

Designing and Evaluating a Professional Sound Reinforcement System for Adults

Ken Miyamoto
University of Hawaii Manoa
USA
kenmiyam@hawaii.edu
<http://creativesoundssystemdesign.weebly.com>

Abstract: Creative Sound and Lighting is a small business that services military, churches, hotels, and mobile deejay professionals by providing professional sound equipment through a retail store, rental department, and by installation. Clients have asked if they could observe us at venues, such as installations and live concerts, to see how to set up sound. No formal training or clinics are offered due to the lack of time and resources. The potential for an online module to both serve a client need for training and a business need to be responsive to clients' desires could potentially grow the business. The purpose of this instructional design project was to develop and evaluate an instructional module to improve basic knowledge of signal path and how to create an audio sound system for adult clients at Creative Sound and Lighting. The best way to reach as many potential customers and audio enthusiasts as possible, was to develop an online module with multimedia.

Introduction

The art of sound reproduction has been a fascination and interest worldwide for a very long time. Gold, Morgan, and Ellis (2011) stated that, "Speech and music are the most basic means of adult human communication" (p.1). The desire to be heard by the masses is evident in today's society, for example in public speeches by the President, music festivals or concerts, and church services. Many social and professional entities rely on sound reproduction to convey their messages. To be able to reproduce sound clearly and to project it for a distance involves many factors.

Creative Sound and Lighting is a small business that services military, churches, hotels, and mobile deejay professionals by providing professional sound equipment through our retail store, rental department, and by installation. My primary role in the store is assistant manager and buyer. I provide sound system quotations as well as purchase equipment to meet our client's needs for audio and visual integration.

There have been many occasions both in the store and out on locations, when clients have asked me, or other staff members, if we would provide any training or teach them more about sound. People have asked if they could observe us at venues, such as installations and live concerts, to see how we set up sound. We do not offer any formal training or clinics due to lack of time and resources. The potential for an online module to both

serve a client need for training and a business need to be responsive to clients' desires will potentially grow our business. The purpose of this instructional design project is to develop and evaluate an instructional module to improve basic knowledge of signal path and how to create an audio sound system for adult clients at Creative Sound and Lighting.

Literature Review

Rougui, J. E., Istrate, D., & Souidene, W. (2009) conducted a study that used audio to detect distress from elderly patients through sound classification. An audio system was put in place at the home and microphones set up in strategic locations throughout. Benefits to the user included not being tied to a device worn, having independence at home, and safety in case there was a cause for personal distress. Drawbacks included not accurately classifying distress audio, interference with audio pickup called audio noise, and the cost of the system to implement. This study provided an example of an audio system being designed for use as an aid in everyday life.

Understanding signal path is to understand what good vibrations are and they are basically sound waves. Evans (2011) states that:

Sound is an event of disturbances that excites the molecules in the surrounding air, which creates a wave that travels away from the point of the original event. At this point it is easiest to look at these waves as vibrations. The speed of the vibration is the time it takes to complete a cycle as in determines what we humans call pitch. The faster the vibration, the higher the pitch. We measure the speed of these vibrations in cycles per second or hertz. Every musical note produced by any instrument can be described in terms of frequency or hertz (p 3-4).

Once you know how sound behaves the next step is making sense of the equipment that is part of a sound system. According to Toole (2009), "sound systems reproduce sound by imitating something closely, translates a recording into sound, and cause something to exist again" (p.3).

Soltau, H., Saon, G., & Kingsbury, B. (2010) conducted a study that involved the use of speech recognition through the use of software using C++ library codes, with main objectives to enhance flexibility, efficiency, simplicity, and maintainability. The authors devised a formula based on the C++ library and Python Library, and developed what they called The Attila Training Recipe (ATR). The ATR is a set of standard scripts to build acoustic models for speech recognition. Their conclusion describes that they had positive feedback that their system worked and was scalable to meet universities' and government related institutional needs. This study pertains to my project in that speech is part of sound and building a system can take many forms other than musical play back.

A study by Ahrens and Spors (2010) of sound field reproduction using planar and linear arrays of loudspeakers, concluded that even the largest of array systems still has its flaws, "the sound field can only be perfectly reproduced on an infinite line parallel to the secondary source distribution and a decay of approximately 3 dB with every doubling of the distance" (p. 2048). In other words even the biggest loudspeaker systems have their

flaws in reproducing sound and there are many different ways to setup a sound system. It depends on a few factors including the source material, the environment, and sound equipment. An audio system consists of a microphone, mixer, signal processors such as equalizers or crossovers, amplifiers, and loudspeakers. Each piece of equipment has a specific function in an audio signal path to ultimately amplify sound.

The final equipment in the signal path is the loudspeaker. Beranek, L. L., & Mellow, T. (2012) states that, “many working in the field of loudspeaker design believe that it is as much an art as a science because it involves many choices which reflect personal preferences such as maximum loudness versus bass extension, physical size, directivity characteristics, and weight” (p.290). I find this statement to be in agreement with my own experiences where one client will like a speaker for various reasons depending on application while another one will not. Ultimately speaker selection is the biggest variable in the sound system design process.

Project Design & Development

Clark and Mayer (2011) states, “Self-study asynchronous e-learning has the potential to customize learning to the unique needs of each learner” (p.15). E-learning saves time, travel costs, and use dynamic visuals better suited to today’s fast paced learning environments. From Clark and Mayer’s statement I have chosen to develop this instructional design project through a Weebly website. The website allowed users access based on their own needs, it is also easily managed and maintained, and can be accessed anywhere there is Internet. I also chose a website as the delivery tool because it is relatively inexpensive versus print and ad space to deliver content. The Weebly site is at <http://creativesoundsystemdesign.weebly.com>. De Koning, B. B., Tabbers, H. K., Rikers, R. M., & Paas, F. (2009) suggest that attention cueing that uses multimedia from audio and visuals has more impact on attention than static visuals. Using dynamic visualizations, such as animation and video, helps learners retain more complex systems information and understanding content materials. Within the module, demonstrations through video clips were embedded along with pictures and audio theory concepts shown in Figure 1.

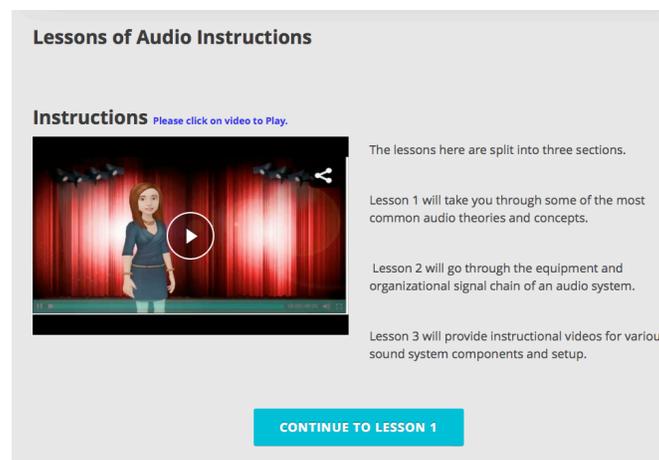
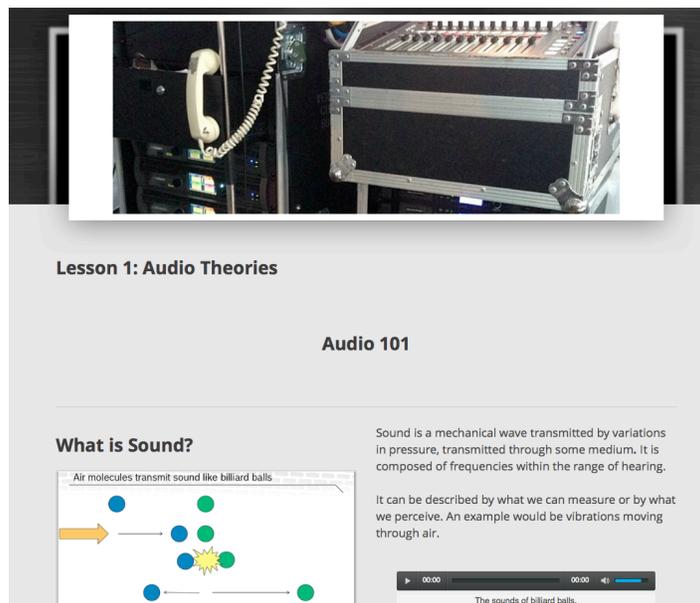


Figure 1. Title Screen to Lessons.

The module was split into three different sections called Lessons. Each lesson had a target group in mind Lesson One: Novice, Lesson Two: Intermediate, and Lesson Three: Professional. Lesson One, audio theories, focused on the audio mechanics of sound, theories, and concepts as shown in Figure 2.



Lesson 1: Audio Theories

Audio 101

What is Sound?

Air molecules transmit sound like billiard balls

Sound is a mechanical wave transmitted by variations in pressure, transmitted through some medium. It is composed of frequencies within the range of hearing.

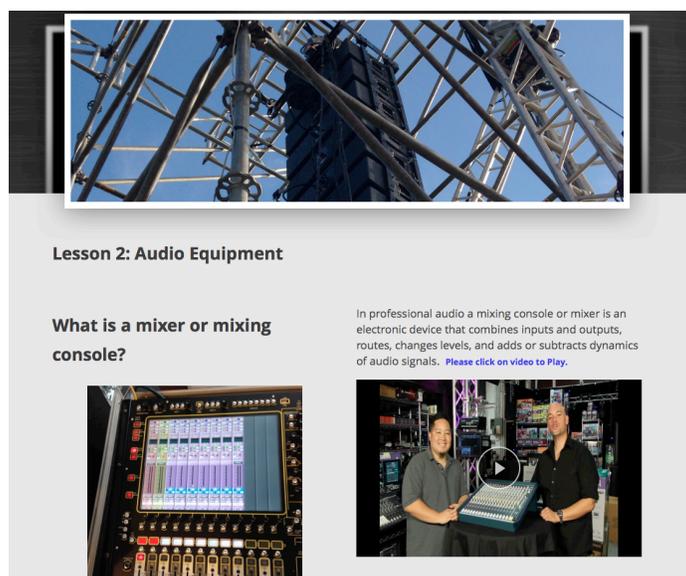
It can be described by what we can measure or by what we perceive. An example would be vibrations moving through air.

00:00 00:00

The sounds of billiard balls.

Figure 2. Lesson 1: Audio Theories.

Lesson Two, audio equipment, focused on intermediate knowledge for sound design. This lesson specialized in the area of audio equipment such as mixers, amplifiers, and loudspeakers. A picture gallery was used to show examples as well as detailed embedded video on the page as shown in Figure 3.



Lesson 2: Audio Equipment

What is a mixer or mixing console?

In professional audio a mixing console or mixer is an electronic device that combines inputs and outputs, routes, changes levels, and adds or subtracts dynamics of audio signals. [Please click on video to Play.](#)

00:00 00:00

Figure 3. Lesson 2: Audio Equipment.

Lesson 3, tutorial resources, focused on the professional and demonstrated step-by-step instructions on how to put a basic sound system together. Written steps were added to the final module per suggestions through revisions. This provided two ways to interpret the instructional content one with visuals via embedded video and audio and a guided written account shown in Figure 4.



Lesson 3: Tutorial Resources

Putting it Together.



[Please click on video to Play.](#)

Step 1 : Putting it Together.

1. The Mixer is on the left.
2. Next to the Mixer on the top right is the Dual 31 Band Graphic Equalizer.
3. Underneath the Dual 31 Band Graphic Equalizer is the Crossover.
4. Directly underneath the Crossover is the Power Amplifier.
5. The microphone shown is then plugged into the Mixer with an XLR cable.
6. Next if you want to plug in an audio device such as an iPod or phone you can do so with a Dual quarter inch cable to a stereo mini 1/8 inch

Figure 4. Lesson 3: Tutorial Resources.

The target audience consisted of adult clients. After initial module development one-on-one feedback was collected from employees who were familiar with signal path and how to create an audio sound system. These served as expert reviewers and content experts. De Jong (2010) states that, “The three main recommendations that come from cognitive load theory are: present material that aligns with the prior knowledge of the learner (intrinsic load), avoid non-essential and confusing information (extraneous load), and stimulate processes that lead to conceptually rich and deep knowledge (germane load)” (p.31). Critical friends group feedback also was used to make module revisions with cognitive load theory in mind.

Campbell, J., & Mayer, R. E. (2009) suggest that using strategically formed and placed questions help aid learners to retain content materials. Morrison, G. R., Ross, S. M., Kemp, J. E., & Kalman, H. (2010) also suggest when evaluating knowledge and skills consider designing questions that are equal in size and complexity to the task. Also keep in mind the necessary or specialized equipment and time required to take the test. Rating

scales should form from left to right and least to greatest. These resources helped me design better questions and aided me to embed questions for each section of my module. Demographic surveys, participant consent forms and attitudinal surveys gathering feedback from users were developed and can be seen in Appendix A and B. These were also embedded in the website.

To develop the website I used a few applications for Apple OS X to assist, which are featured in Figure 5. Tellegami is an application that animates text to speech. I then used Snapz Pro X to do audio and video screen captures of Tellegami animations to be imported to Finalcut Express. Within Finalcut Express I could then non-linearly cut and paste multiple tracks of audio and video to create the content needed for the embedded lessons. To make the multimedia files manageable for web use, I used Handbrake to compress the files to be used on the Weebly website.



Figure 5. Design Tools.

Developing the module I did face a few obstacles and challenges. To gain approval for audio equipment logos and brochures proved to be problematic because of the restrictions manufacturers put on their logos and content. There was not enough time to get clearance to use their content for this project's time frame. To solve this problem I used personal pictures and staff pictures for content galleries and reference materials. The biggest challenges came in the form of the time to setup, plan, and edit the videos. The logistical planning for the professional video crew to come in to Creative Sound and then edit, took an enormous amount of time and effort. As for the non-professional training videos figuring out the right design tools and equipment to shoot the videos and then replace the audio with Tellagami voice-overs was a big challenge. The reason why I used

Tellagami for voice-overs was because I wanted an even volume and soothing voice. In contrast to my own which most audio enthusiasts would find harsh to listen to, due to pitch and volume irregularities.

Putting together demonstration videos versus professional footage is shown in Figure 6. In comparison of my attempt to assemble video footage seemed very amateur compared with the professional version. In my attempt we have the background lighting on the wrong side thus the huge glare in the video and it looked washed out. We could not re-shoot the video due to equipment and time constraints. If I had the time and money I would use professional footage for all multimedia content for consistency and professionalism.

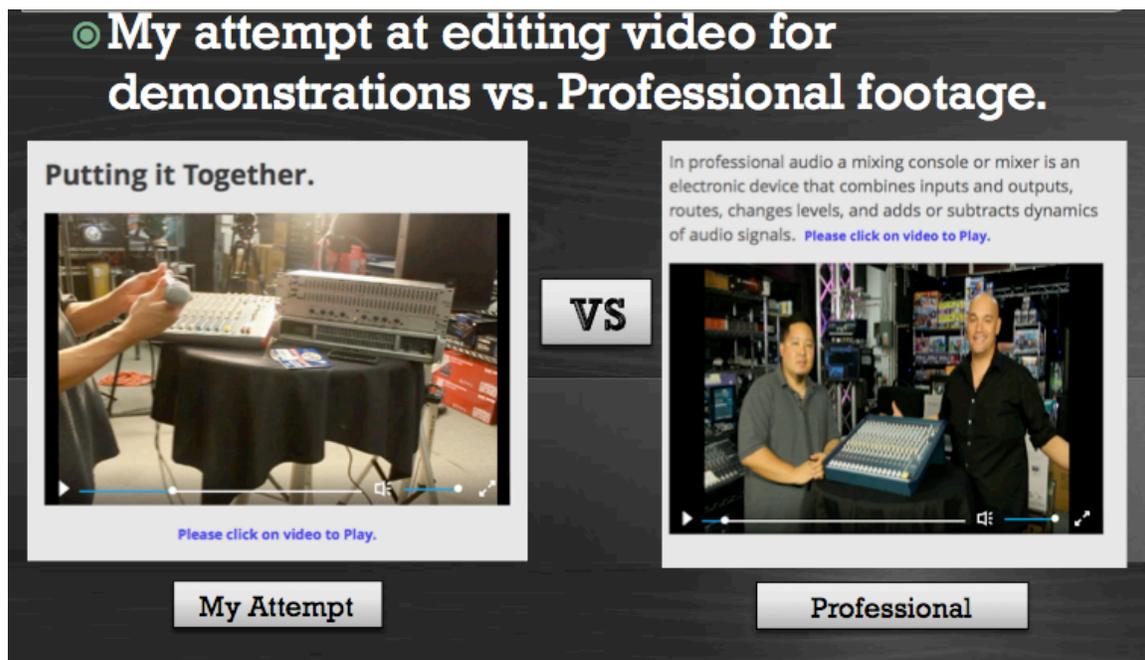


Figure 6. Video Comparison.

Conclusion

Designing a module on sound systems provided the company with a resource to meet the needs of the clients in a cost-effective and time efficient manner. For future iterations for this module I would add more content specifically to lesson one by adding animated video content where possible to demonstrate audio theories. Next redesign color scheme of the website and layout. I would then use a professional sound and video crew to demonstrate the audio equipment in action through a video clip. A possible addition to the module would be to add an interactive section where a participant could assemble a virtual audio system by selecting audio equipment from an animated environment. With the potential of future positive outcomes on attitudes and knowledge, further development is suggested. Ultimately the goal is to help clients learn and understand the process of audio systems design. Providing an educational resource for our clients has the potential to increase sales and positive attitude towards Creative Sound and Lighting.

References

- Ahrens, J., & Spors, S. (2010). Sound field reproduction using planar and linear arrays of loudspeakers. *Audio, Speech, and Language Processing, IEEE Transactions on*, 18(8), 2038–2050.
- Beranek, L. L., & Mellow, T. (2012). *Acoustics: Sound fields and transducers*. Academic Press. Waltham, MA. Retrieved from <http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=JD2RIDGIUJoC&oi=fnd&pg=PP2&dq=sound+equipment&ots=yLLviMLLMz&sig=D3h4JorkeebLQ-gv9sHeB87crDo>
- Campbell, J., & Mayer, R. E. (2009). Questioning as an instructional method: Does it affect learning from lectures? *Applied Cognitive Psychology*, 23(6), 747–759.
- Clark, R. C., & Mayer, R. E. (2011). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning*. John Wiley & Sons. San Francisco, CA. Retrieved from [http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=twoLz3jlkRgC&oi=fnd&pg=PR17&dq=Mayer,+RE.+\(2009\).+Multimedia+Learning&ots=Mey3m dVwnk&sig=TOvbkJSuwFKznppJxDzFEIdIYFg](http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=twoLz3jlkRgC&oi=fnd&pg=PR17&dq=Mayer,+RE.+(2009).+Multimedia+Learning&ots=Mey3m dVwnk&sig=TOvbkJSuwFKznppJxDzFEIdIYFg)
- De Jong, T. (2010). Cognitive load theory, educational research, and instructional design: Some food for thought. *Instructional Science*, 38(2), 105–134.
- De Koning, B. B., Tabbers, H. K., Rikers, R. M., & Paas, F. (2009). Towards a framework for attention cueing in instructional animations: Guidelines for research and design. *Educational Psychology Review*, 21(2), 113–140.
- Evans, B. (2011). *Live Sound Fundamentals*. Course Technology. Boston, MA. Retrieved from http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=dWILAA AAQBAJ&oi=fnd&pg=PR6&dq=Live+Sound+Basics:+The+Fundamentals+of+Live+Sound&ots=ZLGmytu4JM&sig=rmyH1z7_XFEUAb4LBNIGWm_sPRE
- Gold, B., Morgan, N., & Ellis, D. (2011). *Speech and audio signal processing: processing and perception of speech and music*. John Wiley & Sons. Hoboken, NJ. Retrieved from <http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=p0mNAF8gMmUC&oi=fnd&pg=PA1&dq=understanding+audio+signal+path&ots=GqXdLdq56d&sig=MvXiw8X-R9NalzBtWT01p57zyak>
- Johnson, C. I., & Mayer, R. E. (2009). A testing effect with multimedia learning. *Journal of Educational Psychology*, 101(3), 621.
- Mayer, R. E. (2011). Instruction based on visualizations. *Handbook of Research on Learning and Instruction*, 1–516. Routledge. New York, NY.

- Morrison, G. R., Ross, S. M., Kemp, J. E., & Kalman, H. (2010). *Designing effective instruction*. John Wiley & Sons. Hoboken, NJ. Retrieved from http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=ygIbaCIN3KMC&oi=fnd&pg=PR7&dq=instruction+based+on+audio&ots=7SufO_CTRs&sig=sbU_hjMUnKcaCehCfYhGBI98DJI
- Rougui, J. E., Istrate, D., & Souidene, W. (2009). Audio sound event identification for distress situations and context awareness. In *Engineering in Medicine and Biology Society, 2009. EMBC 2009. Annual International Conference of the IEEE* (pp. 3501–3504). IEEE. Retrieved from http://ieeexplore.ieee.org.eres.library.manoa.hawaii.edu/xpls/abs_all.jsp?arnumber=5334581
- Soltau, H., Saon, G., & Kingsbury, B. (2010). The IBM Attila speech recognition toolkit. In *Spoken Language Technology Workshop (SLT), 2010 IEEE* (pp. 97–102). IEEE. Retrieved from http://ieeexplore.ieee.org.eres.library.manoa.hawaii.edu/xpls/abs_all.jsp?arnumber=5700829
- Toole, F. (2009). *Sound reproduction: The acoustics and psychoacoustics of loudspeakers and rooms*. Focal Press. Burlington, MA. Retrieved from http://books.google.com.eres.library.manoa.hawaii.edu/books?hl=en&lr=&id=S5rR4UCd3KAC&oi=fnd&pg=PT11&dq=live+sound&ots=8_04TiIK4n&sig=97r6zjRjEACfnwLErvUO8Rh5_rA

Appendix A Demographic Survey

1. What is your Gender? (Circle one):
 - A) Male
 - B) Female
 - C) Prefer not to say

2. What is your age group? (Circle One)
 - A) 18-30
 - B) 31-40
 - C) 41-50
 - D) 51-Up

3. What city/town do you live in?

4. Are you an audio enthusiast? (Circle One)
 - A) Yes
 - B) No

5. How long have you been working with audio equipment? (Circle One)

A) 0-5 yrs. B) 6-10 yrs. C) 11-15 yrs. D) 16-20 yrs. E) 21+yrs.

6. Do you own your own Professional Sound System? (Circle One)

A) Yes B) No

7. How often do you use your sound system in a week? (Circle One)

A) None B) Once C) Twice D) Three E) Four or More

8. Do you have any prior knowledge of what a Hertz is? (Circle One)

A) Yes B) No

9. Do you have any prior knowledge of what Pitch is? (Circle One)

A) Yes B) No

10. Do you have any prior knowledge about what Sound Pressure Level or (SPL) is?
(Circle One)

A) Yes B) No

11. Do you know what an audio mixer is? (Circle One)

A) Yes B) No

12. Do you know what a loudspeaker is used for? (Circle One)

A) Yes B) No

Attitudinal Survey

Designing a Professional Sound Reinforcement System

Thank you for participating in “Designing a Professional Sound System” and taking the time to answer the module questions. Now I would like to know what you think about the module itself. Please circle a number.

1=Strongly Disagree

2=Somewhat Disagree

3=Neutral

4=Somewhat Agree

5=Strongly Agree

1. The lessons were easy to follow.	1	2	3	4	5
2. The pictures were clear.	1	2	3	4	5
3. The sections in the model were well divided.	1	2	3	4	5
4. The practice questions in the module were helpful.	1	2	3	4	5
5. The length of the module was manageable for me.	1	2	3	4	5
6. I learned something new from this module.	1	2	3	4	5
7. The information provided was enough to answer the questions.	1	2	3	4	5
8. This module helped inform me about sound theories.	1	2	3	4	5
9. I better understand what sound is.	1	2	3	4	5
10. I better understand what pitch is.	1	2	3	4	5
11. I better understand what hertz is.	1	2	3	4	5
12. I better understand what mixers are.	1	2	3	4	5
13. I better understand what amplifiers are.	1	2	3	4	5
14. I better understand what a loudspeaker is.	1	2	3	4	5
15. I feel I can make well-informed choices about audio equipment in the future.	1	2	3	4	5

16. What did you find particularly useful about the module? (Please write below)

17. What suggestions do you have for improvement? (Please write below)

Appendix B
Sample Consent Form:
University of Hawai'i

Consent to Participate in Research Project:

Designing and Evaluating a Professional Sound Reinforcement System for Adults

My name is Ken Miyamoto. I am a Graduate Student at the University of Hawai'i at Manoa (UHM), in the Department of Learning Design and Technology. As one of my interests, I design professional sound reinforcement systems. The purpose of this instructional design project is to develop and evaluate an instructional module to improve basic knowledge of signal path and how to create an audio sound system for adult clients at Creative Sound and Lighting. The purpose of the research is to improve the module for future use.

Project Description - Activities and Time Commitment: If you choose to participate, I will meet with you face-to-face to take part in using the website to test the module in our store. The training will last for about 45 to 60 minutes. This research will use the website

to collect data from your responses to pre, embedded, and post questions to surveys and test included inside the module about demographics and prior knowledge. If you participate, I will ask questions of you during the module. You will be one of a total approximately of fifteen participants who will use this module in our storefront. You will be asked to complete a pre-survey and a post survey that should take no more than 10 minutes each. If you would like to preview a copy of all of the questions that I will ask you, please let me know.

Benefits and Risks: You may benefit from participating in my research project by learning more about setting up sound systems and audio theories. The results of this project might help me and other researchers learn more about creating web-based modules to help people learn. I believe there is little or no risk to you in participating in this project. There is a possibility you may become uncomfortable or stressed by answering a question or navigating the module. If that happens, you may skip the question, take a break, or stop the project. You may also withdraw from the project altogether at any time with no penalty to you.

Confidentiality and Privacy: During this research project, I will keep all data collected in a secure location. Only I will have access to the data, although legally authorized agencies, including the University of Hawai'i Human Studies Program, have the right to review research records. All responses will be kept confidential. After the training session, I will use pseudonyms to protect the confidentiality of any information linked to my participants. When I report the results of my research project, and in my typed notes from my interview with you in the store, I will not use your name or any other personally identifying information. If you would like a summary of the findings from my final report, please contact me at the number listed near the end of this consent form.

Voluntary Participation: Participation in this research project is voluntary. You are free to choose to participate or not to participate in this project. At any point during this project, you can withdraw your permission without any loss of benefits.

Questions: If you have any questions about this project, please contact me at via phone (808) 478-4105 or e-mail (kenmiyam@hawaii.edu).

If you have any questions about your rights in this project, you can contact the University of Hawaii, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu.

To Access the Survey: Please go to the following web page: <http://creativesoundssystemdesign.weebly.com>. You should find a link to the survey and instructions for completing it. Completing the survey will be considered as your consent to participate in this study.

Please print a copy of this page for your reference.

Sample Flyer

The University of Hawai`i is conducting a study on:
***Designing and Evaluating a Professional Sound Reinforcement
System for Adults***



Are you an Audio Enthusiast or Professional?

If the answer is **YES...**

Mr. Ken Miyamoto would like to invite you to participate in this research study.

The purpose of this instructional design project is to develop and evaluate an instructional module to improve basic knowledge of signal path and how to create an audio sound system for adult clients at Creative Sound and Lighting. The research is to improve the module for future use.

- Study visit will take place at Creative Sound and Lighting located at: 46-003 Alaloa St. Kaneohe, HI. 96744. For Directions please call, 808-236-2766.
- Results of the study will be kept confidential and no personally identifiable information will be kept.

To learn more about the study, please email Ken Miyamoto at kenmiyam@hawaii.edu



Pre-Test Questions and Answers

Designing a Professional Sound Reinforcement System

1. Which one of the following is the best example of sound? (Circle One)
 - A. A power amplifier.
 - B. Vibrations in the air.*
 - C. A three way crossover.
 - D. A graphic equalizer.
2. An example of Pitch is the (Please complete the sentence and circle one)
 - A. movement of air on a long wavelength.
 - B. percussion instruments used to play a rhythm.
 - C. cord that attaches to the guitar to play in a band.
 - D. speed of the vibration and the time it takes to complete a cycle.*
3. Which of the following is a Hertz? (Circle One)
 - A. Cycles per second. *
 - B. Cycles per minute.
 - C. Cycles per hour.
 - D. Cycles per day.
4. What is a Decibel?
 - A. A measure of tone and melody.
 - B. A ratio between power and intensity. *
 - C. The speed at which sound travels.
 - D. A bell shaped sound wave.
5. What is Sound Pressure Level or SPL?
 - A. A ratio of hearing and intensity. *
 - B. A test tone used to analyze a room.
 - C. The vibrations used to move power.
 - D. The output equal to the input.
6. An example of an audio mixer is (Please complete the sentence and circle one)
 - A. a blender that hold audio materials.
 - B. a device that separates audio signals between high and low.
 - C. a console that has multiple inputs and outputs. *
 - D. a device that hold multiple songs on a disk..
7. What is a graphic equalizer? (Circle One)
 - A. A device that separates audio signals between high and low.
 - B. A signal processor that separates individual frequencies.*
 - C. A device that amplifies sound.
 - D. A signal processor that switches between audio and video.

8. What is a crossover? (Circle One)
- A. A device that modifies the signal strength.
 - B. A signal processor that adds distortion to the sound.
 - C. A signal processor that separates audio signals between high and low.*
 - D. A device that auto corrects pitch and time..
9. What is an amplifier? (Circle One)
- A. A device that increases sound strength.*
 - B. A music storage devise.
 - C. A digital device that makes frequencies.
 - D. A calculator that increases sound.
10. What is a loudspeaker? (Circle One)
- A. A crate that is made out of wood.
 - B. A box that holds music materials.
 - C. A cabinet that reproduces sound frequencies.*
 - D. A polymer box that splits sound up.

Post-Test Questions and Answers

Designing a Professional Sound Reinforcement System

1. What is the best example of sound?
- A. A graphic equalizer.
 - B. A power amplifier.
 - C. Vibrations in the air.*
 - D. A three way crossover.
2. Pitch is the (Please complete the sentence)
- A. speed of the vibration and the time it takes to complete a cycle.*
 - B. movement of air on a long wavelength.
 - C. cord that attaches to the guitar to play in a band.
 - D. percussion instruments used to play a rhythm.
3. What is a Hertz?
- A. Cycles per hour.
 - B. Cycles per minute.
 - C. Cycles per day.
 - D. Cycles per second.*
4. Which answer best describes a Decibel?
- A. A bell shaped sound wave.
 - B. A measure of tone and melody.
 - C. A ratio between power and intensity.*
 - D. The speed at which sound travels.

5. Which is the best example of SPL?
 - A. A test tone used to analyze a room.
 - B. The output equal to the input.
 - C. The vibrations used to move power.
 - D. A ratio of hearing and intensity.*

6. An audio mixer is (Please complete the sentence)
 - A. a device that hold multiple songs on a disk.
 - B. a console that has multiple inputs and outputs.*
 - C. a blender that hold audio materials.
 - D. a device that separates audio signals between high and low.

7. What does a graphic equalizer do?
 - A. A device that separates audio signals between high and low.
 - B. A signal processor that switches between audio and video.
 - C. A device that amplifies sound.
 - D. A signal processor that separates individual frequencies.*

8. A crossover performs what function?
 - A. A signal processor that adds distortion to the sound.
 - B. A device that auto corrects pitch and time.
 - C. A signal processor that separates audio signals between high and low.*
 - D. A device that modifies the signal strength.

9. What does an amplifier do?
 - A. A digital device that makes frequencies.
 - B. A device that increases sound strength.*
 - C. A calculator that increases sound.
 - D. A music storage device.

10. What is an example of a loudspeaker?
 - A. A cabinet that reproduces sound.*
 - B. A crate that is made out of wood.
 - C. A polymer box that splits sound up.
 - D. A box that holds music materials.