researched the current state of music technology and in his summary of research on music education states:

So, is music technology effective and is it worth the trouble? On balance and on a very basic level, the answer to this question is yes. Does music technology hold the key for solving all our music teaching problems? Of course not. Are there abuses in its use? Absolutely. Does it always improve learning? No, much depends on the context—especially the teacher and its use instructionally. Is it worth the trouble to keep studying its role in music teaching and learning? Unconditionally, yes.

Charles Argersinger agrees that technology can be a fantastic asset in the creation of music. However, he also warns that technology can create the illusion of sophistication without nuance. Argersinger feels we must emphasize the use of technology towards the creation of better work. This is good advice. We, as music educators, must embrace technology and constantly strive to tie it to the outcomes or goals of our curriculum.

**Summary**

Technology is an effective and exciting way to augment and supplement the music curriculum. Music teachers are compelled to find ways to include technology in the classroom, instrumental, and choral curricula. The chapters that follow will explore many ideas and ways to include technology in the music curriculum in a positive, productive manner.
Notes

Chapter 1

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Chapter 2


Chapter 4


