INCORPORATING TECHNOLOGY INTO THE MUSIC CLASSROOMS: SOME IMPLICATIONS FOR MUSIC TEACHERS

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ABSTRACT
MIDI is an acronym for Musical Instrument Digital Interface. It is a data communications protocol, an agreement among manufacturers of music equipment, computers, and software that describes a means for music systems and related equipment to exchange information and control signals. In music education, the most popular use of MIDI is to connect computers to electronic keyboards or other instruments. This combination gives endless opportunities to music teachers for teaching of music to students. Sequencing software allows music teacher record and edit music, while notation software makes him/her able to produce better notation. Music teacher can generate melodies and accompaniments with performance software for in class uses on harmony, musical styles, and performance. While instructional software helps students learn about music, the internet is a great resource for anybody for listening to and studying music of various musical styles.

1. INTRODUCTION
Welcome to the world of technology! Today, schools are experiencing a transformation involving the increasing integration of technology into curricula all around the world. Technology helps educators communicate both concepts and data easily. Technology is changing the way music is taught and performed in schools. So many people are already using computers and electronic instruments in daily basis. Teachers and students are improving their skills, increase knowledge, and have fun while learning and teaching music. With many people becoming computer users, technology continues to become more affordable allowing the classroom to take advantage of equipments. This means technology is here to stay…

The primary reason for incorporating music technology in the music classrooms is to enable teachers to satisfy the needs of students in a rapidly changing world. Teachers can use technology to improve teaching, performance, and inspire students in the new and exciting ways. Technology captures the imagination of students and provides motivation for learning. Music teachers can tap into this motivation by using the same technology to teach musical concepts and skills. Many students are motivated to continue musical training on a higher level after working with music technology.

In today's world, students no longer assume a passive role but actively construct knowledge by exploring and experimenting with new ways of seeking information. They are able to explore other learning styles and find out what works best for their cognitive abilities. In addition, they go beyond traditional memorization of facts and fundamentals to the acquisition learning styles that they can transfer to other courses and later on to their personal and professional lives.

MIDI is an acronym for Musical Instrument Digital Interface. It is a data communications protocol, an agreement among manufacturers of music equipment, computers, and software that describes a means for music systems and related equipment to exchange information and control signals (Rothstein, 1995). In music education, the most popular use of MIDI is to connect computers to electronic keyboards or other instruments. This combination gives endless opportunities to music teachers and students for teaching and learning of music. Moreover, with the use of MIDI in school environment, music learning and teaching become more creative, fun, and efficient as well.

In music education, the use of software designed to teach, tutor, drill, or sequence a student's learning has been available since the late 1970s. Many of the early programs were drill-and-practice programs in ear-training and music theory. When we review contemporary software of the late 1990's, there have been major changes in the availability and quality of the music software. Several hundreds of software titles have been developed specifically to teach music to learners of all ages. Recently, computer hardware has become more powerful and less expensive. Advances in data storage and CD writing have made the process of committing music to compact disc more affordable, accessible, and easy. Music software comes out in a more interactive, colorful, and motivating form than before. Many software publishers offer a wide range of programs contents ranging from note-names to music history, composer biographies, instruments, harmonic analysis, ear-training, music terminology, music appreciation, and so on. Such software is designed to create and understand musical compositions, concepts, and recording technology as well.

2. SOFTWARE TYPES AND THE USE OF SOFTWARE IN THE MUSIC CLASSROOMS

2. 1. Sequencing Software

The MIDI sequencer is a very versatile tool that can be used in music classrooms, rehearsals, and even concerts for many applications. Sequencing software allows teachers and students to do multi-track recording and editing right on the computer screen. Software, used with the synthesizer, provides access to hundreds of sounds and timbres creating a more creative environment. Once the songs are in the proper order, all that remains is the writing it to a CD process.

Many of the sequencing software can combine MIDI-the sounds produced by electronic instruments, with digital audio-the sounds produced by acoustic instruments. Among the most popular sequencing software programs are *Cakewalk, Band-in-a-Box, Logic, Cubase, Performer, FreeStyle, Musicshop, Rock Rap'n Roll, Midiscan, and Pro Tools. FreeStyle*, for example, is a program that allows students to manipulate, compose, and record music. The program creates music using ensembles, players, takes and arrangements. *FreeStyle* can also inspire students with dozens of drum riffs. It notates music as the students play and shows the music on screen exactly as it will print. The program eliminates MIDI terminology and uses tape recorder-like functions. It is an excellent choice to use in early levels of music training.

Cakewalk is another powerful program that handles almost any recording task. Teachers can have students record MIDI, digital audio, and print notation as well. *Cakewalk* is a multi-track music sequencer that you can easily create music with any instrument, even your voice, edit, print and play it back all from your computer.

Musicshop is a full featured, 32 track, entry level sequencer that is easy to use and very affordable software. It has both standard notation and piano roll style editing allowing full graphic views of all MIDI data. Tracks can be selected to record, mute or solo. Individual notes are available for transposing and duration changes. Groups of notes can be selected for editing and other MIDI data such as velocity and pitch bend can be viewed and edited all in a single window.

Band-in-a-Box is one of the most popular software to create and play music. You can enter a chord progression and a formal structure for a song, and software does the rest. "Automatic Soloing" allows you to select a virtual soloist you would like to hear and play with and the program will create and play a solo in a selected style. You can save your songs in Standard MIDI file format. It is an effective program to compose in the styles of Miles Davis, Charlie Parker, and others. Accompaniments for a solo can be written in a variety of styles such as rock, country, blues, big band, and so on. The program has a music printing option. It is indispensable for creating materials for students and the use in the classrooms and concert halls.

Rock Rap'n Roll is a musical simulation that includes a variety of popular musical styles from blues to rap. All of the original music was recorded using dozens of professional vocalist and musicians. The program includes pre-composed phrases that students can organize into compositions. Moreover, this software allows students to record their own sound effects.

There is no need to spend hours or days entering sheet music into your computer. Some software such as *Midiscan* automatically converts printed sheet music into standard MIDI files for playback through sound card or synthesizer. It quickly and accurately captures piano, vocal, solo pieces, part and ensembles scores. Note pitches, note and rest durations, chords, ties, accidentals, bar lines, clefs, keys, and time signatures are all recognized. Place a page of music on your scanner and *Musicscan* does the rest of it. In a few moments you will see the page on your computer's screen and be able to play it back through sound card.

The main advantages of using the sequencer software include the ability to control the dynamics and tempo, and experiment with different timbres. Students and teachers can create an entire orchestration of their composition or make an arrangement by taking a pre-existing song and enter their own timbres and sounds. The biggest advantage of using a sequencer is that the piece can be heard as it is being composed. Teachers can have students experiment with the elements of music. Once students get familiar with the recording process, more creative assignments can be given to stimulate the composer within students. The emphasis is not necessarily music composition but to offer students musical settings combined with the skill to use the keyboard and composer tools for musical creativity.

With sequencing software, music teacher can record music and write it to CD, and then demonstrate the sound of an entire composition in the classroom. The sequence can be used to accompany student's singing or instrumental performance. The key of a melody can be changed if it is not appropriate for the students' singing rage. Teachers can use the sequence the choral and instrumental warm-ups. Students can play and sing along with the sequence while they warm-up. With the ability to control the tempo, the sequence can be played back at a slow tempo. Once the students gain proficiency, the tempo can be increased gradually. Another helpful aspect of a sequence is to control the separate parts. As each part of a piece can be entered separately, they can be muted during playback. Teachers, for example, can

mute the melody part of the sequence while the students perform with their instruments or sing the melody.

Teachers can use the sequence for choral and instrumental performance purpose. The sequence can be used in a live performance outside the classroom. Instrumental ensembles perform or choirs sing with the sequence or at least sequencer performs a specific part if a specific instrument is not available at the school.

Teachers can create warm-up exercises, accompaniments, or jazz improvisation materials for home practice. Because every student has a cassette or CD player at home, teachers can sequence practice tapes or CDs for students to take home. By using these materials, students can practice playing or singing with a steady beat. They can also learn to adjust the tempo for practice.

The MIDI sequencer can also be used as a demonstration tool for analysis, listening and similar activities for the teaching of music theory, music history, and ear-training. The teacher can, for example, isolate a specific part or element of a piece to teach different styles.

2. 2.Notation/Scoring Software

The object of notation software is to convert sounds to written music using just the built-in sound system on the computer. Some features or graphics would appear on the printed page. Moreover, software converts printed sheet music into standard MIDI files for playback through sound card or synthesizer.

There are several excellent notation/scoring programs available for musicians. *Encore, Sibelius, Finale, Autoscore, Overture, Rhapsody,* and *MusicTime* are some of the software to notate and print music. Many programs are designed to provide full orchestral scoring capabilities as well as the solo. Some programs such as revolutionary software program *Autoscore* do not even require keyboard or MIDI. This changes everything you know about composing and teaching music on the computer. With *Autoscore*, you sing, hum, or play a tune, and pitch-to-MIDI technology coverts sound to written music using just the built-in sound system on your computer. With this software installed in your computer, anyone who sings or plays an instrument can instantly see their work displayed in notation on the computer screen, ready to edit, play back, or print out. Teachers or students can layer up multiple lines of music harmonies and build up an entire composition using just the sound of their voices. *Autoscore* makes music software accessible and easy to use for everybody from a singer to a violinist.

MusicTime is ideal for the small ensembles and choirs. It is easy to use and still have powerful capabilities such as transposition, part extraction, real time and step time entry. It easily changes elements such as notes, rests, accidentals, markings, lyrics, and text. *MusicTime* is great tool to use in the music theory classes and lab situations. Because of its ease of use, teachers can spend more time teaching music rather than teaching how to use a notation program to students.

For the music teachers, a printing program as complete as *Encore* offers so many opportunities for the exploration of different teaching techniques. Real time and step time is available and easy to use. With Encore, transposing music, printing out full scores and parts are very simple. It is ideal for people who do not have time to learn a program and need to be

"up and running quickly". Students spend less time using it as opposed to learning to use *Encore*.

Finale is the choice of professional musicians, composers, arrangers, copyists and publishers. The music teachers would like to use it too. Because *Finale* provides you more ways than any program to create music, enter it, edit it, hear it, lay it out on the electronic page, and ultimately print it. Additional new features include range checking, automatic dynamic placement based on your performance, easy repeats and measure numbers, and check region for durations.

Music teachers and students can use notation software to play a song on a MIDI instrument that can automatically notate the music played. Since the software places the notation on screen for editing and playing the notes, the errors can be identified easily. Students and teachers can hear melody and accompaniment or chord progressions, for example, and make changes before printing out the notation. Once the music is in the computer, it is possible to remove or add notes, adjust time, pitch, duration, or key.

For a music teacher, a printing program offers so many opportunities for the exploration of different teaching techniques. Students can use printed music studied for listening, ear-training, or performance purposes. They can view the notation for note reading exercises or musical analysis. Teachers can also encourage the students to take advantage of a variety of sounds, notation and images. Students can select appropriate sounds for a particular music setting and then print out notated version of their assignments, reports, or compositions.

2. 3. Performance Software

Performance software creates melodies and accompaniments easily. Some of the programs come with a library of selections to choose from. Among the most popular software are *Band-in-a-Box, Cakewalk, SmartMusic, Interactive Songbook,* and *Vivace*. All of these programs put music and technology into the hands of students and teachers in a friendly way.

Students and teachers can compose songs, accompaniments, and create their own CDs. Many teachers use performances software for teaching better instrument performance skills. *Cakewalk*, for example, can record actual instruments, and not just MIDI. The program allows for muting of individual parts to create a minus one format. With the use of the program some teachers can take the piano part for example and mute the MIDI piano and replace it with an actual live performance for classroom or concert use.

Performance software has a built-in tuner and is designed to be an intelligent accompanist for student practice. *Cakewalk in Concert*, for example, is designed to be used with any Standard MIDI file. Students (and also teachers) can practice along with a piece with control over tempo and key. *Cakewalk in Concert* provides real-time interactive accompaniment for students of all playing level. The band or orchestra will follow the student's tempo and dynamics. Students would enjoy the experience of playing with another musician, while the teacher concentrates on evaluating the student's performance. *Cakewalk in Concert* gives you on-screen displays of tempo, location, and volume. During playback, students and teachers can critique the performance together.

Interactive Songbook teaches the students how to sing and play some of the greatest songs of all time. Your personal computer becomes an interactive songbook that teaches you note-by-note to both sing and play ten popular tunes. Students learn the rhythm and melody of each

tune. They will see their voice captured on-screen and get instant feedback on every note they play and sing. Students can gain performance skills involving interaction using rhythm, melody, and harmony.

Other programs such as *Smart Music* and *Vivace* have thousands of classical, musical theatre, movie themes, pop, rock, jazz, holiday, and contest titles to choose from. These performance programs make every practice and concert session productive and emotionally satisfying as students play or sing the lead line. Teachers can also have their students to learn about harmony and a variety of musical styles by using the software.

2. 4. Instructional Software

Instructional Software offers comprehensive music knowledge to students. Many programs are designed to teach music theory, aural, and music appreciation. With the instructional software, music teacher can teach and reinforce early music skills, music reading, listening, and dictation skills. They can also use music theory programs to teach music theory skills.

One of the advantages of this type of software is to allow students to work on their own and at their own pace. Students can be energized with the added attention they receive from learning in a computer. Students benefit from the exercise/drill features in a repetitive way on a given musical concept. Experiencing music through guided listening, receiving immediate feedback on their intonation, seeing a progress chart of improved skills or knowledge bring these students a sense of accomplishment.

Game programs reinforce music curriculum content through some types of games. With the use of these programs students actually have fun and learn at the same time. *Music Ace* is one of the most frequently used early music program in many schools. The program is designed to provide an introduction to music fundamentals. Each lesson includes a tutorial and game that is fun and interactive. The program introduces standard notation, key signatures, intervals, and other musical concepts.

Adventures in Music Land is a unique set of music games featuring characters from "Alice in Wonderland". The program includes four different games. Players learn through pictures, sounds and animations which help develop understanding of musical tones, composers, and musical symbols. All concepts are presented in an interactive format. With this software, two or more students can play against each other.

With *Beethoven Lives Upstairs CD-ROM*, students can choose a piece of music, select the instruments and hear their versions of Beethoven's music. They can create their own paintings, learn all aspects of music, from composition to interpretation, and are able to record every stage of fun in their own full-color journal. Activities include sitting down at Beethoven's piano and learning to play "the Old Candle".

Julliard Music Adventure develops an understanding of rhythm, melody, and orchestration as students solve musical puzzles and create their own compositions. Students are transported to a magical castle where they are introduced to rhythm, melody, orchestration, and instrumentation in a variety of musical styles. The program defines and illustrates musical terms and notation, provides a discography and listening guide, and develops music appreciation.

Ear Challenger is an aural-visual music game designed to increase the player's ability to remember a series of pitches as they are played by the computer. The game provides seven levels of difficulty. The different pitches are reinforced on the display screen with contrasting colors.

Exploratory program is great for developing student creativity and concept discovery. Students learn well when they discover things on their own. Interactive CD-ROMs for music appreciation, history, and composer biographies are generally exploratory in nature. *The Pianist Series* includes recorded MIDI files, composer biographies, and musical terms. This multi-media program can be used as a resource and reference, and for listening activities. The program also provides recorded options that can be used for listening and analysis examples for the classroom uses. Having instant access to hundreds of songs in various styles including classical, bluegrass, jazz, and others is very helpful.

Appreciating the Orchestra is easy to use to enjoy self-directed study as students learn about the instruments and basic structure of the orchestra. They explore diverse musical styles and musical eras. Instruments of a symphony orchestra helps students recognize the instruments in a orchestra with this informative CD-ROM.

Making Music: The Symphony Orchestra goes behind the scenes of an orchestra as it prepares for an upcoming performance. In addition to learning about structure and organization of the orchestra, students will become familiar with the different sections of a typical orchestra, the instruments in each section, and the responsibilities of the musicians and conductor.

Music Terminology is a set of five independent programs for improving a student's knowledge of music terminology. The program includes glossary of terms, categories of terms, and also true/false tests, multiple choice test, and fill-in questions. *Great Composers: Their Lives and Music CD-ROMs, the History of Music CD-ROMS-Part 1: Origins of Music into the Classical Period, Part 2: Romanticism into the 1980s, Art and Music CD-ROMs* are some of the music history and composers programs reviewing the music and important composers in an exciting way with interactive multimedia programs.

Regimented program is the opposite of exploratory program. Drills and practice in music theory and ear-training is much regimented. Therefore, teachers can evaluate student progress easily. *Mibac Music Lessons* is, for example, an excellent program for the teaching of music theory and ear-training. The program includes note names, circle of fifths, key signatures, intervals, and more.

Another program, *Auralia for Windows,* is the most comprehensive ear training software available and suitable for all ages. It is designed for use in a school environment. Program covers a very broad range of topics and the sophisticated reporting and testing features. These features allow teachers to spend more time instructing their students and less time playing examples. The program contains intervals and scales, chords, rhythm, pitch, and melody. Topics such as "Interval Singing" and "Scale Singing" can actually listen to your singing and playing into the microphone. *Auralia* will tell you if you were correct or incorrect. Its testing features make preparation of examinations and quizzes easy. The program keeps extensive record of students' activities. All student results are securely stored on the computer hard disk. The record keeping and administrative features allow easy monitoring of all students progress. Music teacher will find that students who use the program will accelerate rapidly.

Teachers will also greatly benefit from the increased time and focus on their individual problems.

Musicware's *Music Lab Series* is a complete ear-training package in two products: *Music Lab Melody and Music Lab Harmony. Music Lab Melody* teaches sight-reading, rhythm, accurate singing and music transcription. Through a microphone, the software reads a student's singing voice with the help of computer's sound card. The learning process involves practicing real musical tasks with immediate feedback to build success and confidence. *Music Lab Harmony* teaches how to recognize, read, and transcribe chords, and how to hear and understand harmony and harmonic progression. It is superior computer-based tutoring system that teaches interactively and patiently for the best possible learning experience. All student work is monitored instantaneously and remedial help including the right answer is only one click away. In both products, the student develops essential skills at progressive achievement levels from beginner to advance.

Essential of Music Theory is designed for grades four to adult. This program includes ear-training exercises using acoustic instruments. It offers a wide variety of activities including note name recognition, time signatures, intervals, and other musical concepts.

Tap-It is a rhythm skills program teaching the concepts of beat and tempo through the presentation of rhythms and tapping drills. Students respond after either listening or reading rhythm patterns. A non-stop quiz at the end of each level drills rhythm accuracy. The lesson has three skill levels with an option for a final quiz.

2. 5. The Internet

The internet has become a part of our lives on several levels and the information available is overwhelming. Everybody is using *Netscape Communicator* and *Internet Explorer* to send and receive e-mails, do research on variety of topics, or make orders. A modem is used to access additional information, sound files and images from educational and research facilities throughout the world.

The internet is a great resource for listening to and studying music of various styles in or out side the classroom. There are, however, some basic considerations that apply to all sites: The web is always changing and some of the sites may not be active when you look for them. It is up to the individual user of these sites to observe the copyright policies and conditions as listed on each site. All the sites listed below allow free printing and distribution of the information for noncommercial use. The following free software will be necessary to view, hear, and print the music: *Scorch* (from Sibelius), *Adobe Acrobat Reader* (version 5.0 or above), and *Quicktime*. Directions for downloading appear on the sites that require the use of the software.

Theory sites vary in level of difficulty and method of presentation on the internet. The descriptions will include whether the sites are interactive, offer worksheets, and an approximate level of difficulty or age. *Practicespot: Ideas and Resources for Great Music Lessons* (www.practicespot.com) offers free resources covering rhythm, note reading, theory, sight-reading, and more. The "Notereading Wizard" is interactive and students get their scores and the correct answers. There are numerous theory worksheets available for free printing. The "Online Scales Manual" could be very helpful for visual learners. The scale is shown with fingering on the keyboard. Students would enjoy using it at home for further reinforcement. This website is definitely worth the time.

Ricci Adams' Music Theory (www.musictheory.net) consists of three areas: Lessons, Trainers, and Utilities. The lessons and trainers are presented in a very attractive, easy-to-understand slide show format. There are several lessons beginning with the staff and going on up chord construction. The trainers are interactive drills with the correct answer displayed immediately when a wrong answer is submitted. The score is posted on the screen and the results can be printed. The utilities include a chord calculator, matrix generator, and staff paper generator, including plain piano and SATB. The trainers and utilities can be downloaded to your computer and be used offline.

Theory on the Web: An On-line, Hypertext for Music Theory (www.smu.edu/totw) is an interactive, hypertext instruction method and a very thorough course with interactive drills at the end of each chapter. *Introduction to Music theory and Aural Skills* (www.murraystate.edu/qacd/music/mus109entry.htm) is a very well designed on-line course for interactive lessons consisting of ten chapters covering all aspects of music theory for the beginners.

There are also many sites offering free downloads of sheet music. Most downloads require Scorch or Acrobat Reader. *Sibelius Music* (www.sibeliusmusic.com) boasts the largest collection of self-published sheet music on the internet. Music can be downloaded and viewed by using their free software Sibelius Scorch plug-in, which is available on this site. *Sheet Music Online* (www.sheetmusic1.com) offers sheet music, piano benches, and supplies for purchase as well as public domain sheet music, theory worksheets, and tests at no charge. The *Sheet Music Archive* (www.sheetmusicarchive.net), *Music Scores* (www.music-scores.com), Easy Sheet Music (www.easysheetmusic.com), *All Piano Sheet Music* (www.allpianosheetmusic.com), *247 Sheetmusic* (247sheetmusic.com/downloads), and *the Mutopia Project* (www.mutopiaproject.org) are some of the other web sites offering free music to download, print, and distribute.

There are some helpful sites that offer databases of music history, biographies of composers, and glossary of terms. If the teacher has access to the internet while teaching, these sites could be useful during the lessons. *Virginia Tech Multimedia Music Dictionary* (www.music.vt.edu/musicdictionary/) and *Learning Zone* (www.naxos.com/newdesign/fglossary.files/bglossary.htm) are some of the sites that list terms online serving as a reference source for teachers and students. *Essentials of Music* (www.essentialsofmusic.com) offers overviews of periods of music history, biographies of composers, and a glossary of terms as well. *Music History 102: A Guide to Western Composers and Their Music from the Middle Ages to the Present* (www.ipl.org/exhibit/mushist/), *Worldwide Internet Music Resources: Composers* (http://www.music.indiana.edu/music_resources/composer.html), *DW 3 Classical Music Resources* (select "composer homepages") (www.lib.duke.edu/music/resources/classical_index.html), *The Classical Music Navigator* (www.wku.edu/~smithch/music/ index2.htm), *Learning Zone from Naxos* (www.naxos.com/newdesign/fcomposers.files/bcomposers.asp), and *Dr. Estrella's Incredible Abridged Dictionary of Composers* (www.stevenestrella.com/composers) are some of the web sites link to individual composer pages.

3. CONCLUSION

The music technology offers unlimited resources for the music teachers. The music companies will continue to develop music software for teachers and students which meet the highest standards using the latest available technology. Of course, there is no substitute for the

interaction of student and teacher. But, the resources can become part of our vast body of teaching tools.

Recently, the Turkish Ministry of National Education has initiated a project for the use of computers in all schools. There is a protocol between Microsoft Company and the Ministry to become part of the Microsoft's worldwide "Partners in Learning". In this project, all the teachers will be required to be competent in computer use. Therefore, the teacher training schools are integrating the computer programs in their curricula.

The Turkish Ministry of National Education's project will open a new way for the music teachers. The music teachers need to support music curriculum by available computer software. The usage of software will increase in schools and consequently licensing multiple copies of software for students and teachers will be required. Technology is here to stay and it will provide the students an environment that enhances the creative aspects of music education. Therefore, the Turkish music teachers should continue to familiarize themselves with as much technology as possible. The Turkish music teachers can not afford to deprive tomorrow's musicians, politicians, doctors, or engineers of the technology.

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