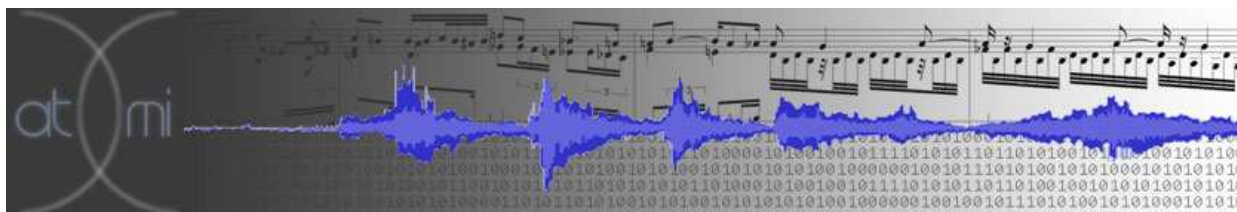# Music Technology Opportunities for Accommodation and Inclusion of Students with Exceptionalities in the Music Classroom

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Music Technology Opportunities for Accommodation and Inclusion of Persons with Exceptionalities in the Music Classroom

Abstract

This presentation examines opportunities for accommodation and inclusion of students with exceptionalities in the music classroom through utilization of music technology. Visually Impaired, Physically Handicapped, and Hearing Impaired are areas of exceptionality that will be considered. Software, examples of ongoing research, current projects, and various commissions in action will be explored as part of the presentation.

Presentation

Envision Possibilities! Bias Dictates Actions! Look to our students' exceptionalities as opportunities for advancement. Many students with disabilities on college campuses do not realize their potential as they are never seen. At times we tend to focus on the generic status quo we see each day. Through technological advances, opportunities for performance, and participation in both distance education and classroom, music activities are now available that did not exist previously.

Physically Handicapped

Opening Performance
Charlotte White, St Roses College, Stroud, plays using a MIDI sensor activated by her head as well as two switches with her thumbs. Her Bach performance is at:
http://www.youtube.com/watch?v=sNBhIZCL54Q Her other interests include mouth painting, and photography. She has a goal to work as a music therapist upon graduation.
http://www.drakemusicproject.org/makepage.asp?page=5acharlotte

> "Charlotte's £25k skydive," reported by Katie Matthews, 26 Nov 2007.
> "Eighteen-year-old Drake musician Charlotte White has raised a massive £25,000 in a sponsored skydive for Drake Music, and St Rose's School, Stroud. Charlotte originally set herself a target of £3,000. "I'm now up to £25,000 which is pretty incredible – people's generosity has been unbelievable," she said. "The best bit about the jump was when the parachute came up after the free fall. We were just floating around in the air – a sort of out of this world experience. It felt like I was on another planet, completely detached. The worst bit was when we were about to jump out of the plane, that was terrifying!" During the tandem jump Charlotte dislocated her shoulder. "But," she says, "I would definitely do it again."

The Drake Music Project
Based in England, The Drake Music Project provides opportunities for disabled musicians of all ages and abilities to explore, compose, and perform music. Using specialist and adapted music technology, Drake Music enables disabled children and adults, who are unable to play conventional musical instruments, to compose and perform. The project illustrates possibilities for disabled and non-disabled artists to be able to perform together. http://www.drakemusicproject.org/makepage.asp?page=1

Adaptive Use Music Instrument Software
This software, with the addition of a webcam, allows individuals to use head movements in composition and performance of music. A demonstration URL located on the Deep Listening site illustrates how the software works.
http://www.cycling74.com/story/2007/12/7/131419/186
http://www.deeplistening.org/site/adaptiveuse/press Additionally, RPI has developed a program using similar software that allows physically challenged students with severe physical disabilities to create music by using their heads. Information is at:
http://www.eschoolnews.com/news/top-news/news-by-subject/curriculum/?i=50703;_hbguid=96411d65-0eec-4278-b39d-bdb1bddf9b92

Yamaha WX-5 Wind Controller.
Breath therapy and musical breathing exercises (respiratory therapy) developed by Ruud van der Wel– Netherlands, utilize the WX-5 to assist Spinal Muscular Atrophy, and Muscular Dystrophy therapy. Band and chamber performance with the WX-5 is also a possibility, as transcriptions to accommodate timbres will allow parts to be covered as well as providing participation. Online teaching suggestions, MIDI, and audio file accompaniments are available on a dedicated page http://www.mybreathmymusic.com/

Click-to-Go Quintet, Magic Flute.
These hardware devices allow physically impaired individuals to perform both individually and with others in ensemble.

Deaf/Hard-of-Hearing

Cochlear Implant A stellar new direction for deaf /hh allow hearing of speech and perhaps eventual hearing of "full spectrum" music. The cochlear implant consists of a processor worn outside the ear. The processor converts music audio (as well as ambient sounds and human speech) into digital data. The data then goes to another chip, implanted in a person's skull, which translates the data into electrical impulses.
        The electrical impulses are then passed down an electrode, which stimulates a nerve that makes the brain create music. It stimulates the nerve in the same way the nerve is stimulated in people with hearing. The implant system effectively bypasses the damaged tissue. Present directions and research are oriented towards sophisticating the implant system for music.

MP3 player for Deaf/hh
Sandy Mintz, an audiologist with medical designer Advanced Bionics, is a person who lost her hearing about 10 years ago. She is trying to develop a wireless MP3 system so the deaf can enjoy music. She indicates, "the trick now is to optimize the system for music. Getting the pitch and frequency of music is difficult". "You have to fine tune it." Wireless is also a challenge. One idea is to link the external ear piece with the MP3 player through Blue tooth. So far, the results are promising, and Samsung is seeking FDA approval. http://asia.cnet.com/reviews/musicplay/0,39050461,61980093,00.htm

Digital Hearing Aids
Digital hearing aids are programmable hearing instruments with digital circuits. They can be precisely programmed to match the patient's individual hearing loss, sometimes at each specific frequency/pitch. Digital circuits offer improved clarity of sound, less circuit

noise, faster processing of sound, and improved listening in noise when compared to analog circuits. Digital hearing aids are easy to use because they adjust volume automatically. Be aware that digital hearing aids allow for certain algorithm changes so knowing that a music algorithm change can be made is important as students try to hear within a classroom.

Blind/Visually Impaired

What Is JAWS?
* JAWS for Windows is a powerful accessibility solution that reads information on your screen using synthesized speech. JAWS provides many useful commands that make it easier to use programs, edit documents, and read Web pages. With a refreshable Braille display device, JAWS can also provide Braille output in addition to, or instead of, speech. An array of versatile features and customizable options lets you tailor JAWS for your individual needs and preferences**.**

Music Transcribing Software
This software allows transcription from MIDI, scanned music, and compositions created in Sibelius, Sonar, Lime, Toccata, and Finale into musical Braille. Files created can also be transferred to tactile Braille keyboards for reading in formats such as Bar-Over-Bar (similar to reading grand staff music with bass and treble clefs).

Software Titles
*Lime Aloud works together with the JAWS for Windows screen reader software. With Lime Aloud, you can navigate through a musical score using standard cursor keys. Your PC plays each note or chord and verbally describes related annotations such as accents, staccato marks, lyrics, and ties via the JAWS screen reader software.
*CakeTalking customizes the JAWS for Windows screen reader so blind users can audio screen-read the SONAR software.
*JSonar is a set of JAWS scripts that enables this audio screen reader to use Sonar professional music recording software.
*Toccata (notation and import software) imports MIDI, MUSIC XML, and NIFF (Notation Interchange File Format) as well as functioning independently as a notation editor. Exports in Braille for embossing, to Toccata notation files, and to tactile Braille display devices.
*SharpEye is page-scanning software.
*Lime is a music editor that has been used for many years for Braille translation**.**
*XML provides a common denominator for interaction between Braille conversion programs. .
*GOODFEEL 3 is a Braille translator. GOODFEEL allows a non-specialist to function as a Braille music transcriber. Using mainstream music scanning and editing software, print notation files can be entered into GOODFEEL, which automatically translates the print information into music Braille.
*Sibelius Speaking delivers the power and flexibility of Sibelius, to the blind user. Sibelius Speaking provides a set of sophisticated scripts for the JAWS for Windows screen reader.

Braille Accommodation Keyboards.
Keyboards with keys embossed with Braille, portable Braille transcribers that provide

speech synthesis, and importation of e-mail into Braille tactile display are available. Tactile Braille devices can be connected to a traditional computer keyboard enabling the translation of the computer screen into Braille display.

Assistive software on your computer Mac and PC
*SubRosaSoft's Macnifier displays a magnified portion of your screen in a separate window. Originally designed as a helper application to assist the visually impaired - it has become an ideal tool for Mac graphic design professionals who need pixel perfect placement and control Download free!
http://www.subrosasoft.com/OSXSoftware/index.php?main_page=product_info&products_id=15:b7299e702910988d2f5aaaffd440558a
*iChat and iSight provide video conferencing solutions with performance and clarity good enough for you to communicate using sign language over the Internet. A high quality video is produced that is good enough to clearly see the finger and hand movements of the person with whom you are communicating.
http://www.apple.com/accessibility/hearing/
*Speech Recognition & Talking Alerts: Speakable items let's you command and control the computer using your voice, without requiring you to train the computer. You can use commands to open and close programs, navigate the menu bar, switch between programs, control application-specific items, to enter keyboard shortcuts and speak front window controls such as check box names, radio button names, list items and buttons. The talking alerts feature gives voice to alert and dialog windows by verbally identifying the application and reciting the contents of its dialog box.
http://www.apple.com/accessibility/physical/
Mac--Apple Accessibility http://www.apple.com/accessibility/
*VoiceOver included with Tiger. For those with vision disabilities a built-in screen reader that provides keyboard control of the computer, enhanced screen magnification options, and spoken English descriptions of what's on the screen. VoiceOver enables many users with special needs to work collaboratively with other Mac users and use a Macintosh without assistance http://www.apple.com/accessibility/voiceover/
PC
*Accessories Accessibility Wizard allows you to customize your computer to your visual, hearing, and utilize Magnifier, Narrator, and Onscreen keyboard.
*ERICA communication system using an eye-tracking camera. The eye-tracking camera and software may be installed on your existing Windows or Macintosh based computer. With this you have the ability to control your computer with your eyes.
http://www.eyeresponse.com/Disabilities/

Practical Suggestions

*If anticipating a blind or visually impaired student in your department, provide JAWS in some manner for inclusion on a department computer. Other assistive software and hardware mentioned above will be helpful also. Navigation of the web or music associated software can then be done on campus if assignments are required.
*Check out and enable adaptive and assistive aspects of the computers student may use when on campus. Be aware of and turn on your PC or MAC speech reproduction or screen-magnification accessories (On PC, under Accessories/Accessibility note the Magnifier, Narrator, and On-Screen Keyboard).
*Provide a student helper, or some type of assistance network to give a hand with brailing

music if a blind or visually impaired student uses this as part of assignments or performance. Student volunteers or yourself can quickly braille music for visually impaired music students.

*Use Smart Music to help in part-identification and learning, by extracting part from score so student can work separately..

*MIDI vocal or instrumental parts and emphasize the individual's part, either with timbre or dynamic contrasts. This allows the individual part to be heard in relation to the total vocal or instrumental ensemble.

*Have a chorus member record the student's part with lyrics and export to mp3 or other formats so the part can be learned outside of choral organization using iPods or mp3 players. This can also be done with a specific instrumental part.

*If your students are deaf/hh and utilize hearing aids have them check on availability of new digital hearing aids and the possibility of financial aid for purchase. Many still work with analog models, which are not as well suited for music listening. Many of the newer models have a setting specifically for music.

*Children are examined at birth for hearing loss and many have a cochlear implant as early as age three. We are experiencing a new generation of individuals with more opportunity for musical endeavors in our classes and an opportunity to provide aesthetic opportunities. We can do a lot in encouraging and identifying students who can benefit.

*Challenge--The direction now is to optimize the cochlear input system for music. It works well with speech. Getting the pitch and frequency of music is difficult. "You have to fine tune it," Wireless is also a challenge. One idea is to link the external ear piece with the mp3 player through Bluetooth. Proactive support and dissemination within our profession and with producers of these items can be helpful.

Research Resources

Physically Handicapped
*Adaptive Controllers for Music including musical instruments   GOOD ClickToGo products http://www.click2go.ie/
  *ADAPTIVE USE OF INSTRUMENTS   This software, with the addition of a webcam, allows individuals to use head movements in composition and performance of music. Good Video illustrating how it works at:
http://www.cycling74.com/story/2007/12/7/131419/186
http://www.deeplistening.org/site/adaptiveuse/press Also available at
http://www.youtube.com/watch?v=ABqABv7MnmM&eurl=http://www.deeplistening.org/site/adaptiveuse/media
*Drake Music Project includes cello video presented:http://www.drakemusicproject.org/makepage.asp?page=1
*Headbangers group singing with switches. http://www.s-t.com/daily/12-02/12-28-02/a06sr042.htm MOVIE at http://www.switchintime.com/HBCNN.mov
*Adaptive Use Musical Instrument http://adamglazier.blogspot.com/2008/03/adaptive-use-instruments-project.html Includes good video demonstration
*E-scape and feedback http://www.drakemusicproject.org/makepage.asp?page=4d-es-feedback
*E-scape in action http://www.drakemusicproject.org/makepage.asp?page=4des-us-norsid2005 Tutorial for E-scape at http://www.drakemusicproject.org/downloads/E-Scape%20tour.d

 *New York State Arts Standards Alternate Assessment Standards for Students with Severe Disabilities http://www.emsc.nysed.gov/ciai/arts/artstand/artstand.html
*Super Switch Ensemble. http://switchintime.com/SSE.html Access to music for Mac computers. Super Switch Ensemble enables groups of students with mixed abilities to play together in a cooperative setting; each individual working at his/her own level while contributing to the overall performance. Can use IntelliKeys keyboard to communicate if there are problems with regular keyboards.
http://store.cambiumlearning.com/ProductPage.aspx?parentId=074003237&functionID=009000008&site=itc
*Switch in Time. Jon Adams http://www.shanj.org/News/concert.htm
http://www.switchintime.com/
   *My breath my songs and song backgrounds that can be utilized with a windcontoller.
http://www.mybreathmymusic.com/download.htm

Deaf/Hard-of-Hearing
*Researchers working to make better music for hearing-impaired people. MIT research concerning music and speech. http://web.mit.edu/newsoffice/2002/hearing-0313.html
*Dance techniques for Hard of Hearing http://depts.gallaudet.edu/dance/techniques.html
The Gallaudet dancers are well known for their quality. This site illustrates information about developing dance for Deaf/hh.
*BREAKING DOWN SOUNDS http://web.mit.edu/newsoffice/2002/hearing-0313.html
Synopsis of research direction in developing comprehensive hearing of music sounds through implants.
*hearingimpaired.net   Blogs and information about hearing impaired and products for their assistance. http://www.hearingimpaired.net/welcome.html
*Hearing Loss Web information concerning technology and hearing loss.
http://www.hearinglossweb.com/tech/tech.htm
*Advanced Biotics http://www.cochlearimplant.com/index.cfm?langid=1 Strong information on cochlear implants, digital hearing aids, and their usage.
*Deaf and Music http://deafness.about.com/cs/educationgeneral/a/deafmusic.htm
Information about deafness and learning music with reference to many individuals who have accomplished despite their disability.
*Deaf Education programs at Michigan State University. Dr. Harold Johnson, Dr. Claudia Pagliaro, Co-Directors. Well-developed program with information for both hh/deaf and teachers/professionals. http://ed-web3.educ.msu.edu/deafed/
*TEACHING INSTRUMENTAL MUSIC TO DEAF AND HARD OF HEARING STUDENTS. Phillip M. Hash University of Illinois at Urbana/Champaign, September 2003. Good Research Study http://www.stthomas.edu/rimeonline/vol1/hash1.htm
*Scholarly Research Articles on Hearing Impaired through Google.
http://scholar.google.com/scholar?hl=en&lr=&ie=ISO-8859-1&q=+music+and+hearing+impaired+research&btnG=Search
*Developing Hearing Aid algorithms and background for digital hearing aids. Protools, iMac, and Yamaha using the AW4416 aid in developing testing advanced signal processing features to individualize in hearing aids.
http://www.yamaha.com/yamahavgn/CDA/ContentDetail/PressReleaseDetail/0,,CNTID%253D20751%2526CTID%253D%2526CNTYP%253DNEWS%2526RLTID%253D,00.html   Yamaha Workstation information at:
http://www.yamaha.com/yamahavgn/CDA/ContentDetail/ModelSeriesDetail/0,,CNTID%25253D2204%252526CTID%25253D,00.html

*Deaf Net. Vital page for information, research, and current thought. Managed by high quality professionals. http://www.deafed.net/
*Kristi Brown LeAnn Denney. The University of Tennessee April 4, 1997. *Music Use in Elementary and Middle School Classrooms for the Deaf.* Research Study on usage of music in classrooms for the deaf.
http://www.deafed.net/PublishedDocs/sub/970723b.htm
*Sonic Innovations. Information on hearing aids and usage. http://www.sonici.com/
*Hearing Loss Web. A good page for information including definitions of various disabilities and terms that aid in clarity of understanding problems of exceptionalities.
http://www.hearinglossweb.com/tech/tech.htm

Blind/Visually Impaired
*Recording for the Blind & Dyslexic® Groves Dictionary files for speech reader.
http://www.rfbd.org/membership_1.htm http://www.rfbd.org/index.htm
*Sibelius 3 and Sibelius Speaking can be utilized.
http://www.dancingdots.com/support/supportsibspeaking3.htm

Dancing Dots --http://www.dancingdots.com/prodesc/tacktile.htm
*Demo of GOODFEEL http://www.dancingdots.com/main/goodfeel.htm

- An Introduction to Music for the Blind Student, A Course in Braille Music Reading http://www.dancingdots.com/prodesc/currdet.htm
- An Introduction to Piano for the Blind Student, A Course in Braille Music Reading http://www.dancingdots.com/prodesc/intromusicpiano.htm
- Who's Afraid of Braille Music: handbook for parents, teachers & students http://www.dancingdots.com/prodesc/whosafraid.htm
- Jazz and Contemporary Chord Symbol Reading for the Blind Pianist http://www.dancingdots.com/prodesc/jazzchords.htm
- TACK-TILES: learning system for braille http://www.dancingdots.com/prodesc/tacktile.htm

*Opus Technology Products. http://www.opustec.com/products.html Good source of information about Braille Music resources including Braille music transcription programs and Braille music translator.
*Lavelle School for the Blind Helpful Links.
http://www.lavelleschool.org/text/helpful_links.asp   A great source of reference information including American Printing House AFB Press etc. Good for looking up materials, information and services.
*Music and Visually Impaired Children. Excellent pamphlet concerning including music in the schooling of children.
 http://www.rnib.org.uk/xpedio/groups/public/documents/visugate/public_musicvi.hcsp

*Music education for the visually impaired. A compendium of articles from Braille Music magazine, with supplementary material.
http://www.rnib.org.uk/xpedio/groups/public/documents/visugate/public_museduvi.hcsp
*Perkins School for the Blind. Information and resources from a highly respected School for the Blind. http://www.perkins.org/
*Sigma Alpha Iota information page. Resources for musicians with special needs.
http://www.sai-national.org/phil/vislres.html

*RISE. Information pdfs on ways visually impaired can function in society. http://www.learnwithrise.com/english/risenews.htm

*Trinity College of Music "Case Studies Making music technology accessible for visually impaired students" An examination of direction to provide music technology for disability college students in the United Kingdom. Examines costs, software to acquire, limitations, and outcomes. http://www.bicpa.ac.uk/casestudies/making_music_tech_accessible.html

*Music Software information. Includes most titles with demographic information. http://ace.acadiau.ca/score/others.htm

*LIMECEMERL Sound Group. Devices and software for handicapped individuals. Includes LIME software. http://www.cerlsoundgroup.org/main.html

*LIME Information and Download Site. http://www.cerlsoundgroup.org/cgi-bin/Lime/Windows.html

*Do Visually Impaired Children have Special Musical Abilities? RNIB Research and Information of Blind and Partially Sighted People. http://www.rnib.org.uk/xpedio/groups/public/documents/visugate/public_musicvi.hcsp#P10_964.

*JAWS software for Windows. http://www.freedomscientific.com/fs_products/JAWS_HQ.asp

*APH Products-Studio Recorder http://www.aph.org/products/sr_bro.html Studio Recorder^{TM} contains many features that make recording, editing, and proofreading audio books easy. Speed up playback with no pitch distortion. Features: Three levels of phrase detection, index tone generation and removal, instant open on large files, instant cut, copy, paste, and delete, intercom functionality, simple user interface, Accessible to blind and visually impaired user, Multiple user marks and notes, External controller support.

*SharpEye Music Reader is widely regarded as one of the most accurate music scanning programs available today. SharpEye 2 saves your scans of sheet music as MusicXML files so you can import them into Finale, Sibelius, MuseBook, Score, or any other product that reads MusicXML http://store.recordare.com/sharpeye2.html

*Dolet for Sibelius. Plug-in that allows music to be transported between pieces of software. http://store.recordare.com/dolet3sib.html

*Jsonar Project. http://www.jsonar.org/drupal/download_cwmc Access to Jsonar script that allows JAWS to read Sonar as audio speech.

*Opus Technology Products, http://www.opustec.com/products.html Includes Toccata, a full-featured Braille music translator; OpusDots Lite, a braille music transcription program. Bettye Krolick, *How to read musical Braille* – an strong resource for understanding how to produce Braille music.

*RFB&D Recording for the Blind & Dyslexic (RFB&D), a national nonprofit, volunteer organization, has been the leading producer of accessible audiobooks for students with disabilities such as visual impairment or dyslexia that make reading standard print difficult or impossible. With titles available in every subject area and grade level, RFB&D's digitally recorded textbooks help students challenged by the printed page. http://www.rfbd.org/

Generic Resources Applicable to All Areas of Exceptionality
 *Assistive Technology, a generic term that includes assistive, adaptive, and rehabilitative devices and the process used in selecting, locating, and using them. (From Wikipedia) http://en.wikipedia.org/wiki/Assistive_technology

*Technology Center at Indiana University Bloomington and IUPUI. A great source of college services for students at their schools. Included Vision, Hearing, Learning, Mobility, Hardware, and Software. http://www.indiana.edu/~iuadapts/services/web-accessibility/resources.html

Adaptive Technology for the Internet: Making Electronic Resources Accessible to All. Barbara T. Mates, Doug Wakefield, and Judith M. Dixon (Paperback - Jan 2000) Super book on the information illustrated in this presentation. Highly valuable for reference. http://www.amazon.com/Adaptive-Technology-Internet-Electronic-Accessible/dp/0838907520/ref=sr_1_3?ie=UTF8&s=books&qid=1198114580&sr=1-3

*Center for Disabilities List of Organization Addresses. California State University Northridge http://letsgoexpo.com/expo/index.cfm?EID=80000093&p=2 Good source of organizations dealing with access, adaptive, and assistive technology

*Wisconsin Education Association Council--Special Education Inclusion. http://www.weac.org/resource/june96/speced.htm   Information on inclusion of students in the classroom. Well defined with support resources.

*Boston University Office of Disability Services. Good listing of organizations and resources for individuals with exceptionalities. http://www.bu.edu/disability/resources/alternative.html

*Software strikes a chord for disabled students. University project enables physically challenged students to create music using technology Very important as it has the video demonstrating the Physical Access Technology Software http://www.eschoolnews.com/news/top-news/news-by-subject/curriculum/?i=50703;_hbguid=96411d65-0eec-4278-b39d-bdb1bddf9b92

*Music Education Network for the Visually Impaired--A good source of major contributors and leaders in the field. E-mail addresses and resources are mentioned http://menvi.org/