

The University of Utah

Using Webcams in a Music Classroom

A Project on Technology in Music Education

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School of Music

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Abstract

New technology surfaces every day. It brings with it a more fulfilling experience of entertainment, more productive work, ease of operation, and time saved. Students are accustomed to technology in their everyday lives. They are engaged by technology's entertaining features and its newness. Any way teachers can use technology in their classrooms will result in lessons that are engaging to students and provide a greater environment for student learning.

One technology that saves time and engages students is webcam technology. Webcams have many applications in music education including video conferencing and broadcasting video. One way to engage students is to bring in a guest clinician to work with the students. Imagine bringing in a clinician from a place of considerable distance without the clinician leaving his or her office. Like magic, the clinician appears on screen in the classroom. The students are captured by the idea of someone so far away appearing before them to help in their musical endeavors. This example is just one application of webcam technology in a music education classroom.

Review of Literature

Any literature on technology has a limited lifespan of application. Great changes in technology can take place almost overnight. These changes have been exemplified with websites such as Yahoo!, Google, and YouTube. Literature on technology will be reviewed chronologically to reflect changes throughout time.

“Teaching with Technology...Miles to Go” by Joe Wyatt (1985) was published over twenty years ago, which is a considerable amount of time in terms of technology. The idea of using technology for research was just beginning. Wyatt mentions that studies had concluded that computers were useful in research and large government grants were funding universities to be able get computers. Some of these grants were instrumental in laying down a network of computers to connect researchers to share their work. Today researchers enjoy a well-developed network that puts mountains of information right at their fingertips. Wyatt describes the use of computers in teaching law students. He describes how the use of computers had increased in the previous decade due to the advancement of the personal computer. These computers connected to a network enabled for an interactive experience where law students put into practice what they had learned. Future plans involved using video disc technology for a video response to the student’s input.

Raymond Fry’s (1992) dissertation, *Development and Trial of a Computer-Based Interactive Videodisc Program in a Course in Fundamentals of Conducting*, provides the next step in the use of technology. Videodisc enables the student to actually see a demonstration rather than just read about it. In his research, Fry’s subjects used an interactive videodisc to receive instruction on basics of conducting. Those who used the interactive videodisc performed better on the final exam than those who did not. Fry concluded that the use of technology, especially videodisc technology, helps students learn more effectively.

David Fetterman's (1996) "Video Conferencing On-line: Enhancing Communication over the Internet" provides many of the core concepts of research on webcams. The fundamental principles in this article remain applicable in current applications of webcam technology. The programs and equipment quality and features have changed since Fetterman's article. Although the cost of a webcam has stayed relatively the same, the quality of picture has improved dramatically. What was then a black and white, fuzzy video that was choppy due to low frame rates is now a clear, color video that is almost perfectly smooth. His application of that technology requires a different program, but can still be done in a similar way. Fetterman's research is some of the earliest using webcams for educational use. His descriptions of equipment and quality are useful as it is compared to current webcam applications.

Fetterman's article (2002) six years later, "Web Surveys to Digital Movies; Technology Tools of the Trade," takes videoconferencing into the actual classroom. Fetterman uses videoconferencing for a collaborative science project with middle school students. From the descriptions given, the technology had improved since his last article, but still did not meet today's capabilities. Fetterman mentions video and audio was still choppy and it was easier to communicate by typing messages back and forth rather than speaking. Also, the program that Fetterman uses in both articles, CU-See Me, may have been popular at the time, but no longer exists as it was bought out by another company which no longer offers that software. The most valuable part of Fetterman's research is that he brings webcam technology into the classroom for viewing science projects from a great distance away. This project also enables for collaboration of multiple schools but brought them virtually closer together by use of a webcam.

The last two articles provide the most insight to using webcams in a music education setting. Both articles are more recent than the previous articles and deal directly with music education. The more helpful of the two is Tony Leong's (2004) "Music Makers: Technology - Using Technology as a Vehicle to Enhance Music Performance." This article addresses specifically using a webcam for guest

clinicians, private instruction, and teachers teaching their classes from a remote location. Leong discusses teaching one of his students privately from across the world. He was able to both see and hear his student and give help on technique and musicianship. Leong also gives a couple examples of the use of broadcasts and webcasts, streaming video across the internet for a wide audience to view. These examples included broadcasting live concerts and making webcasts of concerts and instruction available for students to view any time. Pamela Glaros (2006) touches briefly on webcam use in her article "The Private Studio: Technology in the Private Studio – A Never Ending Story." She addresses using a webcam to video record students, especially for posture at a side view. Glaros expresses how this side view is an excellent way for students to see poor posture and make the appropriate corrections.

All these articles provide the basis for the use of webcam and video conferencing technology in the classroom today. They provide insight to the benefits of technology and descriptions of the advancement of the equipment. A few of these articles, Fetterman (2002), Leong (2004), and Glaros (2006), give a description of specific ways that webcam technology can be used in a classroom.

Uses for a Webcam in a Music Classroom

The uses for a webcam in music can be many. These uses include recording video, video conferencing and internet broadcasting. Video conferencing includes: private lessons, guest clinicians for ensembles, and exchange concerts. Internet broadcasting includes: remote observation and broadcasting concerts.

The simplest use of a can be to record video. A video recording can be helpful in showing students their technique. Two of the best applications for video recordings are percussion and strings since the technique is mostly visual. A video recording can show students such things as their stick height, grip, bowings, and approach. Posture is something that can also be viewed by students using a video recording. With a webcam, students can be video recorded from the side, an angle that cannot be seen using the traditional mirror. A side angle enables students to get a different view of their posture, embouchure, and technique, enabling them to better understand the corrections necessary for better playing.

Another use for the webcam is video conferencing technology. Using two webcams, people a great distance away from each other can see and talk as if they were in the same room. The video and audio is broadcast over the internet enabling the people to talk as if they were using a telephone with video. This technology can be used in private, individual, and ensemble instruction.

Private lessons can be given using video conferencing technology, enabling more possibilities for private instruction. No longer are students limited to private teachers within driving distance. Students can receive private instruction from anyone in the world that has a computer with an internet connection. This application of video conferencing can be particularly helpful for students living in rural areas where private instruction may not be readily available or instruments with hard-to-find instructors.

Ensemble instruction can be given via a webcam as well. Using video conferencing can be particularly useful for inviting clinicians from a considerable distance. Rural schools have the challenge of a long drive for anyone who chooses to visit, making it more difficult for inviting clinicians. A webcam would enable clinicians from around the world to virtually visit a classroom without ever leaving their own office. University professors can work with a larger number of high school and middle school music groups without traveling long distances. Composers can work with a group playing their piece without having to travel. High schools and middle schools are able to invite a composer to comment on their performance of the composer's work without the large expense of paying for travel and lodging in addition to clinician fees.

Exchange concerts can be easily arranged with video conferencing technology. A fun experience for a young musician is to play a concert with another school. Each school takes turns performing, sharing their music with one another. These exchange concerts can now be arranged without the expense and hassle of traveling. Video conferencing makes it possible to have exchange concerts with other schools that would otherwise be out of the reach of district policy and financial ability.

Remote observation can be done using a webcam as well. This can be done utilizing video conferencing technology as well as broadcasting technology. Inexperienced teachers can use remote observation to observe master teachers. Some districts will provide for a teacher to have a substitute to enable the teacher to leave his or her classroom to observe another teacher, but often this substitute will only cover one class period. Most master music teachers do not work in the same building as the teachers who want to observe them. A webcam would enable a teacher to observe another teacher in a different school without having to take as much time away from his or her own classes. College professors can observe student teachers more often and with less time taken out of their busy schedules by using a webcam. After the student teacher's lesson is over, the student teacher and professor can then video conference to discuss the lesson.

Video broadcasting can be done with a webcam as well. Video broadcasting can include broadcasting a concert live over the internet or having in-class solo and ensemble performances viewable by parents at home or work. Video broadcasting enables for a much wider audience to participate in musical activities. Because of the nature of a broadcast, some districts require parental permission for broadcasting a student's image over the internet. Parental permission can easily be obtained using a simple form. Some districts may already have a form for placing student pictures on the internet.

Equipment Needs and Explanation

There are three main pieces of equipment when using a webcam: a computer, webcam, and microphone. Another important piece of equipment for classroom use is a projector. Each of these pieces of equipment has different products of all ranges of cost and complexity. While considering options for use, check configuration and requirements to ensure that the equipment will work together and provide acceptable quality.

Most computers less than five years old with a high speed internet connection should be acceptable for webcam use. The setup, meaning each piece of equipment and the program, needs to be checked for minimum and recommended specifications to ensure that there is enough computing power to run correctly. Program compatibility with the computer's operating system should be checked as well. Either a Mac or a PC may be used, but the operating system used may change the options of available programs. The operating system of the person with whom you wish to connect can change your available programs as well. These compatibilities will be discussed more in the section on programs. An ideal option for a computer would be the new Intel-based Macs. These computers have the ability to run both Microsoft Windows and Mac OS. The option of both operating systems means more programs will be available to use. The flexibility to use more programs enables more people with whom to connect.

A webcam is simply a camera that is connected to a computer for the use of transmitting video over the internet. Many digital video cameras can be easily connected to a computer using a firewire cable and used as a webcam. Some digital cameras claim to be able to be used as a webcam, but sometimes getting that to work may be more trouble than it's worth. Another option is to purchase a camera that is manufactured for the purpose of being used as a webcam. The two main manufacturers of webcams are Creative and Logitech. Both of these companies make good quality webcams. A

webcam costs approximately \$30 - \$130, depending on resolution and features. A few things to consider when purchasing a webcam are resolution, stand type, and other extra features. Resolution is the most important aspect to having a good picture. For general web use, a standard VGA resolution of 640x480 is acceptable. If the webcam is to be used for video recording, a resolution of at least one megapixel is desired for a better quality picture. There are webcams with higher resolutions, but the extra resolution is not necessary for general broadcasting and video conferencing. There are some webcams that have a QVGA resolution that is said to be software enhanced to be a 640x480 resolution. The quality of these webcams is not as good as an actual VGA resolution of 640x480 and should be avoided. When comparing webcams, look at the native resolution not anything labeled as "software enhanced." The type of stand varies from webcam to another webcam. There are some webcams that have a clip that can be mounted onto a laptop or flat screen. This clip can be useful when placing the webcam above a white board for viewing a classroom. Other stands are designed to be mounted on a flat surface such as a desk. Getting the webcam placed higher is helpful for large ensembles because this placement enable all the students to be seen. There are also webcams with wide angle lenses that are helpful in a classroom to be able to see a large group. The placement should be considered before deciding what type of stand will be required. Other features include face tracking, digital zoom, video masks, and pan and tilt. Face tracking is the ability of the webcam to recognize and follow your face as you move out of the screen. This feature can be useful for a single person using a webcam, especially if the person moves around. Digital zoom can be useful for large ensemble use. This feature gives the director the ability to zoom in on a section for a clinician. Digital zoom has the best quality when used with high resolution webcams (two megapixel or higher). Video masks use face recognition software to recognize your facial movements and apply them to a cartoon character that will be used to represent you. This feature is more of a novelty item and not something that will be very useful, except for some humor. Pan and tilt enables the webcam angle to be moved to see different parts of the group without

having to move the actual webcam. This is a nice feature, but not something that is necessary. In the future, video conferencing software may enable the other end to control what is being seen using pan, tilt, and zoom, which will make these features more useful.

A microphone is one of the most important pieces of equipment needed for using a webcam in a music setting. The higher the quality of microphone, the higher the quality of sound will be available for being able to listen to tone quality. Microphones that come with computers or are built into webcams are generally designed for speaking and do not yield good results when used for instruments. The best option for having high quality sound is to use a condenser microphone. A condenser microphone can be used most easily when it is battery powered and connected by a 1/8th inch plug directly into the computer. Macs do not have microphone-in port. They do, however, have a line-in port, which a microphone can be plugged in if it has a preamp. Another option for using a microphone with a Mac would be to use a USB sound card or a firewire recording device. A firewire recording device can also be used with microphones that require phantom power. A more cost effective option would be to use a dynamic microphone with a similar setup. The least expensive option would be to use a microphone from SmartMusic. SmartMusic.com has an inexpensive, good quality omnidirectional microphone for \$20. This microphone works well for the price and can be a great way to get started using webcam technology in the music classroom. More information about selecting a microphone are on the website for this project (www.robertjackman.com).

When using teleconferencing with a large group, it is recommended that a projector be used to project the images so all can see. Clinics where a projector is used enable the guest clinician to be visible as life-size or larger than life-size. This life-size view of the clinician can contribute to the ensemble feeling like the clinician is actually in the room, enriching the experience. Ensemble to ensemble video conferencing would require a projector to enable students to see the other group. Most schools have access to a projector to be used for such an occasion.

Programs for Videoconferencing and Broadcasting

There are several major programs available for teleconferencing that are free and easy to use. There are several others that require purchase or a subscription. The focus of this project is on free programs including Skype, MSN Messenger, iChat and AIM, and Yahoo!. Options for video broadcasting include: Ustream.tv, Windows Media, and Quicktime.

The video conferencing programs which will be discussed have several features in common. The first of these features is instant messaging. Most of these programs are designed as and all can be used as instant messenger programs, which allow users to communicate by typing text messages. All of the video conferencing programs reviewed have the capability for video conferencing in addition to being used for instant messaging. Other features each program include the ability to view the video full screen, having the local video in a small picture within the full screen picture, and the number of webcam streams that can be viewed simultaneously. Having video full screen makes it easier to see person with whom one is video conferencing. Full screen is particularly helpful when working with large ensembles. The local video helps to know what the other person is seeing. This video preview is helpful in ensuring that the other person is seeing what they need to see, which is particularly helpful in clinic settings.

Skype is a newer program than the others. It was designed, unlike the other programs, to be used for VOIP (voice over IP), which is to use the internet for telephone service. Skype's design include being able to use a PC to make phone calls to traditional telephones. Because of this design, Skype's audio quality is superior to the other programs. Skype also has a superior video quality with smooth, clear video.

MSN Messenger is an instant messaging program created by Microsoft and is included with Windows. It is a popular program among Windows users. MSN Messenger can be used with Mac users,

but only for instant messaging. Video conferencing cannot be done using a Mac. Because of the lack of Mac compatibility, MSN Messenger cannot be consistently used in music education video conferencing.

iChat is the instant messaging program created by Apple and is included with Macs. iChat features the ability for full screen with a local preview picture. It also can have up to four users simultaneously video conference. There is no version of iChat for Windows; however, Windows users can use AIM (AOL instant messenger) to video conference with iChat. AIM does not have ability to use full screen video.

Yahoo! Messenger can view multiple video streams without limit. The quality of video drops dramatically if more than one video is being viewed simultaneously. Yahoo! is available for both PC and Mac. Yahoo! can be used with full screen including a local view.

There are newer emerging video conferencing programs that are flash-based, which is the same technology used in the popular website YouTube. Because they are flash-based, they are embedded right into the web-browser, making them easy to access from any platform. The quality of these at this point is still quite low, but they do offer a future of easier to use web conferencing solutions.

Webcasting or internet broadcasting is a way to enable a musical group to be viewed by anyone with an internet connection. The easiest to use and setup software is a website ustream.tv. This website enables an easy setup for quick broadcasting. The broadcast can also be recorded and placed on a website for easy viewing later. The quality of the video and audio stream is not the highest, but the ease of setup makes up for the quality. The broadcast can also be embedded into a school website making it easy to find for those who wish to view it.

Two other programs that also enable for broadcasting are Windows Media Player and Quicktime. Either of these programs require server-side software to be installed and setup. Many schools have one or both of these servers already running; however, they usually require setup and configuration by a network administrator. Software is run on a computer that is connected to a video

source, which can be a webcam or a higher end video camera. These two programs require more setup but yield a much higher quality result for the end user. Windows Media Player requires a Microsoft Windows server and a Microsoft Windows computer to operate. Quicktime requires a Mac server and a Mac computer to operate. Either program may be viewed by either platform. Contact your school's network administrator for more information about availability of these two broadcasting options.

Appendix

The appendix materials will be placed on my website robertjackman.com to be made available to all who wish to benefit from this project. Here are some screenshots to visualize what is on the site:

Here is the main page of the site www.robertjackman.com. This site will have a link to all the information from my master's project. Other links included will be information for other projects currently in progress.

Robert Jackman.com



Resume

[Masters Project \(Webcams in the Music Classroom\)](#)

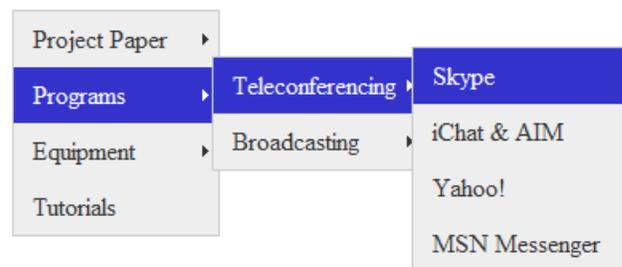
SmartMusic

SmartBoard

The next page of the project website includes links to pages dealing with different aspects of the project including programs, equipment, and tutorials. Each page has information about that subject, including links for additional information.

Robert Jackman.com

Masters Project - Webcams in the Music Classroom



This page from the project website focuses on the Skype program. The page includes links to download the program and guides to setting up and using the program. Other pages for each of the other programs are also included.

RobertJackman.com
Masters Project - Webcam in the Music Classroom



Links:

[Skype.com](#)
[Download Skype Windows Mac](#)
[Getting Started Info & Guides](#)
[Adding Contacts Guide](#)
[Setting up Video Guide](#)

Skype is my top choice for videoconferencing. It works with both Windows and Mac and has the highest quality video. Skype is also easy to setup and use. Skype's main market is VOIP (Voice over IP) which allows you to use your computer to call regular telephone numbers. If your main goal for using Skype is for videoconferencing, then you can ignore all the phone information.

The equipment section features pages like this one for webcams. It provides information for users to know which equipment would be the best to get and includes links on how to get it.

RobertJackman.com

Masters Project - Webcam in the Music Classroom



One of the most frequent questions I receive is "What webcam should I get?" I often answer with a vague description of what features to look for and what types are available. This is usually followed up with, "Just tell me which one to get." So I am going to put in the top three choices for webcams. There are many sites that review webcams and will compare features, but really it doesn't matter that much which one you get. So here are my top picks. Retail prices are included, but these webcams can be found for much less than retail prices. I have included a link to pricegrabber that will search out the best price. One of my favorite retailers is Newegg.com because they have good prices, are reliable with good service, and their shipping is fast.

Logitech Quickcam Pro 9000



This webcam is rated as the top pick in several different websites. This webcam features a high quality picture and many additional features. It can also record video in High Definition. The clip for this webcam makes it easy to mount just about anywhere. It should be able to be mounted on a whiteboard for a front of class view. Retail cost for this webcam is \$99. [Pricegrabber price comparison](#) [Newegg listing](#)

Logitech Quickcam Orbit AF



This webcam is the one that I use in my classroom. It produces a high quality picture and many features the same as the 9000. It does not have a clip for mounting on a laptop or whiteboard. I created a mount for mine to put on top my Smarboard. It can be desk mounted. This webcam has the features of being able to pan, tilt, and zoom. This is a nice feature when a clinician wants to see a specific section. There is an optional 9 inch stand bringing the webcam up a little higher. Retail price is \$129. [Pricegrabber price comparison](#) [Newegg listing](#).

Logitech Quickcam Communicate STX



This camera is a great less expensive camera. For the person who is looking to get started and doesn't want to invest a lot of money, this is a great option. It still has good quality video and will give good results. The mount is able to be desktop mounted as well as on a screen or whiteboard. Retail cost \$49. [Pricegrabber price comparison](#) [Newegg listing](#).

Lastly, here are some additional resources for webcams, including reviews and other information about how to use and set them up.

[Cowboy Franks Webcam Reviews](#)
[Howstuffworks Webcam Consumer Guide](#)
[PC Magazine Webcam Reviews](#)
[CNET Webcam Reviews](#)

Lastly, because Mac computers generally all ship with a built in webcam, many webcam companies are no longer including support for Macs with their webcams. These webcams can still be used, but may need some additional driver help. [Macam](#) provides webcam support for mac so that virtually any webcam can be used with a Mac.

Bibliography

- Fetterman, David M. "Video Conferencing On-line: Enhancing Communication over the Internet." *Educational Researcher* 25, no. 4 (May 1996): 22-30.
- Fetterman, David M. "Web Surveys to Digital Movies: Technology Tools of the Trade." *Educational Researcher* 31, no. 6 (Aug-Sep 2002): 29-37.
- Fry, Raymond Jay. *Development and Trial of a Computer-Based Interactive Videodisc Program in a Course in Fundamentals of Conducting*. Ann Arbor, MI: UMI, 1992.
- Glaros, Pamela. "The Private Studio: Technology in the Private Studio - A Never Ending Story." *Journal of Singing - The Official Journal of the National Association of Teachers of Singing* 62, no. 5 (May-June 2006): 567-572.
- Leong, Tony Nam-Hai. "Music Makers: Technology - Using Technology as a Vehicle to Enhance Musical Performance." *Canadian Music Educator* 46, no. 1 (Fall 2004): 30-33.
- Webster, Peter. "Historical Perspectives on Technology and Music." *Music Educators Journal* 89, no. 1 (Sept. 2002): 38-43, 54.
- Wyatt, Joe B. "Teaching with Technology... Miles to Go." *Peabody Journal of Education* 62, no. 2 (Winter 1985): 6-17.