UNIVERSITY OF MIAMI

THE INTEGRATION OF COMPUTER TECHNOLOGY INTO MUSIC TEACHER TRAINING CURRICULA: AN HISTORICAL PERSPECTIVE

By

Jay D. Dorfman

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The purpose of this study was to trace the integration of computer technology into curricula used to train music education students for teaching in a K-12 environment. Twenty-six experts in the field of music technology education were sent five open-ended questions designed to probe their experiences and beliefs regarding this integration. Ten responses were received by email or on audiotape. Using the interview responses, along with other primary and secondary historical resources, the development was traced beginning with the initial experiments in electronic music in the academic world, and concluding with uses of the World Wide Web in music education. For the purpose of organization, the study was divided into three chronological periods. Conclusions were drawn based on the historical trends that developed throughout the periods addressed in the study. Recommendations for more specific research are enclosed.
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THE INTEGRATION OF COMPUTER TECHNOLOGY INTO MUSIC TEACHER TRAINING CURRICULA: AN HISTORICAL PERSPECTIVE

Introduction

At conferences and meetings of music teachers throughout the country, technology is a popular topic of lectures, presentations, and informal conversation. It is, however, an area of music education that is still in its infancy. Music teachers are exploring its uses in the classroom and in their lives, and the appropriateness of the integration of technology into the music and music teacher training curricula is still questioned by many. Despite the persistent interrogation of the validity of technology in music, the education profession has acknowledged its importance. With that relevance recognized, it is necessary at this point that the history of the progressive integration of technology into the music curriculum be recorded.

Purpose and Significance of the Study

The purpose of this study was to document the ideas and events that led to the integration of technology in the training of school music teachers. Documentation exists that traces the development of fields of specialization within music education such as instrumental music, choral music, contest movements, general music, and the use of movement in school music. As a comparatively new subject in music teacher training, the integration of technology is not yet viewed as a topic of historical significance, when in fact several factors have led to its inclusion in the curriculum over many years. Technology integration in music relates directly to issues of teacher training and uses of technology in the schools. These relationships are discussed in this study.
As with any historical research topic, certain events mark major changes in the thoughts and behaviors of those individuals involved in the development of an idea. The significance of this study is in its recognition of those events: the major contributions made by individuals to advance the cause of technology in the music teacher training curriculum. Several texts have isolated individual efforts that have brought about change in the music teacher training process. It was the author’s intention to synthesize the most significant contributions to this field in a single resource.

This research project also served to delineate the integration of technology into music teacher training curricula into chronological periods. The first period, prior to the 1980’s, is characterized by unclear curricular guidelines for technology in music. The onset of the 1980’s began the second period, which is distinguished by many calls for reform to the general music teacher training curriculum, and the introduction of ideas for including technology in the music curriculum. The third time period began around 1995 with the establishment of the Technology Institute for Music Educators (TI:ME) which codified the skills that teachers must have to be considered proficient with technology on several levels. The research project concludes with a summary of the information and with predictions for the future.

Several research questions were addressed in this study. They include:

1. Why has technology become a topic that is included in most music education programs today?

2. Which individuals made the most significant contributions to the development of music technology education?
3. What is the involvement of professional organizations in the development of technology education in music?

4. When did integration of technology into teacher training curricula begin to occur?

5. At what points in history have people changed their philosophical views of technology in music teacher training, and what factors brought about those changes?

6. What are the specific topics within the field of music technology that have been/are being addressed in music education programs?

Definitions and Limitations of the Study

For the purposes of this study, the definition of technology was limited to computer technology. In music, improvements to the physical quality of instruments is an important technological development that allowed performers to achieve improved tone quality and intonation while eliminating fatigue and other negative attributes of instruments. The use of electronic technological devices in the music classroom was important long before the advent of the personal computer. One could research the many contributions to the music industry and to the art alike, which were based on the development of and improvements to equipment. However, in order to focus the topic of this study, these contributions and others were acknowledged, but were not central to the research. Rather, the text focuses on the use of computers, both mainframe and personal.

A definition of the type of music teacher training addressed is also necessary. The teacher training programs discussed in this study are those that intend to prepare music teachers to work in the K-12 environment. While there are also important uses of
technology for the private studio teacher, technology use in teacher training programs tends to focus on preparing music teachers for the classroom.¹

Review of Related Literature

This section will survey several texts that relate to music teacher training and technology. There will be three types of sources discussed: (1) sources on the general history of music education and its reform movements, (2) sources dedicated to instruction in music technology, and (3) studies that provide data on the effects of technology in the varied environments of music learning. It is only within the past two decades that authors have begun to address technology as a significant part of the curriculum; therefore, not all of the sources discussed herein are dedicated solely to technology. Sources prior to that time period address technology on a very limited basis, usually as a small subtopic of items such as instrumental music education, general music education, and general education for the music teacher. These historical sources provide some insight into the perspective of those charged with teacher training, and their beliefs as to the importance of technology in curriculum.

Current teachers are fortunate to have several reference materials that have served as definitive handbooks on the topic of technology in music. These materials address broad ranges of technology-related topics, and are geared toward pre-service or practicing teachers who will use technology in their classrooms. As with most research topics in music education, there also exist many sources that provide data on the effectiveness of

¹ The major texts available for teacher training in technology (Williams and Webster, Hofstetter, Rudolph, etc.) address issues of technology use in the classroom far more than in the private studio setting.
technology in music teaching and learning, and on teachers’ and students’ attitudes toward technology. In these studies, the hardware or software technology is the dependent variable; they serve to validate or invalidate the use of the technology as a teaching tool.

Sources on the General History of Music Education and Reform

Several important texts have been written to trace the historical development of music education, and coincidentally include information pertaining to the various reform movements in the field’s history. The reform movements are not the topic of this paper, and will therefore not be discussed in any detail, but they are significant to the technology movement because reformists bring new ideas to the forefront of music teacher training. It is through the ideas of reformers that new topics such as technology have come to prominence. Houlihan² (1961) traced the history of the Music Educators National Conference (MENC) from its beginnings as a branch of the government agency, the National Education Association. Leeder and Haynie³ (1958) made direct reference to the use of emerging technology by the high school music teacher, and warned of the potential dangers of misuse of technology. “Teachers who do not have a basic philosophy and understanding of audio-visual methods have been quite willing and ready to show any film on any subject at any time. The indiscriminate use of motion pictures has been one of the most serious problems in audio-visual education.”⁴ These authors recognize the lack

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⁴ Ibid, 260.
of training music teachers had in the use of technology and suggest that they “seek the advice of an audio-visual specialist.”

Mark and Gary also traced the development of MENC, and focused a great deal of attention on the National Association of Schools of Music and its function as an accrediting body for schools of music and music teacher training programs. “The NASM was created in 1924 with the accreditation of all music degree programs as one of its major purposes. For some time thereafter, music teacher-training programs were approved by NASM and by the various state accrediting offices.”

A thematic similarity among these works that discuss the general history of music education in the United States is their attempt to delineate the proportions of subjects to be taught in music teacher training programs. Each of them makes reference to the NASM standard that as much as seventy-five percent of the music teacher training curriculum was to be devoted to formal music study. The remaining twenty-five percent was assigned to general education requirements.

Sources Dedicated to Technology in Music

Fred T. Hofstetter is widely viewed as a pioneer in the uses of computer technology as an instructional aid and as a tool for teacher presentations. His book *Computer Literacy for Musicians*, provides information for the pre-service or active teacher on the practical uses of technology in music teaching. The book discusses the early uses of computers in the music classroom and the production and integration of the

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7 *Ibid.*, 221
Musical Instrument Digital Interface (MIDI) specification. Its ninth chapter contains a timeline of significant dates and events in the development of music technology in education. Hofstetter divides his chronology into the subheadings of System Developments, Applications, Organizational Landmarks, Hardware Breakthroughs, and Brand-Name Computers and the Years in Which They Were Released. Writings by Hofstetter often include some prediction or insight into the future of music technology, and this book is no exception. The final chapter is comprised of suggestions for improving music software so that it will become more functional and user-friendly.

Steven Estrella names Thomas E. Rudolph as “[t]he single most influential person in [the music technology] field.”9 Rudolph’s *Teaching Music with Technology*10 serves to help teachers move music technology from the college lecture hall to the public school classroom. This book gives teachers practical instructions on how to use computers, synthesizers, and other advanced technological devices and software in their teaching of music. Rudolph includes in this book over 100 teaching strategies, which are essentially objectives which lead teachers to obtaining the skills necessary to effectively use technology in the music classroom. These strategies may be as broad as “Establish the goals of the music curriculum. Then ask how technology can best serve the desired outcome,”11 or as focused as “Add a projection system to your set up and display the screen image for an entire class or performing ensemble.”12 The text also includes tutorials for the use of several computer applications that were popular at the time of the

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9 Steven Estrella, interview by author, April 25, 2002. Interview in possession of the author.
11 Ibid, 9.
12 Ibid, 217.
book’s release for the production of hypermedia, recording audio and MIDI, and music printing.

Currently, the most important work to address directly the integration of technology into the music curriculum is *Experiencing Music Technology: Software, Data, and Hardware* by David B. Williams and Peter R. Webster. The book is written from the perspective of two teachers responsible for music teacher training, and therefore most directly deals with preparing teachers for technology use. It is intended for use in the college classroom, but can be adapted for the high school level. A concerted effort is made within this text to address the historical development of music technology. Each Viewport, the authors’ term for a chapter, begins with an overview of the subject, which is immediately followed by a timeline of important events and people that have contributed to the specific area of technology to be explored. Although the book is geared mostly toward computers as the “hardware” of music technology, its scope is wide. Each chapter delves deeply into a broad concept of music technology.

Viewport I is an overview of the important people and procedural issues of music technology. It includes very brief biographies of several individuals who have made outstanding contributions to the field, as well as a developed view of the historical periods of music technology, as divided chronologically by the authors. Viewport II discusses the uses of computers as communication devices over the Internet and over local area networks. Viewport III introduces the reader to computer-assisted instruction. The fourth Viewport is perhaps the least “musical” of all, as it discusses the general

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procedures of desktop publishing. One might question the inclusion of this topic in a textbook about music technology, but the authors clearly defend their reasons for this apparent digression. The software pieces discussed in this chapter include word-processing, graphics, database, spreadsheet, and statistical applications, which all fit into a category that Williams and Webster call “Fill-Your-Own” software. In this type of software, “someone has already programmed the logic of the computer software but has left it empty of content so you can fill in your own information.”14 The authors show that these applications use processes similar to those of music programs in the same category.

The transition to discussions of music software is therefore a logical one. Viewports V and VI discuss music notation and MIDI sequencing respectively. Viewport VII explores both the hardware and software necessary for creating music with digital audio. The eighth and final Viewport explains the uses of multimedia authoring including hypertext and CD-ROM burning.

Yet another interesting feature of Experiencing Music Technology is its focus on the individuals that have helped to develop this field. Interviews with professors, composers, and performers shed light on the contributions that these people have made. Those interviewed for the text include Edward Asmus, Dale A. Olsen, Christine Hermanson, David Cope, Henry Panion III, and Pierre Boulez.

Now in its second edition, Experiencing Music Technology is a vast resource for teachers interested in integrating music technology into music programs, and is an appropriate text for college classes on music technology.

Studies on Music Technology

Throughout the development of music technology, and its concurrent integration into music teacher training curricula, several traditional studies have been conducted which help to reveal the relative importance of this topic in the larger curricular structure. Some of these studies deal with several curricular areas and only make mention of technology, while others deal with technology independent of other curricular disciplines.

During the 1970’s and 1980’s, a time when several calls for reform were afoot, Taebel\textsuperscript{15} addressed several points of change he believed necessary to improve the quality of music teacher training programs. “At this stage it appears that teacher education programs are based less on empirical research which shows the effect of teaching competencies on pupil learning, than on theoretical models of teaching and informed opinion.”\textsuperscript{16} His study is a report of the relative importance of several competencies, which were gathered by interviewing teachers and administrators. The use of audio-visual equipment ranked as the sixth most important topic that needed to be given more emphasis in the curriculum.

Erbes\textsuperscript{17} studied trends in the certification of music teachers based on surveys of teacher training institutions and on policies of state accrediting agencies and national boards of accreditation. He reports that as of 1986, only two states listed a course in computer literacy as a requirement for music teacher certification, while several others claimed to be considering the possibility. As his study is designed to track the trends of


\textsuperscript{16} \textit{Ibid}, 186.

certification, Erbes summarizes that, “certification practices other than testing have not changed dramatically since 1982-3.”

A related study by Wollenzein concentrated on the curricular areas of teacher training institutions and examined the recommendations of the National Association of Schools of Music pertaining to the comprehensive curriculum in music teacher training. He reports that, in addition to the basic competencies for baccalaureate degrees in music (performance, aural skills and analysis, composition, history, technology, etc.), NASM sets guidelines for those training to become music teachers to receive instruction in educational psychology, instructional design, education technology, and unique learner settings. Wollenzein also directly addressed the increasing significance of technology in the curriculum:

“In 1985, 68% of all institutions reporting in Schmidt’s study offered the topic dealing with technology, and it was usually mentioned in 1 to 2 class periods. In today’s study, 89% of all institutions offer the topic. The time allotted is generally 3 to 7 class periods or more, and is offered as the main focus of 1 or more course in 34% of responding schools. The overwhelming increase in technological development in the intervening years of these studies has influenced music education and music performance significantly. The importance of this topic in undergraduate curricula will probably continue to grow as technological applications continue to affect our lives and our students’ lives.”

Jones provided us with a clear example of the type of study that is traditionally focused on technology. In this study using technology as an independent variable, he studied the effect that the hardware or software has on the learner’s efficiency, attitude, or

18 Ibid, 14.
20 Ibid, 96.
some other aspect of learning. “The purpose of this study was to develop and test a practical system which would enable music education students to effectively practice error detection skills in the context of score reading.”22 The technology, in this case, was used for playback of audio examples in random order, for instruction, and for recording and analyzing the responses of the user.

The 1997 study by Mager23 reported the status of technology in the curriculum, although in this case his findings are limited to the uses of MIDI, and not to technology as a whole. The purpose for his study was, “to report on the current status of MIDI in the curricula of higher education institutions offering music degrees.”24 He concludes that a thorough treatment of MIDI in the music education curriculum would involve a series of three courses; the first course would serve as an introduction to the topic and its uses, the second as a development of the first and to explore more advanced topics such as general MIDI and digital audio, and the third course for instruction in multimedia authoring and courseware development. Analysis of the data indicated that almost two thirds of those music education professors who responded to a questionnaire worked at institutions where courses are offered that teach the integration of MIDI into the music education curriculum. Almost half of the respondents said that such courses are required, and that technology definitely enhances the educational experiences of their students.

Price and Pan25 conducted a recent study on the proliferation of technology in the higher education music curriculum. “The purpose of [their] study was to collect data

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22 Ibid, 7.
24 Ibid, 133.
concerning the implementation of technology in music education programs at the college level in NASM accredited music education degree programs.\(^{26}\) The authors developed a questionnaire to gather information about the curriculum, facilities, and personnel of the participating colleges in the Southern Division of MENC.

Responses to the questions on curriculum expressed opinions that, in descending order of frequency, notation, MIDI, Internet use, sequencing, hardware, software, synthesis, multimedia, and sampling are the topics most often covered in undergraduate courses at the colleges and universities which responded. The data regarding facilities only briefly mentioned the physical space allotted for technology at these institutions, and instead focused on the hardware and equipment available for student use.

Faculty who responded to the survey were of vastly differing backgrounds and amounts of experience. They were polled not only for their personal backgrounds, but for their use of Internet utilities including email, web browsers, file transferring, sound/video streaming, newsgroups, and chats. The authors found that “only 59% of the colleges responding reported having adequate staff to teach music education technology.”\(^{27}\)

The authors concluded that the most important issues facing the development of music technology can be grouped into the two categories of funding, and teacher preparation and training. They note, “It is striking that many of our prospective music teachers are not introduced to the use of music technology to augment their teaching.”\(^{28}\) The comments from the questionnaires in this study expressed the desires of the faculty

\(^{26}\) *Ibid*, 2.
\(^{27}\) *Ibid*, 16.
members to have technology integrated further into their classrooms, and into courses outside of the music education curriculum.

Sources

The main body for accreditation of institutions granting certification in music education is the National Association of Schools of Music. The organization publishes a semi-annual handbook that presents its guidelines for accreditation. This handbook served in this study as an important source of information for NASM policy on the integration of technology into the undergraduate music curriculum, and more specifically into the music teacher training programs at accredited schools.

The Music Educators National Conference publishes its recommendations for technological opportunities that should be available to college students on its Internet site29, as does the College Music Society on its site.30 Several other organizations such as the Association for Technology in Music Instruction, and Technology Institute for Music Educators, or TI:ME, also post their philosophical statements, as well as their historical records on the World Wide Web. These served as evidentiary documents for the significance of these organizations in the development of music technology curriculum.

The most important source of information for this study was a series of interviews with some of the important people in the field. Several professors throughout the country were contacted and asked to respond to a series of questions (see Appendix A) designed to probe their involvement in the history of music technology and music teacher training.

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29 http://www.menc.org
30 http://www.music.org
The questions were intended to produce the opinions of these professors regarding the previously stated research questions. An audio tape was sent along with the questionnaire so that the interviewees could record their responses. They might also have chosen to send their responses by email or traditional mail in the stamped, addressed envelope that was enclosed. It was the author’s intention to collect responses from fifteen to twenty selected experts. The individual interview responses are found in Appendix D. Note that the responses appear exactly as they were returned to the author; no attempt was made to edit their content.

Criticism of Sources

The information of a research project that traces an historical development, such as this one, can be tainted with the biased opinions of many individuals. Criticism of sources is the examination of materials to ascertain their value and relevance to the study, as well as their accuracy and genuineness. This procedure is necessary so that information is not merely accepted at face value, but rather is tested for authenticity and credibility. In historical research, interrogation of primary sources such as interviews is necessary to determine the truthfulness of the response given by an interviewee. It is not the intention of criticism to censor the opinions of those being interviewed for the study, but to test those opinions based on the respondent’s perspective.

Authenticity, also referred to as external or lower criticism, is an examination of a source document’s value based on its genuineness. Lower criticism determines the potential for accuracy of a source when its origin and the process by which it came to be

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31 Appendix B is a listing of the individuals who were contacted for interviews, along with their institutional affiliations.
published are considered. Issues such as forgery and falsely-claimed authorship are
examined under the umbrella of authenticity. The most significant sources of information
in the search for curricular development in music teacher education are the Handbooks of
NASM. These documents were supplied to the author directly by NASM, so their
authenticity was evaluated by examining biographical information about the members of
the authoring committee. A brief investigation into the formation and philosophies of
NASM also shed light on the ideas expressed in the organization’s handbook. The
authenticity of the interview responses needed to be tested. Unless the respondents have
carefully documented their own involvement in the field of music technology, the
responses relied on the memory of these people. It may have been the case that someone
other than the respondents themselves has recorded that involvement, which helped in
authenticating the responses. Since most of the relevant events have occurred within the
last thirty years, criticism of the facts stated in interview responses was conducted
through personal contact with the involved parties.

Credibility, also referred to as higher or internal criticism, examines the claims of
fact made within a source document and checks them for truthfulness; it is a fact-
checking process. Internal criticism relies on the use of secondary and primary sources to
verify that the information a source provides is accurate. Positive internal criticism is the
researcher’s opportunity to use the facts in a source in context. In this process, terms that
are unclear or used by the author for purposes other than those for which they are
normally intended may be defined and clarified. Negative internal criticism searches the
claims of a source for opinions, bias, or facts that are just untrue.
For the research in this paper, the level of credibility was checked in a fashion similar to that of authenticity. The community of individuals involved in music technology teacher training is small enough that many respondents identified the same events as those most significant to the subject’s development. If dates or claims conflicted, further investigation was done by contacting the respondents for verification of their claims. Biographical information about the respondents was useful in determining credibility. Some respondents may have held personal loyalties to individuals who are members of the same college or university faculties, or other organizations, which forced them to respond to the interview questions with bias. Although their opinions may be heartfelt, their devotions may have influenced their responses.

Description of the Narrative

By its very nature, a discussion of the integration of a topic into a curricular area does not lend itself to clear definition of historical periods. This type of infusion is a process that occurs over many years and at varying rates in different parts of the educational community. A college in a metropolitan area, for example, may integrate technology into its curriculum earlier and faster than one in a rural area with less access to the equipment and materials involved in the pursuit of the study of technology. This variation causes difficulty in identifying demarcations in time, and thus complicates the organization of an historical study.

For the purpose of organizing the narrative into academic form, the history of technology integration into music teacher training curricula is herein divided into three historical periods, each discussed in its own chapter. Chapter 2 focuses on music teacher
training and technology prior to the 1980’s. Technology was slow to enter the music classroom in the United States during the nineteenth and early twentieth centuries. Only a very few teachers were considered experts in the field, and it was often recommended to other teachers that those experts be consulted prior to using technology, rather than that the teachers seek the training themselves.

Chapter 3 concentrates on the period from the early 1980’s through the mid-1990’s. Several watershed events brought public recognition to the fact that reform was needed in music teacher training curricula. In his 1981 paper, Leonhard said, “Graduates of contemporary programs identify the same problems and deficiencies in preparation that graduates of programs in the 1930’s identified.”32 This is an example of the kind of reformist thinking that brought about change to teacher training programs. The 1980’s were a period of change in several aspects of music teacher training, and technology began to be included on the list of topics with which undergraduates were familiarized.

Chapter 4 of the narrative focuses on the period from the mid-1990’s to the present. The establishment of groups such as TI:ME began to codify the skills that music teachers need in order to be considered proficient in music technology. With the standards set forth by the organization’s founders, there was a framework with which college and university faculties could work to formulate the curricula appropriate for their own music teacher training programs. Concurrently, the philosophies of NASM began to support the integration of music technology during the mid-1990’s, so accreditation from that organization became dependent upon institutions offering their students technological opportunities. This period also saw the publication of the Rudolph text and

the Williams and Webster text, which have become industry-standard resources for teachers.

The final chapter of this paper includes further insights from the interview responses from prominent experts in the music technology education field. Based on their experiences, these experts make predictions for developments that will occur in the future of music technology.
Chapter 2

MUSIC TECHNOLOGY AND TEACHER TRAINING PRIOR TO THE 1980’S

Introduction

Music education has a rich and storied history in the United States that is the subject of the initial chapters of many texts on music teaching and learning. Tracing the early revolutionary thinking and practices of American music teachers leads us to the integration of new ideas and technologies. The singing of psalms in the public schools can be traced to the colonial period of the seventeenth century, during which time informal methods of solmization and music instruction were introduced in the ninth edition of the Bay Psalm Book (1698).1 Movements of reform in general education and music education had tremendous influence on the curriculum used in school music teaching. As the American federal government began to materialize, the ideals which would come to be most important to the people of the United States included the right to education.

Influences of American educational philosophers, as well as the progressive ideas of European thinkers, became the cornerstone for music teaching methodologies in the United States. Several educators of the late eighteenth and early nineteenth-century are categorized as “Pestalozzian,” since their teaching practices were powerfully influenced by Johann Heinrich Pestalozzi. Educated in theology at the University of Zurich, Pestalozzi was a general educator who believed in the value of morality and citizenship education in order to elevate the society as a whole.2 Pestalozzi influenced the main ideas

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of the teaching of music instructors in the northern United States, who formulated several principles which included the teaching of sounds before their associated symbols, instruction through imitation, separation of tasks, and repetition.

Throughout the eighteenth century, music teachers acted on a largely independent basis. There were few means by which to share theories or methods that might improve the music teaching of the day. Clearly, organization of the profession of teaching music was on the horizon.

It may be difficult to draw a relationship between the trends and practices of early American music education and modern, high technology. But it is the very nature of progressive thinking and innovation that has led us to the integration of technology into music education, and therefore into music teacher training. The sharing of ideas and methods among those responsible for training music teachers is a key development in that integration, and as such, the organization of music educators into professional groups is of utmost importance to the eventual inclusion of technology into the curriculum.

This chapter deals with the beginnings of associations of music teachers, and the influences that those groups have had on the profession; the historical period from the late nineteenth century until the 1970’s is its focus. The Music Educators National Conference and the National Association of Schools of Music emerged from this period as the most powerful and influential of these organizations. The policies and recommendations from these groups regarding teacher certification, and specifically the evolution of those policies regarding technology, parallel, if not perfectly, the progression of technology integration into the curriculum. Also during this period, corporate-
sponsored projects appeared that brought new music, composition, and electronic music into the classroom. The 1970’s, in particular, saw a great emergence of technology as a tool for music educators.

Early Organizations and their Individual Leaders

The organization of public school music teachers into a cohesive unit, based on their beliefs in the importance of music education, can be traced to the late nineteenth century. Several unions were formed during this period which can be viewed as the “adolescence” of music education in the United States, since the profession was beginning to expand and experiment with new ideas and freedoms. It was during this time that the National Education Association was petitioned by a group of music teachers interested in creating a Department of Public School Music under the umbrella of the Association dedicated solely to music.\(^3\) A committee of the department led by Thomas Tapper of Boston in 1905 published a report that included recommendations for curriculum in music teacher training. These recommendations included skill in literature equal to that required for high school graduation, proficiency with an instrument or as a singer, and familiarity with curricular trends and texts.\(^4\)

Phillip C. Hayden was one of several individuals responsible for establishing the national importance of the Department when in Madison, Wisconsin in 1897, he spearheaded the creation of the National Federation of School Music Teachers. Hayden was elected the first president of what would, in 1910, become the Music Supervisors


National Conference. Less than thirty years later in 1934, the organization’s name would again be changed to the Music Educators National Conference. During these first few decades of the twentieth century, institutions of higher education began investing in the education of music teachers. Normal schools, which would later come to be known as teachers colleges, began to offer instruction in vocal and instrumental music for the classroom teacher, thus indicating the increasing importance of music in the public schools.

Concurrently, in 1924 came the beginning of the National Association of Schools of Music. This organization “was created…with the accreditation of all music degree programs as one of its major purposes. For some time thereafter, music teacher-training programs were approved by NASM and by the various state accrediting offices.” The original music teacher training programs, similar to those that exist today, were segmented into several types of coursework. Students had requirements to fulfill in applied music, in general education, and in music education. The NASM also served to protect the percentage of time dedicated to the musical portion of a music teacher’s training. While this would seem to be a positive influence, there were some unforeseen consequences of the organization’s watchdog mentality. As university curricula developed an interest in producing more well-rounded graduates, the number of credit hours required to earn a music education degree expanded significantly. In some cases the requirements were as much as fifteen percent higher than those for other academic degrees in the university.6

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5 Ibid
Sunderman went to great lengths to show the importance of the federal government’s role in the advancement of American public school music education during the Great Depression. “During the bleak years of the 1930’s many Americans began to feel the need to plan and evaluate their social and economic futures. Music had a definite design in weaving the fabric of the future.” He cited the Federal Music Project, part of the Works Progress Administration, as a major catalyst for musical opportunities in the United States during that period.7 The late 1930’s and 1940’s also brought technological innovation in the form of the Hammond organ and other electronic musical devices.

In 1940, MENC adopted the ideas of a pamphlet that outlined a model for school music curriculum. “The significance of the pamphlet was that it presented a model for local school systems by which local programs could be measured.”8 Among the literature that discusses the early development of MENC, the implications surrounding the adoption of this pamphlet are the first mention of the accountability of teachers for curriculum design and for the success of their students’ achievement. With the standardization of the school music curriculum throughout the country came a new concern for the expressive abilities of students. It was now more important than ever for music teachers to be trained properly and completely, so that they could help children to express themselves through music.

As the scope and reach of MENC grew throughout the 1940’s and into the 1950’s, so too did its partnership with other professional organizations dedicated to music and education. In 1951, a permanent committee was formed comprised of the presidents of

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8 Ibid, 293.
MENC, NASM, and the Music Teachers National Association. A sub-committee of MENC, with cooperation from the other two major organizations, developed Standards for Evaluation of the College Curriculum for the Training of the School Music Teacher in 1952.

The 1950’s and 1960’s were a time of growing concern for the rights of children to a complete education; that complete education had to include music in both its traditional and progressive forms. The movement toward Competency Based Teacher Education emphasized the accountability of teachers for the level of mastery students acquired. There was a renewed interest in the general music class, an area that had been overtaken by the popularity of the more traditional performing ensembles. Several important conferences were held in the early 1960’s that pointed out the lack of focus on the part of American music educators on the creative, analytical, and compositional aspects of music instruction.

The Yale Seminar, in June, 1963, produced a report that discredited the value of materials being used in music classrooms in terms of both their scope and quality. Those materials, according to the attendees, had not been updated for several decades, and were therefore inappropriate for use by the students of the day. Included in their report was a recommendation that the use of audiovisual aids be developed for classroom teachers. This is a significant step toward the training of teachers in technology methods.\(^9\)

Similarly, the Manhattanville Music Curriculum Project of 1965 addressed the need for a re-evaluation of teacher training processes.\(^10\)


Proper uses of contemporary music and the education of students of diversified cultural backgrounds were the topics of discussion at the Tanglewood Symposium in the summer of 1967, a meeting that was sponsored by several music publishing and education firms in the Boston, Massachusetts area. Keene wrote, “The assemblage noted a need to revise…music instruction so that the substance and structure of music could be emphasized…a study of structure and substance of music would lead to an awareness of music as an art form.”¹¹

The most concrete evidence of this public and corporate concern over revision of teacher education programs and of public school music curriculum was the publication of the 1972 document *Teacher Education in Music: A Final Report*¹² by MENC President Wiley L. Housewright and a commission appointed to study the changes needed in such programs. Certification requirements for music teachers in individual states began to reflect the MENC recommendations and the tenets of the Competency Based Teacher Education movement. NASM established its own certification criteria in 1974 and also followed the guidelines of the MENC report.

In recent years, corporate sponsorship has become a significant and driving force in educational reform and policy-making. This trend can be traced to the late 1950’s through the 1960’s when meetings and conferences such as those discussed were funded by large corporations. Although *corporate sponsorship* often carries with it a negative connotation, it has not necessarily been a negative influence on music education, and especially on music technology. Manufacturers, publishers, and other firms interested in

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promoting their products have provided tremendous amounts of financial support for the advancement of music education and its employment of music technology. It stands to reason that corporations assume the role of sponsor so that their products can be marketed and become inextricably connected to the development of curriculum. In the 1970’s, however, corporate name recognition seems to have been less important than the pure desire of America’s art community to bring creative experiences to youth.

Creativity in the Schools Breeds a New Philosophy

Norman Dello Joio, a popular twentieth century composer, is credited with the idea for a program called the “Contemporary Music Project,” which was funded by the Ford Foundation beginning in 1959, on behalf of MENC. The concept was based on the belief that bringing composers into school music programs would help stimulate the creative compositional process in students, while providing an outlet for composers to write and have their music performed. About ninety composers were placed in schools, and wrote music for the schools’ ensembles with varying degrees of success.

“Unfortunately…it was soon discovered that music educators were not sufficiently equipped to deal with contemporary idioms. Furthermore, the young composers were not always sensitive to or aware of the needs of the music teachers in the schools.”¹³ The project continued under Dello Joio’s chairmanship until the early 1970’s.

Despite the less-than-desirable results of the Project, the movement was an example of a positive relationship between the music education community and the

corporate world to promote music education, at all levels. Both of these entities displayed, through the existence of this project, a dedication to nurturing the expressive aspects of performance and composition. A new movement of reform grew out of this project. Starting in the early 1950’s, respected music educators and philosophers such as Charles Leonhard, Abraham Schwadron, Bennett Reimer, James Mursell and Suzanne Langer published their ideas about the importance of aesthetics in music education. These influential books, as well as outgrowths from the Contemporary Music Project, served to popularize the aesthetic philosophy.

Aesthetic education in music continues to be an important system of values in music teaching and learning. Critical viewpoints emerged that contested the tenets of aesthetics in music education. Elliott cites several theorists who argue against the validity of aesthetics in music education.\(^{14}\) Notwithstanding the vast criticism of this new philosophy, aesthetic education in music would be an important contribution, the roots of which can be traced to the projects involving contemporary music experiences of the mid-twentieth century.

The moderately unfortunate outcome of the Contemporary Music Project is inextricably linked to a lack of proficiency on the part of the classroom music teachers involved in the project. Had these teachers been prepared to teach in the culture of contemporary music, as Keene indicated that they were not, then the project itself might have been more successful, in addition to sparking a new philosophical interest in aesthetics. The need for teachers to be trained in the practices of teaching in a more

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\(^{14}\) In David J. Elliott, *Music Matters: A New Philosophy of Music Education* (Oxford University Press, 1995), the author addresses the contributions of philosophers such as Sparshott, Berleant, Bowman, and Beyer to the argument against aesthetics in music education.
contemporary environment than that to which they were accustomed was evident. Also, in order to make this transition possible for teachers, new materials would need to be developed that suited their teaching styles.

In order to develop standards for training teachers in the practices of contemporary music, including the use of technology, there would need to be an increased involvement from MENC and NASM, and several new bodies would need to be established to help create these standards. Individuals with the knowledge and resources to create the necessary materials would emerge from research universities to produce items that teachers could use, and that would benefit students as they explored the process of creativity.

The College Music Association, which later became the College Music Society (CMS), was founded in the late 1940’s as a subsidiary organization of the Music Teachers National Association, with the goal of promoting music as an integral part of the college liberal arts curriculum. There were ties between this organization and SMILAC, the Society for Music in the Liberal Arts College. The CMS name was conceived when SMILAC and CMA merged in the early 1950’s. It was the belief of the founders of these organizations that larger organizations such as NASM and MENC were ineffective due to their size, and that CMS would be able to carry out the goals of its membership more efficiently.¹⁵

CMS holds annual meetings at which the issues of teaching music in college and university settings are addressed. In 1965, CMS took a significant stride in the

implementation of technology into the college curriculum when Walter Collins, Leo S. Packer, Barry S. Brook, and A. Wayne Slawson presented a lecture on the uses of technology for college faculty in composition and in research positions. A 1967 session addressed the status of the Contemporary Music Project, featuring speaker Grant Beglarian, then director of the project. Harry B. Lincoln presented a 1968 lecture on the uses of computers in music theory instruction. All of these are demonstrative of the attention being paid to the possibilities of technology by university scholars responsible for shaping the undergraduate and graduate curricula at their institutions.

A small group of members of CMS and MENC, dedicated to the potential and promise of computer technology as a part of the college curriculum, convened at the University of Delaware in 1975, with the purpose of creating an organization that supported their cause. According to Gary Wittlich of Indiana University, “Actually, Fred Hofstetter and I mulled over the idea while waiting for a bus in Los Angeles in 1975. Fred then took the lead and convened a meeting at Delaware later that year…”16 This organization, the National Consortium for Computer-Based Music Instruction (NCCBMI) would later be renamed the Association for Technology in Music Instruction. “ATMI was formed in 1975 as a special interest group of the Association for the Development of Computer-Based Instructional Systems (ADCIS).”17 Perhaps the most important function of this body is the annual publication of the Technology Directory which serves as a

16 Gary Wittlich, interview by author, electronic mail, September 23, 2002.
catch-all reference for contacts in music technology industry and education.\textsuperscript{18}

The January, 1983 issue of the *Music Educators Journal* was dedicated to emerging technologies in music instruction, and featured articles by several members of this group. In this issue, an advertisement appears stating that the activities of the NCCBMI serve to “provide a forum for the exchange of ideas among developers and users of computer based systems for music instruction; maintain a library of music courseware; reduce redundant effort among courseware and hardware developers; and provide consultation for new users of computer-based music instruction.”\textsuperscript{19} The founding members of NCCBMI and their institutional affiliations are listed in table 1.

\textsuperscript{18} ATMI is credited with several important contributions to music technology education, and remains an active body. Its creation during the 1970’s is poorly documented, and therefore presents difficulty in reporting specific activity of the group during this period.

Table 1. Founding Members of the National Consortium for Computer Based Music Instruction

<table>
<thead>
<tr>
<th>Member</th>
<th>Institutional Affiliation</th>
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<tbody>
<tr>
<td>Mike Arenson</td>
<td>Iowa State University</td>
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<tr>
<td>Ned Diehl</td>
<td>Penn State University</td>
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<tr>
<td>Lee Garrett</td>
<td>Lewis and Clark College</td>
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<tr>
<td>Burdette Green</td>
<td>Ohio State University</td>
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<tr>
<td>Fred Hofstetter</td>
<td>University of Delaware</td>
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<tr>
<td>Earl Hultberg</td>
<td>State University College at Potsdam</td>
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<tr>
<td>Wolfgang Kuhn</td>
<td>Stanford University</td>
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<td>G. David Peters</td>
<td>University of Illinois</td>
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<tr>
<td>Robert Placek</td>
<td>University of Georgia</td>
</tr>
<tr>
<td>Jack Taylor</td>
<td>Florida State University</td>
</tr>
<tr>
<td>Gary Wittlich</td>
<td>Indiana University</td>
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Major Contributions of Universities

The University of Delaware served as the host for the initial meeting of what would, in 1985, become ATMI. That institution, along with the University of Illinois at

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Urbana-Champaign, also made significant contributions to the development of the use of computers in music education during the 1970’s and early 1980’s.

The PLATO\textsuperscript{21} system, the development of which began in 1959 at the University of Illinois by Don Bitzer,\textsuperscript{22} was a mainframe system based on the Control Data Corporation (CDC) mainframe computer. Its intention was for use as a base system for which music cognition drill programs could be written. PLATO used a touchscreen interface for input of student responses, and was capable of providing a format for individualized response to musical stimuli. The most popular and successful program written for the PLATO system was the GUIDO system, which was created at the University of Delaware in 1974-1975.

GUIDO, an acronym for “Graded Units for Interactive Dictation Operations,” was named for the famous music educator Guido d’Arezzo, who is credited with inventing a system of notation and techniques of solfège in the eleventh century. GUIDO was used at the University of Delaware in the mid 1970’s as part of its music theory curriculum to individualize students’ ear-training experiences. Drill and practice exercises using the GUIDO system were available in rhythmic, harmonic, and melodic dictation. Hofstetter published a series of articles that reported the relative successes of these units in experimental sessions with the University’s freshman ear training classes.\textsuperscript{23} Along with Arenson, he stated that, “[t]he key to GUIDO’s flexibility is its table-driven lesson design.”\textsuperscript{24} Hofstetter stated that the cost of operating and maintaining a GUIDO lab based

\textsuperscript{21} PLATO is an acronym for “Programmed Logic for Automatic Teaching Operations.”
\textsuperscript{22} Hofstetter, Fred T. “Microelectronics and Music Education.” \textit{Music Educators Journal} (April 1979): 44.
on the PLATO system in its mainframe form was prohibitive, and stressed the importance
of the development of stand-alone systems with similar capabilities.\textsuperscript{25} This would come
to fruition in 1980 with the advent of the Micro GUIDO unit. The system was later
rewritten for the IBM PC in the mid-1980’s.

Other academic institutions were important in the development of electronic
music applications as well. Florida State University established the Center for Music
Research during the early 1970’s under the direction of Jack Taylor, and focused much of
its research activity on the potential uses of technology. James Moorer conducted
significant research into music technology at Stanford University. At Pennsylvania State
University, Ned Diehl used an IBM 1500 to create programs for instrumental methods
classes.\textsuperscript{26} Indiana University established its Center for Electronic and Computer Music
during the same time. Logan noted the increasing enrollment of the Indiana University
School of Music over the ensuing thirty years, perhaps linked to the progressive nature of
the academics available there, but also cited the decreased enrollment in the music
education discipline during the same period.\textsuperscript{27} It was not yet completely evident to music
theorists, who dominated the technology field, that computer applications would have a
viable and flourishing home in the school music classroom.

\textbf{Continued Technological Advances}

Despite the technologies in development in Delaware, Indiana, and from other
universities and manufacturers throughout the country, the state of music technology was

\textsuperscript{27} Logan, George M. \textit{The Indiana University School of Music: A History}. (Bloomington: Indiana University Press, 2000).
still underdeveloped. The ease of use that teachers needed to integrate technology seamlessly into their curriculum was not yet available, nor was the training necessary to learn how to do so. Development of the hardware and software that teachers needed to make this integration happen occupied the time of music technologists for the remainder of the 1970’s. Once the technology existed, only then could practices be established to integrate its use in an efficient manner that allowed for meaningful student experiences, appropriate evaluation of students’ performances in the related activities, and collection of data that reflected the effectiveness of the technology.

The late 1970’s saw the introduction of several hardware pieces and Computer-Based Instruction applications that are the forerunners of modern uses of computers in music education. The Apple II was introduced to the public in 1977. Micro Music, Inc. published ear-training programs for the Apple II a year later. Radio Shack/Tandy, Atari, Texas Instruments, and Commodore produced other microcomputer systems in the final few years of the decade. Data storage became simpler in the 1970’s with the advent of the floppy disk and the hard drive. New operating systems with graphic interfaces were a concrete prediction of what was to come in the development of personal computers. Desktop publishing and music printing became viable in the 1970’s with the release of several word processing applications, and with the production of affordable printers from Apple and Hewlett-Packard. *Music Composer* and *Mockingbird* were notation packages written for Apple and Xerox personal computers. The University of Illinois contributed to the field of music printing with a notation package for the PLATO system.

There was also prolific development in the field of synthesis during the 1970’s. Moog synthesizers, as well as models by Sequential Circuits, Synclavier, Yamaha, and
Fairlight, became widely available. Roland introduced its first computer-controlled, stand-alone sequencing machines to be paired with these new instruments. In addition, digital tape recording became popular during the 1970’s. All of these contributed to the interest of the music education community in the uses of technology.

The individuals involved in the development of music technology education also established their own abilities to easily communicate and exchange ideas in two ways. First, the *Computer Music Journal* was established. Second, new computer network protocols became commonplace, allowing for electronic transfer of data over the vast new network known as the Internet.\(^{28}\)

**Conclusion**

A climate of excitement certainly existed in the late 1970’s with the introduction of so many new technological devices and their concurrent applications. New authoring languages were even beginning to foreshadow the implementation of multimedia design and its potential for use in the classroom. In little more than thirty years, American education had advanced from a state when computer technology was reserved strictly for those involved in scientific research to a time when it was becoming clear that technology education was a worthwhile venture for all. Its potential for capturing the creative essence of music education was evident, and those who used it effectively had to kindle that spark that it provided.

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\(^{28}\) Much of this information was extracted from the Williams & Webster and Hofstetter texts. Each provides excellent timelines of events relating to music technology.
With the sheer volume of technological development that occurred within the last few years of the 1970’s, the music education community was poised for a change in its attitude toward technology. Advocates of computer technology, including the founding members of organizations such as the National Consortium for Computer-Based Music Instruction (Association for Technology in Music Instruction), would push for technology to become an integral part of music education. They would also become active in describing and standardizing its uses for those with less knowledge and experience.
Chapter 3

THE 1980’S AND 1990’S:

ORGANIZING MUSIC TECHNOLOGY EDUCATION

Introduction

In order for the field of music education technology to achieve forward progress, it was necessary to begin to organize the technologies that existed at the beginning of the 1980’s. Boody predicted the importance of organization in the use of computers in music education in his doctoral dissertation when he wrote, “Standardization is necessary if rapid progress is to be made in computer assisted studies of music.”¹ Several organizations would contribute to the eventual standardization of the field. This systemization addressed several key areas such as (1) the skills that teachers would need to have to be practitioners of technology in the classroom, (2) the curriculum of music teacher training programs, and (3) the facility, equipment, and scheduling issues involved in implementing music technology into a crowded curriculum already fraught with sacrifice. Publication of concrete standards could only take place after the necessary technology was available and there were enough people who knew how to use it and teach with it.

While the 1970’s gave us significant advances in software and hardware, and began to make clearer the possibilities for the uses of technology as a tool for music educators, that decade also brought us the contributions of several organizations toward the goal of standardizing teacher preparation. The National Council for the Accreditation of Teacher Education (NCATE) formed out of several other organizations to become “the

sole agency for the accreditation of teachers.”2 Increased contributions more specifically related to standardization of music teaching degrees came from MENC and NASM.

These organizations held close ties to the curricular and technological developments taking place at the trendsetting universities addressed in the previous chapter. The University of Delaware continued to make significant progress in the use of computer technology in the classroom, as well as technology in other forms. This chapter will address a major contribution in the use of multimedia authoring for educational purposes.

The Birth of MIDI

As mentioned in the discussion of the technological developments of the 1970’s, massive amounts of technology hardware flooded the market for educational and commercial use. The synthesizer and the personal computer became legitimate musical instruments through their use in the music of composers such as Pierre Boulez, Wendy Carlos and Isao Tomita. These composers, along with hobbyists and educators, made use of electronic instruments and software. Instruments new to the market included the Sequential Circuits Prophet 6 and the Roland Jupiter 6. Perhaps the most celebrated synthesizer from this period was the Yamaha DX-7, which was the first of its type to use FM synthesis as its method of sound generation.

The personal computer was an especially useful musical device when linked to these new instruments and used for data storage and manipulation. In the early 1980’s, Roland and Passport Designs introduced the MPU-401, a link that would eventually

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become a standard connection between synthesizers and computers. ³ With a synthesizer connected to a personal computer, it was possible for musicians who relied on the flexibility of sound provided by a synthesizer to store their creations in data form on floppy disks or hard disks, which had recently become ubiquitous forms of data storage.

This mass development of new hardware and software was a positive step in that more products were available, which allowed prices of the equipment to drop, thus making the technology accessible to more people. However, the MPU-401 protocol did not allow for hardware products of differing brands to communicate with one another. The first attempt to standardize a facet of music technology came about as a reaction to this lack of communication between devices. The organization that represented manufacturers of these instruments and computers is the National Association of Music Merchants (NAMM), which later became the International Music Products Association. In 1981, the organization laid the groundwork for the protocol that would lead to communication between devices of differing brands. The protocol was titled MIDI, an acronym for Music Instrument Digital Interface, and was released in its first version in August of 1983.⁴ Newquist wrote about the process of developing the MIDI Standard:

In a remarkable display of industry unity…a group of vendors began work on a proposed specification developed in 1981…This specification, which was called the Musical Instrument Digital Interface (MIDI), was presented as a combined language/transmission protocol which would not only allow for the sending and receiving of information, but also for determining the structure of that information. During 1982 and 1983, the primary vendors of keyboard synthesizers…worked at hammering out the physical specifications for the MIDI protocol.⁵

³ Passport Designs would contribute more significantly to the field of software with their notation and sequencing packages Encore and Master Tracks Pro.
The MIDI Standard contained a number of elements that addressed aspects of both hardware and software. A device that was MIDI-compatible, according to the original standard, was equipped with MIDI IN, MIDI OUT, and MIDI thru ports, all of which sent or received the MIDI messages that were part of the software specification. The ports connect using a 5-pin cable known as a DIN.\(^6\) The MIDI Standard also included specifications for the software capabilities of MIDI-compatible instruments. The MIDI messages that are transmitted between devices address such controls as “note on” and “note off,” selection of synthesizer program, MIDI channel selection, and MIDI mode selection.\(^7\)

With the MIDI Standard firmly established as a usable set of devices, and the popularity of the Roland MPU-401 as a connection for synthesizers to personal computers, more synthesizer manufacturers began to produce MIDI-compatible instruments. Joining Roland, Sequential Circuits and Yamaha were Casio, Ensoniq, Kurzweil, and E-mu Systems. Additional interface devices began to compete with the Roland device. Synthesizer keyboards were introduced that contained the ability to record their own music using an internal computer.

The significance of the invention of MIDI and its related devices is practically immeasurable. William E. Purse says that the development of MIDI is, “almost as significant as music notation in the fact that it’s opened up a whole new arena of possibilities for music educators and musicians.”\(^8\) The MIDI protocol, which allowed the communication between computers and musical instruments, allowed for the foundation...
of coursework in this area in the college curriculum. Dr. Sam Reese indicated that the birth of MIDI created “a much more open-ended environment for teachers and students to develop applications that directly related to the needs and responsibilities of music teachers and students.”

With MIDI, access to the uses of technology in music education increased substantially. Prior to its acceptance as part of the technological vocabulary, the use of computers in any musical context was awkward at best. But with the standard in place, those who saw the potential of technology sought out ways to integrate it into their teaching and learning. As Wittlich wrote, “Until there are applications that are perceived to be of value, neither those who might want to use technology nor especially those who are called on to support its use will be sufficiently inclined to invest the money or effort in acquiring and using it.” The development of MIDI in the 1980’s and its apparent power brought that perceived value, and established the first true standard of music technology.

### Multimedia Products in Education

The adoption of the personal computer into educational settings was on the rise in the 1980’s due to its decreasing cost and increasing flexibility. The computer engineering world was exploring the graphic capabilities of its devices and producing operating systems such as the Macintosh OS and Microsoft Windows that permitted for interactivity between a computer and a user without advanced knowledge of the device’s design. This interactivity was a desirable feature for the educational infrastructure, which

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had witnessed the effectiveness of technology-based devices such as the GUIDO system. In 1984, Apple Computer created the Apple University Consortium, and began its eventual dominance in the education community. “This small group of prestigious universities was given substantial price discounts and the opportunity to work closely with Apple designers to develop instructional tools on the Macintosh and to provide input to Apple on ways in which Mac[intosh] hardware and software could be made more useful in academic environments.”¹¹ By the end of the 1980’s, most major schools of music housed computer labs dedicated to electronic music production and computer-based instruction.

As technology infiltrated the campuses of colleges throughout the United States, groups of professors began to realize the benefits of teaching their students with the aid of technology. While the computer was the primary tool of this era, those individuals also experimented with forms of technology other than the computer to deliver information in an environment rich with media.

An example of this alternate media was the University of Delaware Videodisc Music Series, which was released in 1985. The project, funded by a 1982 grant from the National Endowment for the Humanities, ranks among the most significant events in the development of music technology and its integration into curricula.¹² Fred Hofstetter was the principal investigator of the project, and scholars from throughout the country joined him in creating this product. The Pioneer Corporation manufactured the video discs, and a user’s guide accompanied the package.

¹² The importance of the Videodisc Music Series was mentioned in several of the interviews and conversations conducted in researching this paper.
The video disc, a format that never reached the level of popularity that many predicted it would, is approximately the size of an LP. It is created using a method similar to that of a compact disc, and is read with a laser. Jacobs discussed the significant benefits of using laserdisc to compliment more traditional classroom lecturing. These benefits included the higher quality media playback, the volume of information that can be stored on the disc, randomized access, sturdiness of the format, and the number of available titles.13

The University of Delaware series is divided into four volumes. The interactive lessons address the following topics: symphonic and chamber music, vocal/choral music, opera, symphonic program music, keyboard works, and orchestral program music. The discs contain footage of live performances of standard repertoire from these genres, scrolling scores that the viewer can see as the music plays back from the digital source, scrolling formal analysis, and slide shows that depict items relevant to the historical periods of some of the featured pieces. There are also demonstrations of the individual instruments featured in the performances, including period instruments, and segmented performances that help the student to identify the sections of each work.

The significance of the Series is that it was the first multimedia product to experience such widespread use. The concepts of presenting information developed for the project contributed to ideas of how to structure multimedia presentations in other formats. Concurrently, the compact disc was infiltrating the media-buying public’s consciousness. These two new formats were similar in that they offered, for the first time, the ability to access the information stored on them randomly. Rather than having to search through the contents of a cassette tape, video tape, or LP, the push of a button

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brings the user directly to the specific material desired. This feature alone, Boody said could, “bring about great changes in the way we teach about music.”\textsuperscript{14}

From this videodisc-based project stemmed ideas for the uses of hypertext and CD-ROM products, as well as other interactive formats. The interactive software on today’s market descends directly from the \textit{Videodisc Music Series}. It was a powerful tool that allowed students to learn in ways that they had never been able to before. The \textit{Series} was yet another innovation that served, if only in part, to convince the educational public of the effectiveness of technology-based education. The world of multimedia development now had a benchmark for which to strive, both in technological depth and in usefulness in educational settings.

The late 1980’s saw the introduction of several new computer products that increased the speed and storage capacity of their predecessors. The NeXT computer, as well as new entries from IBM and companies that produced “clones” of IBM and Apple computers, brought down the prices of personal computers to an attainable level for consumers. Atari and Commodore produced computers that had extended functionality for music production including, in the case of the Atari 520ST, a built-in port for MIDI connectivity. However, due to their graphic interface design, the Macintosh and IBM-compatible operating systems cornered the majority of the software designed for musical applications. This would lead to their eventual dominance in educational and consumer uses. These platforms were also the basis for a major telecommunications surge in the mid 1980’s. The introduction of on-line services such as Prodigy and America Online connected computers in a new way that was accessible to the consumer public. Now, the

link between computers and musical instruments could be shared across telephone wires or other fiber-optic connections.

Educators in the mid 1980’s, especially those on the college level, began making extensive use of a multimedia authoring computer application called HyperCard. Written for the Macintosh in 1987 by Bill Atkinson, HyperCard created “stacks”—the term for programs written using the application. “The basis of...hypermedia system development and delivery lies in the software tools that enable authors to integrate various media...organize the knowledge-base elements, and define relationships between elements.”

Of note are the HyperCard stacks based on the Ninth Symphony of Beethoven, by the Voyager company, *The Rite of Spring*, by Warner New Media, based on the Stravinsky composition, and other famous multimedia productions of the period. Each of these titles features content similar to the *Videodisc Music Series*, such as performances, instrument demonstrations, and supplementary information. The user has the power of a computer interface to help guide through the content. Students are able to use a mouse to navigate from one area to the next by clicking on linked text and pictures. *HyperCard*, along with other hypermedia authoring software like *Authorware*, is the basis for many multimedia development applications that have come since, designed to create educational tools, presentations and pages for sharing information over the Internet.

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Institutional and Organizational Influences

By the end of the 1980’s, many colleges and universities throughout the country had begun including courses dedicated to technology in their requirements for graduation with a degree in music education, or at least offering these courses as electives for music majors. A strong push to have technology as a component of the curriculum came from organizations such as the Association for Technology in Music Instruction, and from individual universities and professors. Notably, classes were added to the curriculum at The University of Texas at San Antonio, as part of an initiative that created that university’s Institute for Music Research. Courses became available in music engineering and technology at Berklee College of Music in Boston, with the leadership of David Mash. The program at Berklee has flourished ever since with the aid of several large grants directed at technology integration.

The integration of technology into the undergraduate curriculum gained support from the National Association of Schools of Music from its inclusion of technology in the addendum to that organization’s 1991-1992 Handbook. This made clear the desires of educational leadership to have technology included in the curriculum. The addendum included the following statement: “Through study and laboratory experience, students should be made familiar with the capabilities of technology as they relate to composition, performance, analysis, teaching, and research.”16 Since NASM is the most important body for the accreditation of institutions engaged in music work, the major competitive programs throughout the country gave this decree its due consideration.

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The statement held great significance to advocates of music technology and its inclusion in the structure of college music. Despite its worth, however, the NASM guideline was vague and incomplete. It did not provide suggestions for writers of curriculum as to the level of integration they should grant to technology studies. It did not address the issues of facilities, faculty assignments, materials, equipment, nor did it suggest any philosophy for designing a music technology curriculum component. Nevertheless, it did state in certain terms that a minimum level of technology integration needed to be met in order to achieve accreditation from NASM.

Over the subsequent ten years, the Handbooks of the National Association of Schools of Music have changed very little regarding technology integration. The statements of the organization have become more concrete and specific, and schools of music have no choice but to make technology an available and necessary component of their students’ education. Not until the edition of the Handbook from the year 2000 did specific technology-related goals appear as an integral part of the college curriculum as mandated by NASM. “These [goals] range from [learning] how a technology works, to how to work it, to how to work with it, to how to do work with it, to how to understand it, to how to integrate it. Programs may concentrate on one or more technologies. Technology goals may also include how to build technologies, how technologies evolve, or the impacts of technology.”

The inclusion of technology as a mandated portion of the baccalaureate degree was indeed a groundbreaking announcement. Despite this positive step, the level of technology integration into the curriculum was still largely determined by the individual

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school, and a variety of factors determined that level. These included, but were not limited to, physical space, budgetary concerns, faculty familiarity and level of comfort with technology, and the progressive or conservative nature of the school. When compared to NASM suggestions regarding other areas of the curriculum, the guidelines for technology were not clear; that is, the Handbook did not supply proportions of time, budget, or other determining factors.

Individuals began to broach the subject of curricular design in music technology in the early 1990’s. Willman suggested that the selection of which computer-based technologies to use in the classroom should focus on several criteria:

…The answer is to choose only software and supportive technology that: promotes the development of higher-level cognitive skills; places students in roles that parallel those normally undertaken by musicians: performer, composer, improviser, consumer, and critic; places all musical facts and knowledge within a musical context; focuses on music, not symbols; helps students unlock the ‘learning process’ rather than merely attain a limited collection of musical facts; requires the student to make musical decisions and exercise musical judgment; causes students to respond to music with understanding.18

Designers of curriculum faced the critical decision of which technologies to teach, and more specifically, which computer applications were most valuable for their students. In the early 1990’s, Temporal Accuity Products (TAP), Educational Courseware Systems (ECS), and other companies introduced new products that related directly to the existing curricula of music institutions. Most of these products were drill-and-practice style software. That type of software is particularly applicable to school music teaching, and would therefore have been an appropriate subject to include in the training of music

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18 Willman, Fred. “New Solutions to Curricular Problems.” Music Educators Journal (November 1992): 34. This article appears in another issue of the MEJ dedicated to technology in music education. Willman was the guest editor of the issue, which was designed to illustrate the evolution of technology in music education since the 1960’s.
teachers. Curricula also included introductions to notation software, sequencing, synthesis, and other technology topics.

By the early 1990’s, the market was flooded with educational software, and the hardware on which to run it was no longer prohibitively expensive, as it had been in previous decades. All of the materials were available, which left only the decision of which were the most germane to the college-level curriculum for training music teachers. The decision of what to teach was truly no different than a decision of programming repertoire made by the director of a traditional ensemble. It would be a matter of determining what was most suited to the curricular and educational goals of the particular students, faculty, and institution in question.

The dominant factor, however, was that most universities, even those with progressive curricular values, did not have faculty qualified to teach technology. In order to integrate even the simplest computer-based learning activities, faculty members needed to be able to use the software and hardware themselves. There existed an incongruity between the designs of the new computer-based curricula and the abilities of the teachers who would be responsible for teaching it. Other than the few individuals who had already made significant contributions to the development of computer hardware and software for music education use, music faculty members lacked the training necessary to make the technology part of their own teaching. In addition, no set of standards existed to alert the administrators of colleges and universities to the fact that their faculty members needed such training.

The reaction to this lack of training in technology would manifest itself in the formation of new organizations and establishment of new sets of guidelines, beginning in
the mid 1990’s. Although the major players would persist (ATMI, MENC, NASM), their focus would shift from the mere development of new technologies to the goal of increasing the comfort level of teachers who wanted to use those technologies. New organizations of people with progressive, business-minded ideas would surface. These groups would work with those who train music teachers, and help them to increase their own exposure to technology, so that they could successfully prepare pre-service teachers for technology use in the classroom.
Chapter 4

THE 1990’S AND 2000’S:
CURRICULAR INTEGRATION OF TECHNOLOGY AND THE RISE OF
IN-SERVICE TEACHER TRAINING

Introduction

The group of individuals who organized the Association for Technology in Music Instruction (see Chapter 2, Table 1) established a foundation for the principles of computer-based music teaching. Those individuals laid the groundwork for a philosophy that included the integration of technology, and specifically computer technology, into all areas of music education. The group comprised people with substantial influence, but such a small faction could not bring progress to a movement as radical as computer-based music education without others adopting their cause.

Beginning in the early 1990’s, larger groups of individuals, backed by their university and school-district affiliations, began to rally behind the philosophy that there is true educational potential for integrating computer technology into music teaching and learning situations. Not only did individuals begin to encourage this belief, but also the largest music education organization, Music Educators National Conference, contributed significantly to the effort to legitimize music technology education. They did so both by word and by deed. MENC developed its own set of standards for technology in the school music program, and recognized a new group, the Technology Institute for Music Educators, which had as its goal the education of pre-service and in-service teachers in the uses of technology for music education.
MENC’s *Opportunity-to-Learn Standards for Music Technology*

The 1994 publication of the *National Standards for Music Education* led MENC to release other documents that detailed more specific guidelines in several curricular areas of music education. MENC published an addendum to the 1994 document in 1999 that provided guidelines for music technology integration into the K-12 music curriculum. The addendum addresses standards for curriculum, scheduling, staffing, equipment, materials, software, and facilities. MENC found these areas to be interrelated and of equal importance in determining the quality and depth of technology integration into the already-existing curriculum. The authors of the document were members of the MENC Task Force on Music Technology, and represented primary-, secondary-, and university-level concerns. Members of the educational infrastructure were included in the task force, as were representatives of the technology industry. Due to their extensive involvement in the field of music technology education, some of these individuals were contacted for interviews for this paper. Appendix C is a list of the members of the Task Force and their affiliations to educational institutions or technology corporations.

These authors divided the *Opportunity-to-Learn Standards for Music Technology* into four levels: ages two through five, grades one through five or six, middle or junior high school, and high school, and they addressed each of the standards at each level. The standards are further divided into criteria that would reach minimal or desirable qualities. For example, at the high school level, the document lists specific equipment that reaches a minimum standard for what should be available to the teacher and students (see Figure 1).
1. Every music classroom should contain one multimedia-ready computer that is Internet capable and includes: audio in/out capability, General MIDI sound generation, powered speakers, CD- or DVD-ROM player, and a MIDI keyboard connected to the computer. When a teacher must move between classrooms and schools, a similarly equipped laptop computer is preferred for that teacher.

2. The school computer lab is equipped with dual headphones and MIDI keyboard controllers for use by the students.

3. Students have access to eight digital keyboards (possibly portable units) with standard-size, touch-responsive piano keys.

4. A large screen video display for class presentation.

5. Each teacher has access to a computer (workstation or laptop) for administrative purposes.¹

Figure 1. List of equipment that reaches the minimal standard for high school level.

While these items meet the minimum amount of equipment that a high school music technology classroom should contain, they do not comprise the most desirable arrangement. The desirable level includes several additions (see Figure 2).

1. A computer video projector to enhance class presentations in large classrooms.

2. In addition to the minimal specifications, the classroom teaching station has five additional multimedia-ready computers with keyboard controllers (dual headphone capable). Alternatively, there is a digital keyboard lab or dedicated computer music lab with seventeen or more units configured in a way similar to the workstations recommended in item 1 above. All equipment includes powered speakers, a computer display projector, and large-capacity removable disk storage.

3. Digital recording and CD-R capability are available.

4. For instrumental instruction, alternative MIDI controllers, such as wind, guitar, string, drum controllers, are available.

5. Music teachers have the same access to scanners, digital cameras, and other multimedia equipment as teachers in other disciplines.²

Figure 2. Additional equipment required to reach desirable standard for high school level.

The desirable level of equipment listed in the Opportunity-to-Learn standards is lofty. Simply from a budgetary perspective, few schools have the financial resources to dedicate to a facility that houses all of the stated equipment. Several of the curricular recommendations would lead the reader to believe that the focus of every minute of a student’s school day should be devoted to music technology. The staffing guidelines, were they followed implicitly, would leave room for very little staff development training in any area other than music technology.

It was the perspective of MENC that if they were to make these recommendations, then schools, administrators, teachers, and others involved in educational policy could use them as guidelines upon which to develop their own music technology programs. This set of standards was designed to surpass the level of technology integration that may

² Ibid.
have immediately been feasible. “The minimal standards are intended to provide
guidance for schools that are just beginning to incorporate technology into their music
curriculum.”\(^3\) However, the document lends tremendous credence to the importance of
technology access for music teachers and students, and provides the following message:

Those who give music teachers the same level of access to
technological resources as teachers in other disciplines will find two things.
First, they will find that the music program is greatly enhanced by
innovative applications of technology. In addition, they will find that
music offers an exciting way for students and teachers alike to make
technology come alive as an innovative instrument for creative
expression.\(^4\)

The Technology Institute for Music Educators

The Technology Institute for Music Educators (TI:ME) was founded in 1995 as a
collaborative effort between educators and industry leaders, and was the first organization
founded to be dedicated completely to the training of educators in the skills necessary to
use technology as part of their practices of music teaching. Since it was, and remains, a
non-profit organization, it was necessary to include greater involvement of the music and
technology industries to support the foundation of the organization. TI:ME remains
closely tied to companies such as Roland, Korg, Yamaha, Cablevision Systems
Corporation, and several software manufacturers. Throughout its history, several of the
members of the Advisory Board of TI:ME have been executives and educational
representatives from these corporations.

The general goals of TI:ME were to create a set of standards applicable to the use
of technology as a music education tool, and to train music teachers in the uses of

\(^3\) *Ibid.*, document introduction.

technology. Although the majority of their training efforts were aimed at in-service teachers, pre-service music education majors would soon reap the benefits of this organization’s labors. The first meeting of the TI:ME National Advisory Board took place in October, 1996, where several specific goals were established. The first goal was to establish concrete standards for music technology in printed form. Next, the board decided that its members would develop materials for teacher training in what they viewed as the most important areas of music technology: sequencing, notation, telecommunications, and computer-assisted instruction. The board left this list open-ended so that it could be added to with the development of new technologies and methodologies. It should be noted that the topics on which the board decided to focus are all computer-related items. This is most likely due to two factors: (1) the rise in popularity of the personal computer during the mid-1990’s, and (2) the interests of the parties on the board, most of whom were college-level educators or representatives of software manufacturers. The Institute also included as one of its goals to define the skills teachers needed to have in order to be considered proficient in music technology education. The final large goal was to serve as a research and discussion center for those involved in the advancement of music technology.

The TI:ME organization was funded initially by the International Music Products Association, formerly the National Association of Music Merchants, in the form of two three-year grants. One of the initial goals of TI:ME was met when, in 1997, the Institute published *Technology Strategies for Music Education.* Some of the organization’s

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founding members were responsible for authoring and editing the book.\textsuperscript{6} *Technology Strategies* includes an overview of the state of music technology education, and then explains the organization’s list of the important areas of competency in technology. There are significant differences between this document, and the list originally produced. No items are removed from the original list, but the topics of multimedia, digitized media, information processing, computer systems, and lab management are added. Also, the section devoted to telecommunications explores more deeply the possibilities of the Internet as an educational tool. This is indicative of the rapid growth of communication technology in the mid-1990’s.

*Technology Strategies* contains a section that addresses each of the nine National Standards for Arts Education, and their applicability to technology. Also discussed are the content of the three levels of certification available through TI:ME coursework. This coursework is the major function of the organization, as it is what truly provides hands-on experience for in-service and pre-service teachers. TI:ME offers two levels of certification. Level 1 certification requires completion of two courses that focus on electronic music instruments, sequencing, notation, computer-assisted instruction, telecommunications, and digital media. Level 2 certification requires three courses that advance the learners’ knowledge in several of these subjects. The Level 2 courses focus more specifically on an individual topic, rather than providing the broad overview of the Level 1 courses.

TI:ME certification courses are offered at several universities and secondary schools throughout the country, and are often included as part of summer training.

\textsuperscript{6} Additional authors of the *Strategies* text were Floyd Richmond, David Mash, and David Williams. John Dunphy and George Pinchock served as editors.
sessions for in-service teachers. Individuals can apply to be TI:ME instructors, and the
institution with which they are affiliated must possess certain facilities and equipment to
be able to offer the courses. For example, TI:ME certification requirements state that no
more than two students may share a synthesizer during a certification class. If the school
offering the courses does not have a facility to meet these requirements, then the
individual and the school will not qualify.

Despite the fact that TI:ME efforts are directed more toward in-service teachers,
the inclusion of the organization’s training sessions in the activities of universities and
colleges has had an effect on the integration of technology into the curriculum of
undergraduate students. Several factors are involved in that relationship. First,
undergraduates are able to take the TI:ME courses along with in-service teachers and
earn the certification. Second, universities have been forced to upgrade their facilities in
order to accommodate the TI:ME curriculum. Greater priority has been placed on
keeping equipment current so that educators from the community will want to come to
the university and take the TI:ME courses. Finally, college professors who may not have
otherwise become involved in technology education are doing so in order to keep contact
with the local music education community, and to supplement their own income by
teaching the TI:ME certification courses. In his response to an interview request as
research for this paper, William Purse said that the availability of technology coursework
is a positive recruiting tool for Duquesne University. Not only does it offer a direct
attraction for students, but it appeals to teachers who come to campus for TI:ME training,
who then return to their high school students and encourage them to enter the college-
level technology curriculum in music.\footnote{William E. Purse, interview by the author, tape
recording, June 2002.}

In 2002, the Music Educators National Conference partnered with the Technology
Institute for Music Educators, and recognized TI:ME as a major affiliate in the pursuit of
sophisticated integration of technology into music teaching. This recognition provided a
legitimizing force behind the efforts of TI:ME and was nurtured by the current members
of the Board of Directors of TI:ME which includes John Dunphy, Executive Director;
Tom Rudolph, President; Steven Estrella, Vice-President/Secretary; and Lee Whitmore,
Treasurer.

Educational Technology Standards

The International Technology Education Association published \textit{Standards for
Technological Literacy: Content for the Study of Technology} in 2000, after six years of
preliminary work and revision. The intention of the document was to provide standards
for teachers of technology, following a trend other curricular areas had established. While
these standards are not related directly to music or the fine arts, they call to consciousness
the pervasive stature of technology in our educational infrastructure. The content
standards themselves are presented in five areas: (1) The Nature of Technology, (2)
Technology and Society, (3) Design, (4) Abilities for a Technological World, and (5) The
Designed World. Each of these five areas contains several standards that would lead
students to mastery of benchmarks for grades K-2, 3-5, 6-8, or 9-12.

These standards are of limited use to music teachers. It is necessary to mention
them in the context of this paper because the standards represent the efforts of a large,
international group that is dedicated to the potential uses of technology in education. However, the standards make no mention of the possible uses of technology in the arts or in music education. The *Standards for Technology Literacy* are geared toward helping teachers know what students should understand and be able to do in preparation for careers in engineering and technology design. This may ultimately prove fruitful for music education concerns, because new developments in hardware and software design will come from engineers.

The World Wide Web

Although the World Wide Web (WWW) began to display potential for educators as early as the mid-1980’s, it was not until the mid-1990’s that its use became widespread. Before then, not only was physical access limited, but financial factors forced an environment in which online communication was only available to those who could afford it, or to universities and those with vast financial resources such as government agencies.

The catalyst for the commercialization of the WWW was the vision of electronic commerce. Those who saw the potential for selling services and merchandise on-line knew that the interface would need simplification in order to make the average consumer willing to shop over the WWW. In the early 1990’s the Internet (which was by then synonymous with the WWW) underwent a conversion from a cryptic, text-based form of communication to a graphic-rich environment that attracted users with promises of fun and convenience. The Internet began to proliferate all aspects of the culture, but only once it was easy to use and provided real benefit for consumers and educational users.
Initially, uses of the WWW for music were similar to its uses in other disciplines. Teachers and students could search for information that enhanced their learning experiences. Rather than use print resources like encyclopedias and music dictionaries, students could use the WWW to retrieve information. Sharing MIDI and audio files made possible collaboration between composers, even though audio was of low quality. The Internet provided the possibility of swapping other types of music files, such as those produced using already-popular notation and sequencing applications.

As stated in Chapter 3, significant developments in the field of multimedia authoring were providing media-rich environments for music learning. The mid-1990’s brought the realization that the WWW was a perfect tool for distribution of multimedia projects. The HTML\(^8\) code that was the basis for all WWW programming was expanded to allow multimedia authors to include various types of interactive media. The WWW is capable of broadcasting multimedia projects to the entire world. These projects may be authored using applications that were originally intended for production of stand-alone media on a format such as compact disc. However, through the broadcast power of the WWW, the same project can be shared with teachers and learners wherever there is a connection to the Internet.

The late 1990’s brought the development of multimedia authoring technology that allows simple exchange of projects, despite several obstacles. The first factor standing in the way of sharing multimedia files was that of computer platform. A user of a Windows-based computer, for example, might have difficulty viewing a project created on a Macintosh. This issue was resolved with the creation of cross-platform player

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\(^8\) Hypertext Mark-up Language is a computer protocol that is the basis of most WWW pages.
applications. Programs such as Real Player, Quicktime Player, and Winamp allow for playback of media files, notwithstanding computer platform.

Next, users of the WWW had to deal with the difficulties of limited bandwidth. Media files can be quite large, and as such, may require the user to wait long time periods for a file to transfer. New computer technologies such as high-speed Internet connections and streaming media\(^9\) conquered this problem. Also, new compression codecs\(^{10}\) allowed for faster file transfer.

Finally, and perhaps most importantly, technology needed to be developed that allowed true interactivity between the user and the multimedia program. Previous ventures into multimedia development over the Internet had been little more than substitutions for traditional approaches to instruction, and offered the students limited opportunity to manipulate musical elements, compose, compare musical events, or take other kinds of active roles in music.

The solution to the limited abilities of the existing multimedia authoring tools was to create new languages to enhance the abilities of HTML. Languages such as JavaScript provided authors of multimedia projects with the opportunity to provide true interactivity for users of their projects, which could then be posted on the WWW. JavaScript and similar languages made it possible for students using media-rich Web pages to play sections of music and respond to them, to view video related to music, and to take an active role in the music learning process. Applications, such as Macromedia’s Flash, that have been introduced over the last few years allow for graphic design of these interactive

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\(^9\) Streaming media describes any file that begins to play back before the entire file has been transferred completely to the user’s computer. This technology significantly reduces the amount of time the user must wait to begin viewing or listening to the file, but often results in decreased media quality.

\(^{10}\) A codec describes a standard for the compression and decompression of a computer file. Examples of popular codecs are MPEG, AIFF, and RA.
environments without advanced knowledge of the underlying code. The files produced by these applications can also be distributed via the Internet.

Contributions of Individuals

The interviews conducted as part of the current research shed light on the belief of the music technology establishment that several individuals made the most important contributions to the field over the last decade. The interviewees consistently provided a small set of names that they consider the group of leaders in the field. It should be noted that, while these individuals made important contributions to the research and practice of music technology education in the past, they are included in this chapter because they are at the forefront of their field and continue to make significant strides. The contributions of Fred Hofstetter were discussed in earlier sections of this paper, but Dr. Hofstetter no longer works in the music field. His energies are dedicated to broader study of Information Technology and on-line delivery of educational materials. He declined the opportunity to be interviewed for this paper.

G. David Peters was involved in the development of the early PLATO applications at the University of Illinois. His current contributions include the development of several educational software applications, and he is the founder of Educational Courseware Systems, which produces drill-and-practice style software. The curriculum that he has helped to establish at Indiana University-Purdue University Indianapolis includes a master’s degree in technology-based music instruction and offers several summer programs in this area. Peters is also recognized for his leadership in making technology a significant part of the Music Industry Conference.
Steven Estrella is a music educator who focuses on interactive WWW development. Estrella studied composition at Claremont Graduate School, and then at Temple University, where he joined the faculty in 1991. His introduction to the possibilities of computer lab-based music instruction came during his studies at Temple. His specialty is the development of highly interactive World Wide Web instructional materials, and his WWW presence includes an encyclopedia of composers, as well as tutorials on the use of Javascript for music applications.

David B. Williams of Illinois State University studied at the University of Washington and has been involved in music technology development for several decades. Williams established the Office of Research in Arts Technology (ORAT) at Illinois State to advance beliefs in the potential of technology in music instruction. Peter R. Webster of Northwestern University earned degrees from the Eastman School of Music. In conjunction with his expertise in music technology, Webster is an authority in the field of creativity in the musical thinking of children. Together, Williams and Webster wrote one of the definitive texts on music technology (see Chapter 1, Related Literature). They have also gained prominence for their presentations on technological topics at conferences of MENC, ATMI, College Music Society, and other music education organizations. Williams and Webster also regularly publish articles on the subject.

Dave Sebald continues to lead the Institute for Music Research (IMR) at the University of Texas at San Antonio, serving as its technology advisor. The IMR hosts an annual conference entitled Technological Directions in Music Learning (TDML) at which music technology researchers from around the world present their research in a helpful, collegial environment. The conference also features keynote lectures by experts on music

11 http://www.stevenestrella.com
technology-related topics and is highlighted by a think-tank session in which conference attendees share their research ideas and suggestions for improving the conference. Although it is a fairly new addition to the world of music technology and its related curriculum development, the TDML conference has quickly gained a reputation for its progressive nature and usefulness for teachers of music technology at the college level. Proceedings from TDML conferences are available on-line through the Institute for Music Research. While these conferences offer reports on the latest in technology research, many of the presentations given at TDML meetings relate to new techniques for using technology in composition, music theory, and ear training. Topics that relate directly to music teacher training are limited.

Sam Reese of the University of Illinois works in the area of music technology as it relates to student composition. His interest in this pursuit stems from his own work with MIDI synthesizers and computers in the middle school classroom. Reese has published many articles on the processes of student composition and how to integrate technology into those processes. Dr. Reese has given several important lectures in the past three years that addressed the effects and impact of technology when integrated into the teacher training curriculum, and the learning of younger students. He is a highly collaborative individual, having worked with several of the people previously discussed.

These individuals currently work on the college level, but each maintains close contact with the K-12 schools in their areas. Webster, Williams, and Reese, along with Tom Rudolph (see Chapter 1, Related Literature), were the members of a panel of experts
at the 1998 MENC conference that was billed as “Making Music Technology Work for You – Ask the Experts.”

Conclusion

The 1990’s is the decade from which came the clearest level of codification of all of the information, hardware, and software that had been developed previously. Documents such as MENC’s *Opportunity to Learn Standards for Music Technology* and TI:ME’s *Technology Strategies for Music Education* serve as evidence of the desire of music educators to solidify this field into a teachable and learnable subject matter. This type of motivation is the result of decades of preliminary work that gave us the technology that was needed to (a) perform musical tasks in an effective manner, (b) gain students’ interest in using technology as a musical tool, and (c) make music technology attainable for teachers with no prior computer training.

These motivating factors developed sets of standards and brought to the forefront the need to train in-service and pre-service teachers in the uses of technology in music education. From this movement for teacher education arose certain recognized leaders who took it upon themselves to establish the importance of technology in our current undergraduate curriculum. Having been involved in the development of this field, these individuals may have the best perspective from which to predict its future.

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Chapter 5

ANALYSIS OF RESEARCH INTERVIEWS AND SUMMATION

The purpose of this study was to trace the development of computer technology and its progressive integration into music education at the college level, specifically in music teacher training curricula. Exploration of this timeline reveals events that shaped the development of that curricular area. In an effort to organize the study, three chronological periods were established: (a) prior to the 1980’s; (b) the 1980’s, and; (c) the 1990’s and 2000’s. While the computer is the main technological device in this study, it is impossible to discuss technology at any depth without acknowledging the importance of other, related devices. Synthesizers, computer peripheral devices, and forms of electronic communication, among other technological advances, have made an indelible impression on the progress of music technology education.

This chapter serves two purposes. The first is to consult the interviews conducted as research for this paper, and draw some conclusions based on them, including predictions for the future of music technology education. The interviews also provide further impressions of the general development of music technology. Additionally, this chapter refers to the research questions stated in chapter 1, and provides concise answers to these questions, along with conclusions.

Analysis of Interview Responses & Predictions

A correspondence containing five open-ended questions was sent to twenty-six individuals, and ten responded. Several encouraged further communication in their initial responses, and they were contacted to verify specific facts, or to expand on their thoughts.
Those who responded to the questionnaire answered either by email or by recording their answers on audio tape. Individual responses may be found in Appendix D.

The individuals interviewed for this paper are clearly experts in their field, and are deserving of their designation as experts based on their experiences and accomplishments. While they share the common roots of the early music education technology discussed in the initial chapters of this paper, they also have their own perspective on the positive influences of technology on music education, as well as its evils.

Interview Question #1. What do you feel are the most significant events that have led to the current level of integration of technology into music teacher training curricula?

Answers to this question ranged from a statement that no events have really shaped this development to sequential lists of the events that respondents thought qualified. Generally, the chronological range of the responses began in the 1950’s with discussions of the PLATO project and its ramifications. Many of the responses concentrated their focus on the mid-1980’s and the development of MIDI as a tool for musicians and teachers. Several of the responses also centered on the involvement of professional organizations and standards movements as the primary driving forces behind technology development in music education.
Interview Question #2. What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?

The responses to this question varied much less than did those from the previous question. There were seven names repeated throughout the returned responses: Thomas Rudolph, David Williams, Peter Webster, Sam Reese, Jack Taylor, Fred Hofstetter, and G. David Peters. Not surprisingly, each of these individuals had been contacted for interviews. The limited scope of this set of responses is indicative of the relatively small community of people involved in the advancement of the music education technology field.

Interview Question #3. What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?

The interview respondents each cited their own professional experiences and their training as graduate students as the catalysts for their involvement in music education technology. Chronologically, none of the respondents are young enough that they would have been exposed to computer technology in music during their elementary or secondary schooling. However, many of them cite experiences during their undergraduate and graduate years that led directly to their level of sophistication in music technology. Other than the fact that their introduction to music technology came as college students, there is no clear pattern to the initial experiences of these people in the field. The phrasing of the question, however, yielded some interestingly worded responses. Sebald commented on his justification for including technology as a part of music instruction: “Traditional
music education taught students to approach music from a 19th century performance based perspective. There are so many more interesting and creative ways to work with music.”¹

Interview Question #4. What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?

This question yielded the most thematically consistent responses. Most of the respondents stated that while the technology itself has changed, their vision has not. Many respondents addressed the importance of technology being transparent, so that educators and students concentrate on the music-making rather than on the technique of using computers or technological devices. Reese articulated, “Observers of technology have commented, insightfully I think, that the most powerful technologies are those that we are least aware of as we [are] using them, so that our full attention is focused upon the purpose that we [are] trying to achieve and the processes that we need to go through to achieve that, rather than on the technology tools themselves to do that.”²

Another interesting response to this question was that of Gary Wittlich. As one of the founders of ATMI, Wittlich’s involvement in music technology and its educational applications is, chronologically, the farthest reaching of those interviewed. Wittlich spoke about his personal shift in the expectations that he holds for the possibilities of music technology:

…Early on I, like many other early adopters, believed that computers would revolutionize music learning. I still believe that the technology will greatly affect the way we go about learning and provide

¹ Sebald, Dave. Interviewed by the author, June 20, 2002. Interview in possession of the author.
opportunities for learning that no other technology can provide, even if it turns out that technology may not truly revolutionize the learning process. But while I believed this would happen within the twentieth century, I see now that I was too optimistic. Change is likely to be evolutionary more so than revolutionary.\textsuperscript{3}

Interview Question #5. What do you think the future holds for music teachers in the way we use technology? On what do you base these predictions?

None of the people interviewed have a “crystal ball” that would allow them to foresee the trends and advances that will be available for the next generation of students in this field. However, their experiences in music technology provide them with an image of the directions in which the field may be headed.

Some of the respondents referred to software and hardware devices that will be influential in the coming years. The Internet was a popular topic of discussion in the responses to this question. The respondents also included as important the potential for teaching devices that use handheld and wireless technologies, and performance devices like interactive music stands and accompaniment software. Other responses alluded to the general popularization of music technology as a revolutionary force in education. Reese cited his own studies involving the K-12 schools of Illinois that showed marked increases in the availability of and access to technology between 1998 and 2002.\textsuperscript{4} The sentiments of all the respondents were perhaps best summarized in Estrella’s words, “We see all these things today in limited scope. The future will bring higher levels of integration of

\textsuperscript{3} Wittlich, Gary. Interviewed by the author, September 23, 2002. Interview in possession of the author.
\textsuperscript{4} Reese, Sam. Interviewed by the author, July 15, 2002. Interview in possession of the author.
technology into our daily lives as teachers. Eventually…the technology becomes an invisible and reliable part of how we will teach music.”

Based on the responses, and on the general theme of this study, it seems clear that the future of music education is bound to technological development. While new pedagogical procedures for the teaching of ensemble classes do occasionally appear, the truly revolutionary changes that occur in the music education profession involve the development and integration of technology. The university curriculum in music education, as cited from several sources in Chapter 2, has remained quite static for the last several decades. Modern alterations to that curriculum often include music technology courses. If university faculty do not see fit to include separate courses in technology, then components of technology education within methods courses are possible and likely. As an emphasis on technology becomes more prevalent in those curricula, students receiving their training in music teaching will naturally include technology use as a part of their own teaching.

Conclusions

The author has observed several trends that may soon gain popularity among the music education professors in the universities of the United States. Requirements in methods courses for students to present project work electronically, either using a multimedia presentation software package or by some other means, exposes those students to the possibilities of this type of teaching. Communication via the Internet is quite prevalent in the university setting. Use of web-based software such as Blackboard and WebCT allows professors to post course information, notes, and discussion groups

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5 Estrella, Steven. Interviewed by the author, April 25, 2002. Interview in possession of the author.
that students can access. This type of environment allows for another developing trend, that of online testing. Evaluating students through on-line testing presents greater flexibility for the student, because students can take tests in a more comfortable environment, and complete them at their own pace. Online testing also eliminates the cumbersome pencil and paper test.

We have long known that not all students learn at the same rate, and that effectiveness in teaching can increase by varying the approach taken by the teacher. A reality of teaching in today’s K-12 schools is that many students enter the classroom with sophisticated knowledge of computers. University professors must decide whether it is important that music teachers capitalize on that previous knowledge, and use it to the benefit of both teacher and students. If it is important, then the amount and quality of technology training that pre-service music teachers receive should continue to increase.

We have only scratched the surface of the research needed to support the effectiveness of the use of technology in music teaching. For many, though, the risk of technology being an equally or less effective means of teaching is one that they are willing to take.

Responses to Research Questions

Research Question #1. Why has technology become a topic that is included in most music education programs today?

The reason that technology has become a topic in music education programs is that it is possible that the use of technology is an effective means of teaching music. It is

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6 Studies on the effectiveness of technology were reviewed in Dorfman, J. “Can a Computer Do Your Job Better than You Can?” Florida Music Director 54 #7 (February/March 2001): 7, 9-10.
simply the nature of music educators to seek out the best tools with which to teach music. Individuals and organizations have invested significant resources into determining technology’s effectiveness, and those who make curricular decisions have begun to realize technology’s value. College and university professors are forced to make decisions regarding what to include in their curriculum; it is simply impossible for them to teach everything. While some relevant topics may be excluded from the music teacher training curriculum, the use of technology is a subject that music teacher educators have deemed important enough to include.

Question #2. Which individuals have made the most significant contributions to the development of music technology education?

Question #3. What is the involvement of professional organizations in the development of technology education in music?

Every individual who has attempted to integrate technology into the curriculum of future music educators is important to the cause. While some have emerged as leaders in the field due to their outstanding scholarship, tenacity, and promotion, the unsung heroes in this integration are the professors who go unrecognized for their efforts in technology integration. The role of professional organizations is to encourage these people to continue the development of technology as a major component of their curricular design. Throughout the history of technology in music education, organizations such as MENC, ATMI, CMS, and others have helped music teacher educators by promoting the importance of technology. It is the progressive nature of these organizations that allows new ideas and methodologies to be introduced into the curriculum.
Question #4) When did integration of technology into teacher training curricula begin to occur?

Question #5) At what points in history have people changed their philosophical views of technology in music teacher training, and what factors brought about those changes?

True integration of technology learning in the music education curriculum is a recent inclusion. Early contributions, while they were groundbreaking, were not widespread, and did not effect the vast majority of the field. The 1980’s and 1990’s are the decades that saw the most significant strides in music technology education. The pace of that integration brought minor changes to the philosophies of those involved. Early innovators expected revolutionary changes, but realized that the technology was slower to develop than they hoped.

The views of music teachers at the K-12 and college levels have essentially not changed during the period examined for this paper. Music teachers have always wanted to provide their students with the tools to make music of high quality independently and with others. They are interested in creating young adults who are educated in the practices of music, and who are smart members of the musical community. Purse said that music technology education will “cast a net much further to draw in more and more students, to help at-risk students stay in school and to help people understand what goes on in all the media they see on television, radio and in the theatre…”7

Skills in electronic composition, music printing, multimedia development, and electronic communications are the topics that are most prominent in the music technology classrooms of today. Though new levels of sophistication in these areas may appear,

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these areas are likely to remain the major foci for technology use in the music classroom. The technology industry drives these areas, and they are therefore the ones that continue to flourish. Coincidentally, they also hold the most possible uses in the education environment.

Summary

Technology in the music classroom existed long before the computer. Uses of the phonograph and other audio devices revolutionized music teaching, and it is necessary to recognize that the computer, while its uses in music are evident, had to be adapted for use in musical settings. A limitation of this study was the determination of the point in history at which to begin. The decision to focus on the uses of computer technology was a difficult one, but expansion of the study past this parameter would have created a much longer and broader document. The author pays homage to those who changed the face of music education with the use of earlier technological devices.

A second limitation to this study was the lack of available documentation about the development of the National Consortium for Computer-Based Music Instruction, which later became the Association for Technology in Music Instruction. This group was clearly an influential force in technology integration into the curriculum, but records of its creation are limited. The refusal of Dr. Hofstetter, the principal founder of the group, to grant an interview made the search for this information a much more difficult one. A suggestion for further research is to create a historical record of the activities of ATMI, similar to those studies that have been conducted regarding the National Association of Schools of Music, and the Music Educators National Conference. Such research would
provide insight into the activities of this organization as it relates to the integration of technology into music education.

Documentation of history is important. Heller provides five reasons for the importance of historical research: “(1) a better understanding of the present, (2) a richer basis of information, (3) a more complete record, (4) a more accurate accounting of what has taken place, and (5) a clearer explanation of complex ideas.”8 If new techniques and procedures that develop in music education are not documented in a historical context, they are destined to be forgotten. True reform in music education, and the betterment of the profession and its effects on students can only be achieved when music educators use the past to revise their thinking. Computer technology is a topic that warrants that review, and encourages our continued efforts in seeking the best ways to teach music to our students.

APPENDIX A

Letter to Interview Candidates
Dear [Name],

Thank you for taking the time to participate in the research phase of my Master of Music thesis. Below are five questions designed to probe your involvement in the historical aspects of music technology and its integration into the undergraduate curriculum. Please feel free to answer them directly, or to use them as a guideline for your responses.

1. What do you feel are the most significant events that have led to the current level of integration of technology into music teacher training curricula?
2. What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?
3. What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?
4. What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?
5. What do you think the future holds for music teachers in the way we use technology? On what do you base these predictions?

I understand that your time is valuable, and I appreciate that you have agreed to lend some of it to me and my research. I respectfully request that the materials be returned in the enclosed stamped, self-addressed envelope by the end of June so that I may begin compiling the responses.

Sincerely,

Jay Dorfman
APPENDIX B

List of experts contacted for interviews and institutional affiliations
List of Experts Contacted for Interviews and Institutional Affiliations

Hal Abeles  Columbia University Teachers College, New York
Ed Asmus  University of Miami, Florida
Nancy Barry  University of Oklahoma
Reginald Bain  University of South Carolina
Bruce Benward  University of Wisconsin, Madison
Ann Blombach  Ohio State University, Professor Emeritus
Charles Boody  Formerly University of South Carolina
John Dunphy  Villanova University, Pennsylvania
Stephen Estrella  Temple University, Pennsylvania
Maud Hickey  Northwestern University, Illinois
Fred Hofstetter  University of Delaware
Stefani Langol  Saint Ann's School, New York
David Mash  Berklee College of Music, Bosto
Don Muro  Freelance electronic musician and author/visiting professor
Barton Polot  University of Michigan
David Peters  Indiana University-Purdue University, Indianapolis
Sam Reese  University of Illinois, Urbana-Champaign
Tom Rudolph  Haverford, PA School District
Dave Sebald  University of Texas, San Antonio
Tim Smith  Northern Arizona University
Jack Taylor  Florida State University--retired
Michael Wagner  Florida International University
<table>
<thead>
<tr>
<th>Name</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kim Walls</td>
<td>Auburn University, Alabama</td>
</tr>
<tr>
<td>Peter Webster</td>
<td>Northwestern University, Illinois</td>
</tr>
<tr>
<td>David B. Williams</td>
<td>Illinois State University</td>
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<tr>
<td>Gary Wittlich</td>
<td>Indiana University</td>
</tr>
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APPENDIX C

Members of the MENC Task Force on Music Technology
Members of the MENC Task Force on Music Technology

<table>
<thead>
<tr>
<th>Name</th>
<th>Affiliation</th>
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</thead>
<tbody>
<tr>
<td>Mike Bates</td>
<td>Yamaha Corporation of America</td>
</tr>
<tr>
<td>Margaret Griffin</td>
<td>Hillsborough County Public Schools, Tampa, FL</td>
</tr>
<tr>
<td>Dennis Mauricio</td>
<td>Hilltop High School, Chula Vista, CA</td>
</tr>
<tr>
<td>Brian Moore</td>
<td>University of Nebraska-Lincoln</td>
</tr>
<tr>
<td>Don Muro</td>
<td>Performing artist and clinician</td>
</tr>
<tr>
<td>David Peters</td>
<td>Indiana University</td>
</tr>
<tr>
<td>Sam Reese</td>
<td>University of Illinois</td>
</tr>
<tr>
<td>Tom Rudolph</td>
<td>Haverford School District, Haverford, PA</td>
</tr>
<tr>
<td>Jack Taylor</td>
<td>Florida State University</td>
</tr>
<tr>
<td>Peter Webster</td>
<td>Northwestern University</td>
</tr>
<tr>
<td>Lee Whitmore</td>
<td>Cablevision Systems Corp.</td>
</tr>
<tr>
<td>June Hinckley</td>
<td>MENC Past-President</td>
</tr>
<tr>
<td>Mike Blakeslee</td>
<td>MENC Staff</td>
</tr>
<tr>
<td>Larry Mullins</td>
<td>MENC Staff</td>
</tr>
<tr>
<td>David Williams</td>
<td>Illinois State University and Chair</td>
</tr>
</tbody>
</table>
APPENDIX D

Individual Responses to Interview Requests
Dear Jay,

I received your thesis questions. Here are my responses.

1. Significant Events.
   
   Advent of the Apple IIe computer system in the 1980s.
   
   The first music CAI programs come to market.
   
   First MIDI instruments appear on the market in 1984.
   
   Popularization of graphical operating systems in the Macintosh of 1984.
   
   1987 Notation and Sequencing Software for the Macintosh brings new productivity enhancements for music teachers.
   
   1991 the General MIDI Standard level 1 makes it possible for teachers and students to create MIDI files in a standard format for use on many different computer systems and MIDI keyboards.
   
   1995 the Technology Institute for Music Educators (TI:ME) forms to create certification standards for music teachers who wish to incorporate technology into their teaching. Programs that train pre-service music teachers now have a set of guidelines to follow and criteria to meet.
1996 the World Wide Web begins to attract a very large following in music education. MIDI file exchanges, online music dictionaries, and other services for music education appear on the net.

1999 the General MIDI Standard level 2 adds more expressive potential to MIDI instruments and MIDI files.

2002 MENC recognizes TI:ME as an affiliate organization and partners with TI:ME to produce a conference for music educators that provides instruction on the use of technology in music education.

2. Influential persons

The single most influential person in this field is Dr. Tom Rudolph. Tom is a practicing teacher in Haverford School District in Pennsylvania. He is a prolific author of many texts on using technology in music instruction. His most important text is probably, Teaching Music With Technology, published by GIA. He is now president of TI:ME.

3. Sources of original interest in the field

I became interested in music education technology while a graduate student in music composition in Claremont California. I enjoyed using the CAI programs on the old Apple IIe computer systems available at the Claremont Graduate School. When I entered Temple in 1987, I was assigned to manage the computer lab and learned about the Macintosh programs for MIDI sequencing and notation. We developed a set of competency assignments for all undergraduate music education majors to ensure they could use technology effectively in their teaching. I was impressed by how empowering
music technology could be for teachers and students. It helped me to remediate problems in aural theory and gave me the organizational power to create a database of composer information that serves the music community on the Web every day. When I became a professor at Temple in 1991, I became more interested in how technology could be used to improve student outcomes in music education.

4. My vision for technology in music education

Over the years my vision has changed. As an early adopter and technology enthusiast, I was very focused on the bells and whistles of technology for many years. Working with undergraduate music education majors as a Professor at Temple, I have gradually become more focused on technology as a tool for teaching and learning. My involvement with TI:ME keeps me in contact with the music education community. The result is that I see potential in technology to transform music teaching and learning. Using technology does not ensure better teaching but in the hands of a competent and well-trained teacher, technology can enhance music teaching and excite students at all levels. For many students, working with technology to compose and perform music provides great motivation and satisfaction. The broad array of sounds available on even the simplest MIDI instruments can inspire creative acts at new levels. I see technology as a way to improve recruitment and retention in school music programs, increase effectiveness of in-class time, provide flexible accompaniment and composition experiences, and remediate and individualize instruction in all areas of music.
5. The future

The Internet is quickly becoming the dominant delivery platform for technology-based instruction. My work involves creating highly interactive music education experiences on the Web to enhance classroom teaching and out-of-class learning experiences. Multimedia standards for the Web are just now beginning to appear. As standards mature and bandwidth increases, I imagine standardized music input and output to allow for real-time collaborative performance on the Web, pitch-to-MIDI conversion and speech recognition (for solfege training), gestural control of music (conducting experiences), computer-assisted composition tools, and form and analysis assistance. It won't be too much longer before small computing devices are standard equipment for teachers to create presentations. Teachers will also begin to use the Web more routinely to post assignments, communicate with students between classes, and share student compositions. We see all these things today in limited scope. The future will bring higher levels of integration of technology into our daily lives as teachers. Eventually, of course, the technology becomes an invisible and reliable part of how we will teach music.

Good luck with your thesis.

--

Steven G. Estrella, Ph.D.
Web Developer Specializing in Music Education
Interview Responses of David Mash, Berklee College

Date: 6/18/2002 8:31:32 AM Eastern Daylight Time—received by email.

1.) What do you feel are the most significant events that have led to the current level of integration of technology into music teacher training curricula?

   From a technical standpoint, the following are key development milestones:

   1982 - The Compact Disc, and the popularization of digital audio in a random access format
   1983 - MIDI
   1984 - Graphical User-Interfaces and personal computers on a mass scale (the Mac)
   1990 - desktop digital audio and music production
   1992 - QuickTime and desktop multimedia
   1994 - The World Wide Web
   1996 - MP3
   1996 - the founding of the Technology Institute for Music Educators (TI:ME)
   1997 - Publication of the "TI:ME Strategies for Music Education"
   1999 - 2000 Preparing Tomorrow's Teachers to use Technology (PT3) grants by USDOE

   These developments each led to the increased capabilities for music teachers to harness the power of technology in support of their teaching. There are of course many other factors, including state and national technology challenge grants, and efforts by MENC, CMS, and ATMI to embrace technology in the classroom and change the teacher preparation process by integrating technology into the curriculum.
2.) What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?

   I'd like to think I have made a contribution, and hopefully someone else will include me in their responses. ;-) 

   Tom Rudolph: Books, “Teaching Music with Technology” among many others; many presentations at MENC and other music educator conferences.

   Don Muro: Books, “Sequencing Basics” among others; many presentations at MENC and other music educator conferences.

   G. David Peters: Music software, coordinating the technology at MENC as part of MIC.

   Peter Webster, David Williams: Books, “Experiencing Music Technology;” many presentations, role in ATMI

3.) What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?

   My original work in developing and implementing Berklee's Music Synthesis Department (1982 - 1989) led me to understand the power that technology brings to the learning process, and how that specialized technology training could be more generalized to teaching music itself. That led to many presentations to teacher organizations like IAJE and MENC, and seeing the opportunity to change future music teachers' roles by integrating technology more fully into the teaching and learning processes. We received a PT3 Capacity Building grant in 1999, and then a three-year PT3 Implementation grant in
2000. That has allowed us to invest a million dollars ($1,000,000) into revising our music education (teacher preparation) program to fully integrate technology into every course, and to create 7 online course enhancement web-sites for supporting student learning beyond class time.

4.) What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?

   My vision is that technology should be invisible. It is a tool that supports the music teaching, learning, and music production processes. It is also embedded in musical instruments and therefore impacts performance. The power that these new tools provide us should be harnessed in any way a creative teacher can to empower students to learn, and to improve our abilities as teachers to mentor students so they become life-long learners.

   This vision has not changed much through my career, but the technology itself has. Where I once thought the technology would become simpler to use, it has not - in fact rather than becoming more transparent, it has become more noticeable and there is even more to learn today than ever. I still hope that one day soon, we will see the end of featuritis, and see a move toward truly useable technologies.

5.) What do you think the future holds for music teachers in the way we use technology? On what do you base these predictions?

   I believe that music teachers will be able to use technology to enable students at younger ages to express themselves through music. Music teachers will bring more
learning materials into their classrooms by more creative use of the Internet. Students will spend more time learning with technology, so that teachers can spend more time on musical coaching rather than drill and practice.

I base these predictions on trends I have seen developing over the last decade, and technology trends in higher education that will change how we prepare tomorrow’s teachers. Also I am a hopeless optimist!

I hope these responses are helpful to you in your work. Let me know if I can be of further assistance.

Best regards,

David Mash
Interview responses of Brian Moore, University of Nebraska

Date: 6/17/2002 2:33:34 PM Eastern Daylight Time—received by email.

1.) What do you feel are the most significant events that have led to the current level of integration of technology into music teacher training curricula?

   The prevalence and role of technology in the business and personal world. Technology is indeed another example of education reacting to the world around it! Technology by its nature is industry driven as the days are long gone when educational entities are the sole developer of software (hardware development was and continues to be solely an R&D phenomenon) MECC was a notable example of state education supported computer software development for a particular target audience. As computer and operating systems increased in complexity, the ability for individual development diminished.

2.) What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?

   David Williams (Illinois State University) - in my mind, really the pioneer in the technical foundations for music software in educational settings. Peter Webster at Northwestern, in working with Dave Williams, has really assisted the development of curricular approaches and materials for both teacher in-service and pre-service.
3.) What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?

My background in music education and composition coupled with several years as a computer technology coordinator for a public school district. I desired to have an environment where students could focus on the creative skills of composition without performance ability becoming a hindrance.

4.) What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?

Technology as tool and solution - equip music educators the approaches and problem solving skills that use technology to address issues of curriculum and pedagogy. Simply knowing "what buttons to push" only addresses about a 6 month window of use!

5.) What do you think the future holds for music teachers in the way we use technology? On what do you base these predictions?

The industry, in conjunction with education, will continue to move from standalone hardware and software to a "solutions approach". We are seeing it now in how computers are marketed. No longer is it to encourage buying a fast computer to have a fast computer, - now there are "multimedia" versions or Internet versions. The technology will need to be conceived, developed and marketed as tool - help the buyer buy the best tool to match the job at hand.
Among the "events," foremost is the stance regarding technology taken by the National Association of Schools of Music. Beginning in the 1990s, the NASM called for tech components within bachelor of music curricula, particularly music education curricula. Thereafter, colleges and universities seeking NASM certification have had to demonstrate how they incorporate music technology in their curricula -- either as integrated within courses such as theory and music history, or in newly-created courses devoted to technology issues.

Of secondary importance but worth noting is the National Standards in Music Education. Music technology was not cited as a specific standard, but was inferred as a means for achieving several of the non-performance standards.

What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?

There have many leaders in the field during the past two decades. Most have espoused the technology without regard to curricular issues, however. Exceptions were Peter Webster and David Williams, visionary leaders who were able to forge a role for
music technology in higher education. Because of them (and the leadership of G. David Peters), the state of Illinois is in the forefront of K-12 music technology.

Michigan is also in the forefront in K-12 music technology. I am told Michigan is the only state with an annual state-wide conference on music technology. This event and its publications has been influential in the growth of MIDI labs in the Michigan.

3.) What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?

My interest in music and computers began in my own undergraduate years, in a course at the University of Michigan taught by John Clough. In it I learned how to program music for the university's sole mainframe using IBM punch cards. The experience gave me a huge head start when, within an astonishingly short amount of time, everyone acquired computers on their desktops.

My interest also was inspired by George Wilson, who provided me with instruction in the University of Michigan's Electronic Music Laboratory, a 1960s-era analog lab that led me to the crossroads of synthesis and musical creativity.

A one-credit course in music technology was added to the music education undergraduate curriculum in 1999. Finding the room for this single credit hour in the very-compacted curriculum was a challenge, as was seeking acceptance for the course from a very conservative curriculum committee. My approach was to treat technology as a new family of instruments, thus deeming its inclusion among the secondary instruments.
Beyond the stated syllabus language, the purpose of this course was to give undergraduate music ed students positive experiences in the process of making music with technology, with the goal that they would be inspired to share these experiences with their future students.

4.) What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?

The singular change occurred when the first generation of computer-savvy children entered higher education. It was no longer necessary to teach --or even preach -- the use of technology. By the mid 1990s, most college students had been born with a mouse in their hand. Consequently, undergraduate instruction in music technology quickly evolved to issues of implementation and development.

To answer the first question, my vision of technology represents a new paradigm in music-making. This paradigm differs diametrically from traditional K-12 music education; the way young people make music in bands, orchestras, choirs, and general music is the polar opposite of the way people make music with technology. Among the stark differences between the new paradigm and the tradition: (a) creating music rather than replicating repertoire; (b) aural musicianship rather than visual musicianship; (c) individual rather than group music-making; (d) technology in lieu of technique.

If tech music-making were the same as traditional music-making, there would be no need to champion its inclusion in the K-12 curriculum. But it is different, profoundly so, wonderfully so. The profession has, for the first time in its history, a radically new music making model: a model that holds great appeal to young people, a model that
holds the promise of life-long music-making after graduation, a model that is practically limitless. My vision is that tech music-making achieve parity with band, orchestra and choir. My goal is to nurture a generation of music teachers that will lead us to that vision.

Jay, I hope you find my comments useful. Good luck in your project.

It may (or may not) be important for you to know that I am no longer on the faculty at the University of Michigan. Michigan's School of Music no longer has a full-time faculty member with the designated responsibility of music education technology, although they may acquire one in the not-distant future. The required undergraduate music ed course is still taught, however. I am currently on the faculty of Schoolcraft College in Livonia, Michigan, where I am responsible for an excellent program in music technology. I also continue to direct the annual Michigan Music Technology Conference.

___ Barton Polot, Ph.D.
Interview responses of William E. Purse, Professor and Chair of Guitar and Music Technology Department, Duquesne University School of Music

Received 6/12/02—transcribed from audio tape.

(Question #1)

…training, I feel that teachers and musicians have always been looking for the aspect of ways to improve through tech, similar to as the pianoforte came in which was much superior to the claviers at that time…moving form wood instrument and metals instruments in to electronics, whether is Elijah Gray working with Edison creating the musical telegraph, to instruments such as the theremin, as soon as electricity came into the picture there were electronic instruments. And the aspect of sound and electronics that work together are once again coming back together such as the fact that recording is now available to teachers through digital audio. I think in the aspect of technology in ’82 when MIDI was developed, that is almost as significant as music notation in the fact that it’s opened up a whole new arena of possibilities for music educators and musicians. At one time most of the electronic development was in the university level, such as the Columbia Princeton RCA digital synthesizer, Max Matthews’ work at Bell Lab and with the electronics almost becoming a folk instrument where the public could afford it and it wasn’t so expensive, it kind of went away from the universities. I think now is the time when teachers are reclaiming this technology and bringing it back for educational means. So, what is really significant? I think MIDI is one of the most significant things that happened. The other thing is the fact that a lot of the teachers who are calcified are retiring and a lot of the younger teachers realize that the folk instruments, electronic
instruments are in the home and computers, whether it’s sound design for video games and films, that there are wonderful ways to reach students and teach them music. I think that technology reaches beyond band orchestra and choir to be able to attract a different population. There’s probably 70% of the students that are not in music programs and with music labs and all the wonderful things that this technology lets us do, I think it’s time for teachers to reclaim this area.

(Question #2)

I feel that Berklee has had a lot to do with having a degree in music synthesis and NYU and also our program at Duquesne were some of the first ones which were NASM schools which were able to get approval for an undergraduate degree in music technology. What we’re focusing on at our program is not so much…Lynne Purse and myself really put together the curricula, which is focusing on kind of a renaissance approach between working with sequencing, notation, desktop music publishing, digital audio, multimedia aspects such as the internet, and CDROM aspects, and a strong, strong proponent for performance, not so much with sequencing but with realtime, using MIDI controllers. And teaching it with juries on the controllers on that aspect. The main thing that we…based a lot of our guidelines on were the National Standards for the Arts, looking at those applications---if high school students are supposed to be able to do that much, and technology is kind of a key area in those, then we really need to look at, you know, use those as guidelines for ourselves, which has been important in putting our program together. I feel that David Mash is a very important gentleman. He was the teacher, he’s the dean of curriculum at Berklee, and is a really strong proponent of
education with technology. Also Dr. Tom Rudolph has written a lot of books. He is the
president of TI:ME…Tom Rudolph is very important. Steve Estrella at Temple. He has his
own company now but at that time he was a very strong proponent in education for
technology.

A note, Berklee is not an NASM school, they are not under that accreditation, but
their state accreditation. You may want to touch base with David Mash also.

(Question #3)

Most of the training that we do is at the graduate level through TI:ME courses.
Before that program started…(gives web address)...we had run masters programs for
educators that are in-service almost as soon as I started at Duquesne 15 years ago, that we
knew (were) very important. What’s almost tragic is the fact that there are so many
courses that the undergraduates have to take, their schedule is so packed, we do the best
we can where they actually have modules where technology is implemented. One thing
that we do, we have a Computers for Musicians course across the curriculum for
freshman when they come in, very right off the beginning. They learn information, how
to be able to do research with information technology, they also learn sequencing with
Freestyle and they work with Finale software. This is built into the syllabi for all
musicianship courses, jazz courses, applied, throughout the whole curriculum the
students are known to have a certain level. I wrote the book The Finale Primer, which is
published by Backbeat and available, out of my five year training Finale with teachers
and undergraduate students for this course. It’s been very effective. And then we
encourage our students, also, to take the summer courses with the graduate teachers if
they want to go in that area. Since the music education requirements are so stringent in our state, some of the students who really want the technology become a double major. Sometimes it takes them five years completely with education, and the last year they finish up all the digital audio courses music technology courses, electronic orchestration that they need to be able to get a second degree in music technology, which is very effective for them.

The importance of technology in performance from years of performing, my wife and I had a duo called Er Go and we performed all over the world, just the fact that I was renting recording studios before I came back to the university, I just knew how important it was in the real world that it had to be able to come back into the university level also. Which is just working with the wonderful instruments that are provided and a lot of the software that’s available without having to write code or go into C++ using what’s available effectively in teaching and in performance. The importance of this, you know if you don’t get into the educator’s end, that’s why we really started the graduate program that we’re looking at and over the years we’ve found that the teachers who really have a head’s up and they don’t feel that this technology is something that’s gonna replace their jobs but it’s something which they can be augmented. And you see that feeling dissipate with teachers, which is a very good thing.

What led us to do so? Just the fact that it was almost an imperative to be able to make this available for teachers and through training teachers in the summer it’s a wonderful recruitment program four our undergraduate. We have doubled our enrollment over the past 2 ½ years which is pretty amazing. And the teachers really like the setup
that we have here and recommend it to our students. We find that reaching the teachers helps the teachers and it also helps our recruitment at the university.

(Question #4)

I think that the vision is that the technology needs to be transparent and the teachers feel very comfortable. This is happening through the industry where the interfaces are becoming much more simplified and we are looking at not so much learning the software or relearning it but taking whatever software is available for digital audio, MIDI, sequencing or working with instrument design, virtual synthesizers…I think it’s much simpler to be able to work with these. So my vision kind of started out in performance and through working with TI:ME where they actually came down with six standards (lists six standards), those areas helped me to open up our program a little more to be able to bring in the media aspects and web design is important.

(Question #5)

I wrote an article for MENC in ’95 and I talked about the IMS, the Intelligent Music Stand, which was a LCD display that had the music scrolling, and you make changes, the whole orchestra gets it and the dynamics and everything. And sure enough Harry Connick has patented that idea. If I’m looking ahead a little more, I just feel that the fact that classes can be combined to the internet, mentoring, through university programs, music education without walls through developing on line courses for students and teachers…you can see some of these things that are happening right now such as: students can submit compositions to composers for their evaluation. I think that the two
things that music technology does really well that teachers sometimes have a hard time are composition and improvisation. You can see that already with software like Band-in-a-Box, and what will happen is that this will become much, much more interactive. I think what’s big in the home industry and will come in to music education is digital audio recording combined with MIDI sequencing and that whole aspect. And in the future, the students will be doing more and more film type work synchronizing MIDI, digital audio, sound design, Foley design, automatic dialogue replacement, pretty much where the classroom will become a model for what’s going on in Hollywood and through film and on cable. I think those things are important. It’s gonna take a while, but I think that the states need to recognize that they have to put more and more music technology into the prerequisites that teachers need to have. And I think what will happen, the teachers who have this training or the ones who are looking for it right now are the ones who will be much more marketable to become in-service teachers. And so I think that what happens in the homefront with all the home recording will be moving into the classroom. I think that the students are ready, they’re doing it all already, it’s just getting the teachers to move. The good thing is the fact that teachers are a little more interested and kind of have fun and enjoy it and hopefully they’re not as threatened by the knowledge that the students have and they’re able to find this and tap into the students to use that as a classroom resource. So the future looks pretty good for teachers using music technology. It’s gonna become easier and easier all the time and I think what it will do is cast a net much further to draw in more and more students, to help at-risk students stay in school and to help people understand what goes on in all the media they see on television, radio
and in the theatre which is really great to be able to understand those. And to actually on a smaller scale be able to participate and be creative with technology.
Hello, Jay, this is Dr. Sam Reese at the University of Illinois, and I’m responding to your request for an interview as part of your masters thesis. I’m pleased you asked me to participate and I’m happy to share my thoughts with you on your questions.

Your first question is [reads question #1]. Well, it seems that there is quite a thread and quite a variety of events that have led to the current status of technology in teacher training, and there’s no clear pathway here, I think, but a variety of developments I think are worth mentioning. Probably first, going back to the mid and late 60’s with the development of the PLATO instructional system here at the University of Illinois and other major universities as well. This is where some of the very first instructional software was developed for use on that earlier mainframe computer system. And continuing with technological types of developments, obviously just the development of the microcomputer in the early 1980s and its continued increase in overall technical power and its growing pervasiveness in our society as a whole has certainly made it much more feasible from a practical point of view to integrate technology into music teacher training. Costs have come down and access has gone up. A third development, and I think a very important one, was the development of MIDI itself in 1982 to allow the communication with computers and music instruments. This allowed development of courses in notation software, sequencing software, accompaniment software, and a
variety of computer assisted instruction titles that gave students a much more musical kind of a context to work in when they were either doing tutorial or game or drill and practice types of software, but I think more importantly when they began to work with productivity kinds of titles like notation, sequencing and accompaniment titles. This is a much more open-ended environment for teachers and students to develop applications that directly related to the needs and responsibilities of music teachers and students.

Continuing on and moving away from the technological kinds of developments, I think I would cite the development of a couple of professional organizations. One of those is currently called ATMI, the association for technology in music instruction, and this organization grew out of an earlier organization, which I can’t recall its earlier name, but it was Computer Based Music Instruction Consortium, something like that, and this organization has been a forum for college music professors in particular to share their developments of applications of information and communication and music technologies to typical kinds of music teaching and learning circumstances. Again, especially in higher education. Because of this forum, learning has been dispersed and knowledge has been dispersed so that more teachers at the university level were able to include technology applications in their own work. A recently developed organization that I think is very important is the Technology Institute for Music Educators, having been organized in the mid-1990’s. And this group in particular has made its mission the professional development of k-12 music educators, and has grown steadily in the number of opportunities that it has provided for teacher training, or teacher learning in technology, and as I think you know, has a three-level certification process in which particular criteria or standards have to be met by teachers to demonstrate their technology knowledge and
skill and their understanding of the processes of integrating technology into school music programs. So I think those are two very important organizations that have had an impact on the current status.

And finally I would mention one other movement, I guess I would say, and that’s the standards movement. Specifically here I’m referring to three sets or three types of standards that have been developed to try to specify or clarify what teachers need to know and what they need to do with technology as well as specify the kinds of curriculum and staffing and scheduling and materials resources that schools ought to be providing to make technology integration possible. So specifically what I’m referring to here first are the recently-developed MENC Opportunity to Learn Standards in Technology, and these were developed by a technology committee at Music Educators National Conference and do what I said earlier. And that is to specify what resources school should be providing to their students in terms of teachers skills and abilities, their curriculum, their scheduling, their technology resources and so on. So I think that shows a maturing of our expectations for technology in schools and clearly if k-12 schools are going to implement these standards, then teacher training curricula are going to have to prepare pre-service teachers to be ready to do that.

A less specific movement, but still influential I think, is the development by many state boards of education of standards for teachers. And among these have been technology standards for teachers. For example here in the state of Illinois, there are nine standard statements that all undergraduate students are supposed to have achieved and that in-service teachers are supposed to be striving to meet, which again specify what knowledge and skills they should possess in relation to the use of technology in teaching.
And finally, a related and broader effort was carried out by the International Society for Technology in Education, again trying to state what teachers should know and do in terms of technology.

So I’m sure there are other events that could be cited, but those are some of the ones that come to my mind.

I’ll turn now to your second question [reads question #2].

Well, this is a hard question because there could be a number of answers here, but the three names that come to my mind most quickly are David Williams of Illinois State University, Peter Webster of Northwestern University, and Thomas Rudolph, who is director of music for the Haverford Township schools in Havertown, Pennsylvania. And I think I would point most concretely to the books that these three individuals have written which are now in active use in undergraduate music technology courses. The book by Williams and Webster, I’m sure you know, is *Experiencing Music Technology*, and is now in its second edition, and this book has been the most comprehensive summary and overview of computer-based technology applications for musicians in general. And as a part of that of course, it is relevant to the teaching and learning of music with some chapters specifically addressing music instruction software. So, I think that’s a very important development because it’s served as a compilation and a codification of knowledge that had been developing over the prior decade and now is available in one readily accessible source for teachers at the college level to use. And similarly, Tom Rudolph’s book, *Teaching Music with Technology*, which is still in its first edition, specifically addressed knowledge that music teachers need to know in order to use
technology effectively in typical school music program settings like the general, instrumental, and choral music programs. So I think those publications have been important by those three people.

Turning again to David Williams and Peter Webster, they have, for a number of years, and I’m uncertain of the exact number, but my estimate is at least seven or eight years, been very active in making presentations about applications of technology to music instruction at the ATMI national conference, and these have been very well attended by college music professors with a variety of specialties. And these presentations have served as kind of an anchor to help others of us stay abreast of developments in the field and to simply expand our knowledge of technology applications and the pedagogy associated with it. They’ve been speakers and presenters in many other forums and professional settings, for the College Music Society, for National Association of Schools of Music, and a variety of other professional organizations. So they’re quite present and well-known in professional circles, and continue to have a strong influence on the thinking and direction of other people.

In a like manner, Tom Rudolph has also been very influential in leading the development of the Technology Institute for Music Educators, and I think this is a very influential organization, to make it more likely that k-12 music teachers have access to technology training. He has a series of other publications to his credit as well including curriculum materials and software guides, so he’s an especially active leader of organizations, speaker, and presenter in professional conferences, and developer of published materials. So I would cite those three people as perhaps the most influential at this point.
I’ll address now your third question [reads question #3].

Well, several years ago, more than ten years ago, I began teaching middle school general music. And prior to that time I had been active as a performer in rock and pop bands and in jazz groups. And as a performer I had begun using MIDI technology with my synthesizers, and particularly had been using sequencers and drum machines. And it occurred to me early on that that environment of being able to easily record musical ideas as input from a musical keyboard or from the touchpad of a drum machine was a particularly open-ended and creative environment in which people could, rather rapidly, create their own pieces of music or arrange existing pieces of music, of course. And to be freed up of some of the typical demands of composing which were a sophisticated knowledge and command of the staff notation system, and to have relatively sophisticated performances skills, particularly on piano keyboards. So when I began to work with middle school students, it occurred to me that I wanted to try to get them in a setting similar to that. So, over a series of three to four years, I began working to get microcomputers and keyboards connected with MIDI in my general music classroom and little by little, developed composing assignments and projects for my students to work with sequencing software as a composing environment. And I worked my way up, or worked our way up to having five MIDI music workstations, and to having a dedicated twelve-week course, elective course, that all seventh and eighth graders in our middle school could elect to take, which was called Contemporary Composing. And in this environment students got an initial experience in creating their own music in this kind of a sequencing and drum machine kind of environment. So I was proud of that, and now that course is still continuing under the leadership of other teachers and it’s easy to say
that thousands of young people have had at least one extended initial experience in composing original music. Of course my interest here was not in developing a whole raft of new composers for our society, but to use music composition as a way of developing the musical understanding and musical perception of students so that their own aesthetic sensitivity and musical knowledge was expanded. It was an alternative kind of a constructivist and synthesizing approach to teaching and learning music, and I’ve written about that in an article published in the *MusicEducators Journal*, I think in the year 1995 called...[laughs]….I can’t remember now, called, MIDI and Composing in Your Classroom, or something like that.

Then, when I was employed at the University of Illinois in 1996, that served me well to integrate, not only composing, but a variety of other technology based applications into my teaching here. I should probably mention that during the years I was teaching in the middle school, and was also a coordinator of music in school district 64 in Park Ridge, Illinois, that I became active in serving as a leader of workshops and presentations for other music teachers, and learned in the process of trying to do these workshops, learned more and more about how technology might be applied to the typical needs and circumstances of school music programs.

Now I’ll speak to your fourth question [reads question #4].

Well, these are always hard questions to address because they are open-ended and broad, but let me just try to explain a few of the ideas that have motivated my interest in technology and my enthusiasm for it. I think my vision of technology in music education is that technology based learning environments might become the kind of constructivist,
open-ended, problem-based learning environments that would lead to higher order levels of think that typically occur when students are working in creative environments or in critical thinking environments, and this grows out of what I was speaking about in my answer to the third question, where I have been excited about the potential of software and other technology based setting to allow students to create their own musical material. That is, to work with it in a very immediate and kind of hands on way, which, the psychologists who adhere to cognitivist and constructivist kinds of views of music learning say that each person needs to develop their own understanding of how a discipline works, and in this case, how music itself works. And that that occurs most effectively when students are able to actively manipulate and work with, that is make changes, experiment with music material itself. And by working in this kind of a holistic and problem based circumstance, the students build up their own unique understanding, their own mental schema if you will, of what music is, how it works, and how it feels to them. So, growing out of my interest in composing, and the flexibilities that computers offer for that kind of environment, and the obvious advantage of the immediate aural and visual feedback that software can provide students, that continues to be at the center of my vision of technology in music education. I’d like to think that the vision is a little broader than composing in that technology might also become so well integrated and so ubiquitous and pervasive in our teaching and learning environments, that we become less and less aware of using technology itself. Observers of technology have commented, insightfully I think, that the most powerful technologies are those that we are least aware of as we’re using them, so that our full attention is focused upon the purpose that we’re
trying to achieve and the processes that we need to go through to achieve that, rather than on the technology tools themselves to do that.

So, I’d like to think as computers get smaller, as they get less expensive, as they get increasingly easy to use, they will essentially disappear, if you will, into our teaching and learning environment, yet be providing powerful new tools for thinking about music itself—music listening, music performing, music composing. And finally I would add this last idea that with the rapidly growing access to communication networks in our society that technology might have a substantial impact on not only how students learn music and what they learn, but also where they learn and who they learn it with, and communication technologies might serve to lower if not eliminate the barriers of space and time that we all face in trying to expand our learning. So, that vision I think, has expanded a bit over the years, as new technologies become more available to more people. But I think, essentially, it has stayed focused upon the aspiration to making technology a powerful tool for cognition and for creation.

And finally speak to question five [reads #5].

Well I certainly wouldn’t want to buy any stock in my company that tries to predict the future. It’s an extremely difficult thing to do, and probably the most interesting thing about the future are the surprises that it brings us, rather than for when it fulfills what we expect to happen. But I think the future for music teachers is somewhat addressed in my answer to number four, and that it, it’s clear to access to technology is becoming less of a barrier. Although still a barrier, but less of a barrier in recent years as schools have invested substantially in computer an networking technologies, and
specifically I have data related to that from two surveys of teachers, actually surveys of schools in the state of Illinois that I did in 1998, and now am in the midst of doing a 2002 follow-up study. But just to cite a couple of statistics there, in Illinois schools in 1998, only 48% of schools even had one computer in the music area of that school. But now in 2002 that number has grown to 80% of music classrooms or music areas of schools having access to at least one computer. And a related development, 1998 only 16% of music classrooms had access to the Internet in Illinois, and in 2002, that percentage had grown to 74%. So, just in simple access to technology, it’s clear that it’s more available to teachers, and therefore at least possible that it will be used more regularly. One of the continuing challenges, as we move in to the future, is to help teachers increase the proportion of time that they use computers for instructional purposes, as compared to administrative or productivity purposes. It was clear in 1998 that although the majority of music teachers did use computers regularly in their work as a professional teacher, they were using it administratively. Only about 25% ever did anything with music and their computers. But that number has increased in to 2002. And so our challenge is to help out colleagues understand the potential applications of technology for music teaching and learning, and to help them develop the skills to do that. I mentioned in my answer to number four that I hope the future holds a continuing growth in the ubiquity of computers; a kind of pervasive computing model, that we can read about in general technology discussions, and again, that these tools will become more and more intuitive, more and more transparent to our music teaching and learning purposes and less focused on technology. If anything, I think the growth of our communication networks is a substantial hope for increasing access to technology, and again to change where and with
whom and when our music students are learning. If we need any single thing in music teaching in our school music programs, it’s simply more instructional time. That is, more minutes in each day that our students would have opportunities for learning music. The amount of time available in schools, as I am sure you know, is quite restricted. And if we can develop not only technologies, but interactive structures if you will, software environments that students could access from their homes, from public or school libraries, or from other classrooms to extend music learning, but yet still be directly related to the types of music learning tasks that they are undergoing in their traditional face to face instruction with teachers—I think that development would be a very promising one for music teachers. Of course, the unknown is what might happen with new technology developments. Internet II is a hopeful development in simply increasing the capacity of the internet for carrying high quality audio and video data, and that would and is indeed making possible distance learning that will, again, reduce those barriers of space and of time that always impact how much music can be taught and learned.

One development that many observers and leaders of educational technology have spoken about in a variety of ways and settings is the need for the organizational structures, the systems, if you will, of schools themselves to need to change substantially, if we’re going to really take advantage of the power and the potential of technologies for learning. Let me try to make that a little more concrete. School structures today have been criticized as being an organization of cells and bells. That is, our students move from one rectangular space to another on a regular, kind of, predictable schedule during the day with predetermined groupings of people, and that this structure itself, inhibits many of the most interesting and powerful uses of technology which need to be often
engaged in for longer periods of time in more open-ended ways in which problems can be pursued and a path of learning followed, so to speak. And need to occur often individually or in interaction with small groups of students as opposed to the dominant large-group instructional structure of schools. And although this is a vague concept, many people have commented that until we can develop whole new school structures, systems and organizations, that we probably are going to be limited in the effectiveness with which we can integrate technology into that kind of an environment.

So Jay, I hope that some of these thoughts made sense to you and I hope they’re helpful. I hope they reinforce what you’re hearing from other of your interviewees or that maybe I’ve introduced an idea or two that others didn’t anticipate. And it’s always a pleasure to know about people like yourself who have a serious interest in music instruction and music technology. So I sure hope we can keep in touch and I would certainly like to know about the results of your research. By the way I compliment you for your questions; I think they’re thoughtful, I think you anticipated well what might bring forward some provocative and interesting responses from your interviewees. So best wishes, I hope you’ll keep in touch and perhaps share a copy of your thesis with me when you finish it. Bye, now.
Hi Jay,

I'm afraid I don't have any historical information in my possession as Treasurer. But I can think of three people who may be able to help you, because they were involved at the time.

Dr. David Williams Illinois State dwilliam@ilstu.edu

Dr. G. David Peters  IUPUI  GDPPres@aol.com

Dr. Charles Boody  Hopkins Schools, MN  Chuck_boody@hopkins.k12.mn.us

I hope this helps. Good luck with your research.

Dr. Reese
Jay,

1) No earthshaking events have affected today's level of technology integration in music teacher training. In fact I would not consider the level of technology integration very high yet. I would point to a few factors that might be slightly influencing this integration:
   a) Individual music professors' consistently pushing for more integration in the arts along with greater integration of technology in all disciplines.
   b) The rise of support organizations and conference events like Tl:ME, NSMIT, TDML, and ATMI which have made music education technology much more visible.
   c) Support from commercial firms.

2) It is too early to pick the most influential visionaries because we haven't achieved the vision yet-- we're still working on it. I can only point to a few of many people spearheading the push and give some reasons:
   a) Tom Rudolph, John Dunphy, Steven Estrella, and other initiators of Tl:ME. These men had the vision and energy to start an organization whose stated goal was to promote technology in teacher training and classroom teaching.
   b) Dave Peters, Peter Webster, and other early pioneers of ATMI, (although this was early in the process.)
c) Those of us (me included, I guess) who first demanded the inclusion of technology instruction in music teacher training curricula and began national conferences devoted to this subject.

3) The reason to me is obvious: Music education remained static while the real world of music was vital and growing. Traditional music education taught students to approach music from a 19th century performance based perspective. There are so many more interesting and creative ways to work with music.

4) I must say that my vision of music technology has not radically changed since I began philosophizing about it 20 years ago. I still feel that its greatest benefit lies in allowing people of all ages and abilities to create music on an individual level.

5) Based on my own experiences over the last 20 years I would say that traditional music education programs won't change significantly. Rather, they will gradually whither while other, more relevant programs rise to replace them. This will occur at both k - 12 and university levels.

I hope this helps.

Dave Sebald
Interview Response of Kim Walls, Auburn University

6/16/2002 11:45:47 AM Eastern Daylight Time

Dear Jay:

I have found it very difficult to answer your questions, as I don't know if my answers help you probe my involvement in historical aspects of music technology, but here goes. I wish you success in your project.

Kim Walls

1. Most significant events: Publication of the following software products: University of Delaware Videodiscs, Beethoven Symphony #9, Guido, Finale, Microsoft Musical Instruments.

2. Individuals and their contributions:

Jack Taylor was an early adopter and has been a visionary for technology in music learning in many academic presentations, teacher workshops, college classes, and publications. Williams and Webster have been important in explaining to others "how to" use technology and "how to" teach college level music technology courses. Their presentations at ATMI and other venues have enabled music faculty to learn and teach technology. Fred Hoffstetter (sp?) developed the first important multimedia product, the U. of Delaware Videodisc series.
3. My initial interest: At UTSA, when a computer course was required as part of the collegiate core curriculum, David Sebald and others were able to convince the university to let a music technology course count for the core and all music majors were required to take the music technology course. So, the job position I accepted there required the teaching of the music technology course!

4. My vision: Technology is a tool that teachers should use only when it enhances music learning goals by making new learning possible, making learning more efficient, or motivating students to learn. My vision has not changed.

5. The future: Technology will become easier to access, cheaper, and easier to use. However, fewer educational applications will be developed because of the tendency of companies to focus on the markets that bring the most income and the tendency toward corporate monopolies. These predictions are just based on current trends.

Kimberly C. Walls
Associate Professor & Coordinator of Music Education
Dept. of Curriculum & Teaching
5040 Haley Center
Auburn University, AL 36849
Interview responses of Peter Webster, Northwestern University


I will simply write my answers to you. I have returned the tape unused.

Question 1.

The integration is far from complete. As you may realize, many undergraduate programs that prepare teachers in the US and Canada do not directly deal with technology or do so in a very cursory way. Despite the efforts of the National Association of Schools of Music (NASM) to mandate this, (which by the way is a very important step), I do not think we have a very rich situation at the moment. I am not sure we have good data on this either. I bet the best source might be NASM report data. So, to your question:

1. NASM requirements

2. Young music ed faculty coming into the system who push for tech in the system

3. Groups like the Association for Technology in Music Instruction (ATMI) and their members (college profs) who push for this.

4. State and national music education meetings which feature technology

5. New textbooks, such as Experiencing Music Technology (smile)

6. Deans/directors/department chairs that push for this in their units

Perhaps the most important factor is the technology itself which has become such a dominate part of the music industry and has gotten so good over the years.
Question 2:

This is very difficult to say. There really is no dominant individual really like there might be in sports or fiction writing for example. It's a movement associated with relatively obscure folks working hard to feature the hardware and software. I've done my part, Dave Williams has too. The two of us have given many workshops and talks over the years but who is to say this has been the most influential or even influential at all really. Sam Reese at the University of Illinois has done great work for the schools particularly, as has Tom Rudolph and the TI:ME organization. But has that effected higher ed? Perhaps. Difficult to tell. The many people that present papers and talks at ATMI probably deserve credit too.

Question 3:

My deep belief in how technology can help get to the difficult mysteries of music and help young people understand both the affective and cognitive aspects of our art. There has always been a strong association between music as art and technology and it will continue I feel. Also, technology is a great aid for music teachers in non-aesthetic matters like management and advertising.

Another reason is that technology allows kids to work in teams and on projects. Project-centered learning is quite important it seems to me. I am a constructionist in my educational philosophy and technology helps constructionism work.
Question 4:

My vision is that technology be used musically in performance, listening, and composition. This has not changed at all and probably will not.

Question 5:

In the short term, it's clear that technology will continue to support music printing, sound recording, and distribution of music. It will continue to be a force in the learning of music concepts. It will begin to make music teaching more universal and less "school" oriented. Look for music education to change radically in coming years, especially with the growth of senior citizen interest and as our middle aged people strive for a better life. On the long term, technology may make MAJOR changes in the paradigm of concert going, music performance, and the music itself. As an example, thinking about the idea that technology can now provide a way for a performer to shape sound without having to "play" the notes. Just this simple ability is a huge deal for traditional music performance where a person is expected to play the notes of a Brahms sonata yet again and then add expression. This performance paradigm we have may not last or ever be the same. I realize this may sound like heresy but there you are.

Good luck on your work. Send me the finished product!
1.) What do you feel are the most significant events that have led to the current level of integration of technology into music teacher training curricula?

As with any new technology, there is a learning curve that can be steep, especially for those who are somewhat “technology challenged.” There is also a kind of critical mass point of accommodation, meaning that until there are enough users there will not be sufficient knowledge and breadth of use to build a user base. Another issue is application development: until there are applications that are perceived to be of value, neither those who might want to use technology nor especially those who are called on to support its use will be sufficiently inclined to invest the money or effort in acquiring and using it. Other developments of importance are MIDI, the growing use of electronic instruments in performance and teaching, the emergence of coursework and degree programs across the country that focus on music technology, and, at least for public institutions, recognition of local and state funding bodies of the need to fund technology in schools.

2.) What few individuals do you feel have been the most influential upon the integration of technology into baccalaureate music programs? What are their most significant contributions?

This answer will depend on one’s individual perspective, but I would cite two persons who were early adopters and drivers, David Williams at Illinois State University, and Fred Hofstetter, first at Ohio State and now at Delaware. But I would also have to
include a group of us who made inroads in music technology through our creation of what is now ATMI in 1975. The primary organizers with Hofstetter were David Peters (Illinois, now IUPUI), and myself (Indiana). Actually, Fred Hofstetter and I mulled over the idea while waiting for a bus in Los Angeles in 1975. Fred then took the lead and convened a meeting at Delaware later that year, out of which the organization now called ATMI emerged.

As for others, Bruce Benward and his group of grad students at Wisconsin (among them Tim Kolosick, now at Arizona) were instrumental in linking Benward’s textbooks to computer-aided drills, and now many of the grad students have gone on to other schools and are continuing there work in music technology. David Williams and Fred Hofstetter have devoted a great deal of effort to pedagogical applications, as have David Peters, Larry Peterson and Michael Arenson(Delaware), Jack Taylor (Florida State), Tim Koozin (now at University of Houston), Peter Webster (Northwestern), Ann Blomback (Ohio State), and Frank Clark (Georgia Tech). Personally, I have been involved in music technology (at first in research) since the late 1960s, and there are a good many other “pioneers” who started early on as well, many of whom worked quietly within their own universities and without much notoriety but did very good work and played an important role in the early history of computing in music; I won’t bother to try to name them for fear of missing some important ones.
3.) What led up to your initial interest in infusing technology into your own music teacher training curricula? What led you to do so?

My case was one of serendipity. In summer, 1966, I was completing some coursework and working on my dissertation research at the University of Iowa when a fellow grad student with a math background asked if I was interested in taking a free programming course in FORTRAN. I had no idea what a computer was, much less a programming language! But I sat in on the course, and then later that summer enrolled in a workshop at SUNY Binghamton given by Allen Forte (Yale) and Stefan Bauer-Mengelberg (I don’t recall his university affiliation) dealing with music and computers, focusing on research using the language SNOBOL3. I became fascinated with the possibilities that I thought computers presented, and when I returned to IU in the fall I began to develop some research problems in music pattern matching. In 1969, as I recall, I offered an elective graduate course in SNOBOL programming, and the rest is history, as they say.

I turned to educational applications in 1974 when IU was able to get some connections to the University of Illinois PLATO system, a mainframe educational computing system connected to various university sites using Government Services Administration phone lines. We eventually got some 24 PLATO terminals on campus and I managed them. Then in the early 1980s, I applied for a grant to get an early version of a microcomputer and went from there to an Apple II and eventually to Windows applications, which I now use. I helped to develop a computer lab in our music library, and by the late 1980s I was appointed as director of computing for the School of Music. While we did not have many faculty yet using computers, we did have enough interest on
the part of students to offer regular courses. This led to creation of a graduate minor program (called Music Information Technology), which I directed until I left in 1995 the School of Music for an associate dean’s position in the IU Office of the Vice President for Information Technology, from which I retired in 1998. Prior to that I served as a Fellow at the Institute for Academic Technology in Durham, NC (fall, 1992), and in retirement I served for a couple of years as director of IU’s Ameritech Fellows Program (http://amfellow.iu.edu), a grant program for faculty throughout the eight campuses of the IU system. In 1998, I helped form the Learning Technologies Consortium, a cooperative organization for sharing information and development among nine major universities. And from about 1998-2000, I worked in the formative stages of a National Science Foundation grant for digital libraries that IU won in 2000 (http://variations2.indiana.edu/). Not all of my work has to do with music, but it was music technology that got me involved in a broader way in technology-enhanced learning.

My interest in learning technology is spurred by my belief that appropriate applications utilizing technology, especially multi-media, can do more for contextualizing learning than classroom teaching. At the same time, I have no illusions about computing and learning. Computers are still too hard to use for some people, and most educational applications leave a lot to be desired. But we’re learning, and I have no doubt that the future is bright, so long as the focus is learning and not the technology. John Seely Brown (formerly of Xerox Palo Alto Research Center) talks about “glass box technology” (as opposed to “black box”), by which he means making the computer a tool through which users can see to the solution of a problem. I strongly endorse that idea.
4.) What has been your vision of technology in music education? Has that vision changed throughout your career? If so, when and why?

My answer is anticipated in my response to the previous question. My vision has always been to use electronic technology as a tool for assisting learning and learners, whether in music or in any other discipline. Music has special problems in this regard, however, in graphics and sound and their manipulation, and this makes development of applications somewhat more difficult than in most other fields. But good applications using appropriate interaction of the learner with the technology can provide assistance in unique and important ways. To paraphrase Seymour Papert (M.I.T.), I want the technology to help students to be musicians rather than to learn about music.

Overall, my vision has not changed, but my timeframe has. That is, early on I, like many other early adopters, believed that computers would revolutionize music learning. I still believe that the technology will greatly affect the way we go about learning and provide opportunities for learning that no other technology can provide, even if it turns out that technology may not truly revolutionize the learning process. But while I believed this would happen within the twentieth century, I see now that I was too optimistic. Change is likely to be evolutionary more so than revolutionary.

5.) What do you think the future holds for music teachers in the way we use technology? On what do you base these predictions?

I believe that change has been more incremental than I originally thought it would be. However, I do believe that in time technology use in music learning will become commonplace. The era of wireless, hand-held devices linked via satellite is coming, and
eventually more and more learning will become time and place independent, including music learning. The “Yak in the Box” approach of traditional classroom lecturing (see Lewis Perleman’s *School’s Out*) will have to give way to more effective means of teaching, whereby information and opportunities for learning will be more anytime, any place than time- and space- bound. This will probably be driven more by students than by teachers, and it remains to be seen how teaching professionals will adjust and adapt. This is a truly exciting (if confusing and perplexing) time to be alive for those involved in education.
Second request for information from Dr. Gary Wittlich

Subj: RE: further inquiry

Date: 10/3/2002 9:31:42 AM Eastern Daylight Time

(This communication was solicited upon research into the history of ATMI. The only source of information on the formation of the group is its original members.)

I'm a bit surprised at Dr. Hofstetter's response, but I suppose he gets many of them and may not have time.

I don't have original documents at my disposal, so I cannot look up names to refresh my memory. But briefly, ATMI was originally National Consortium for Computer-Based Music Instruction (NCCBMI), formed in 1975 at the University of Delaware by, among others, Hofstetter, David Peters (Illinois at the time, now IUPUI), myself (Indiana), Robert Placek (Georgia, I think), Bob George (not sure of the affiliation). In all there were 10 of us. Larry Peterson and Michael Arenson, both now at Delaware, may have been charter members, but I'm not sure. In any event, both of them were important players in the early history of what is now often called computer-enhanced teaching and learning (early on it was called Computer-Assisted Instruction, Computer-Aided Learning, and a host of other names).

NCCBMI, especially Peters, Hofstetter, and I, were also active in a national organization called ADCIS (Assoc for the Development of Computer-based Instructional Systems), which I suspect either disbanded or became part of one of the numerous
national computer organizations. Music was one of the sub-groups with considerable interest and activities.

In 1982, Hofstetter was able to parlay his work with PLATO into a National Endowment for the Humanities-University of Delaware grant to develop a music video disc, which eventually reached production in 1985. This was the first serious production of multimedia for music, and it was called the University of Delaware Music Videodisc Series. On the disc were analyses of opera, song, instrumental music aimed at a variety of uses, among them music appreciation, history, and theory. Developments on that disc led a little later to interactive charting/graphing of CD audio written in Multimedia ToolBook by Doug Short of IBM, with input from myself and others during fall 1992, when I served as a Fellow at the Institute for Academic Technology at Durham, NC. IAT was jointly sponsored by IBM and UNC-Chapel Hill. That software, which enabled realtime time-line graphs of music with associated graphics and text, led to a whole host of other pieces of related software for educational use, such as Tim Koozin's Norton CD Masterworks, written for use with Apple computers. By the early '90s, developments were numerous, but I think that it's safe to say that NCCBMI, then the music videodisc series, performed a great service by introducing musicians to the capabilities of the computer. The rest, as they say, is history.

Best wishes,

GW
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VITA

Jay Dorfman is a music teacher at Charles W. Flanagan High School in Pembroke Pines, Florida. He was born in Livingston, New Jersey, and upon graduating from Livingston High School in 1993, he relocated to Coral Gables, Florida to attend the University of Miami. He studied classical guitar with Juan Mercadal and Rene Gonzalez, and earned the bachelor of music education degree in 1997. In addition to leading the university’s classical guitar ensembles, he was active in the choirs and jazz choirs.

Mr. Dorfman began teaching at Flanagan High School in the fall of 1997 where his responsibilities include teaching two levels of guitar and music technology classes, keyboard classes, and serving as the assistant director of bands. He is also the technical manager of the auditorium facilities.

While teaching at Flanagan High School, Mr. Dorfman has been pursuing his master of music education degree with an emphasis in music technology. His coursework in this field has included studies of digital audio production and multimedia and web design. His article, “Can a Computer Do Your Job Better than You Can?” appeared in the February, 2001 issue of the Florida Music Director. He was appointed as Part-time Lecturer on the UM faculty to serve as research assistant to Dr. George Heller in the publication of a document to mark the seventy-fifth anniversary of the School of Music. Mr. Dorfman has lectured at the University of Miami’s annual Music Education Day on the development and feasibility of music technology curriculum in the comprehensive high school’s music program, and regularly speaks to pre-service teachers about the importance of technology in the curriculum and their lives.

Mr. Dorfman is a staff music director for the American Music Abroad summer honor bands, orchestras and choirs. With this organization, Mr. Dorfman has conducted high school musicians from across the United States in concerts throughout nine European countries. Mr. Dorfman is a member of MENC, Florida Music Educators Association, and Florida Bandmasters Association.