What’s Next Report Engineering - John Watson

“A Better Ear” is the prototype of the grand system we would like it to be. Right now, it consists of a small-scale creation of what the system is intended to be, with only the most basic of components. This project focused more on the information and research design of a system that balances classroom learning for children with ADHD or another form of disability. The overall goal of the system is to create a classroom environment where every student is comfortable and able to have the same experience as the next, regardless of predetermined aliments. Through consistent research and progress, “A Better Ear” can become a well-known system for years to come.

The first area that could be improved, post-class and after development that would be required to take the system to the next level would be speech-to-text and vice versa displayed on a tablet for the student. This could be done with several technological advancements over a normal classroom setting such as:

· The lector will wear a discrete microphone, such as one that someone giving a large-scale presentation would wear for ease of use. This will allow for the audio from the teacher to be recorded or projected concurrently to the students.

· The classroom will be equipped with microphone/speaker systems in different areas of the room (placement will be discussed later). This allows the teacher to better hear questions that the students pose, and to allow for various presentation opportunities with projection of sound.

· The student will have the ability to ask the lector what was said, and the professor can either rehash what was said or copy a section of the speech-to-text and email it to the student for future use.

The microphone/speaker set-up is crucial to the success of the system. Strategically placed devices around the room will provide better coverage of sound and will also allow any student to ask a question without having to yell. In recent times with expanding classes, issues arise when students are required to project their voice because many students do not show the confidence to be able to talk in front of a class. The system is designed for ADHD students, and therefore must be suited to any kid who may or may not want to speak out loud in front of all his or her peers. The diagram below is simple approach to where the microphones will be placed.

(It cut out my diagram those rat bastards)

There will also be speakers located behind the students that target the same area from the back. Speakers should be kept away from the wall, so sound does not reverberate and cause an echo. Large, wooden-framed, pieces of carpet like material will be placed on the walls so to absorb sound and not allow sound to bounce back into the audience. This will give the classroom a more auditorium-like feel where students have an easier time following along with the lecture.

The second major upgrade the system can get is features on the tablet the professor is working with. Earlier in the document we discussed being able to take a tablet and record the class. The speech-to-text ability on the tablet can allow a student to reread a lecture at any time. This also allows a student to highlight specific sections of the material that he or she does not understand and ask questions in class. The professor can look at their tablet and provide the best answer possible to the specific question asked. This can also be done outside of class as well, because a student can highlight a troublesome section and email the professor. This is an aid to the professor because they do not have to remember what they said at that particular time and can give a more accurate answer to the chosen topic.

My role in making sure this gets done is to help Curtis propose a design for an application with the necessary features. The speech-to-text editor will have to be intelligent enough to parse out all of the minute details of human speech, such as “um”s and “uh”s. The system will also need to be able to listen to users with an accent to determine what was said. Many tests will be run on the application to make sure that a professor that does not speak English very well can contribute to his or her students learning. The text-to-speech aspect of design will run somewhat like the voice feature of google translate does. This entails downloading files that pronounce certain groupings of letters. Since the system was designed for English speakers this area of development should not be too tiresome.

Both Curtis and I will put time into finding the correct microphone/speaker combo as well. The set-up will vary slightly from class to class, but the basic triangular setup should work well in most learning spaces. We have run tests on different microphones and their listening distance and will use this data to find out how far from the professor, students and the walls they need to be placed. Placement is key. A surround sound experience is the best way to ensure that students in an “A Better Ear” classroom have the easiest time listening and enjoying the material.

Once the upgrades to the system are completed, a test classroom should be established so that we can test the findings and actually see if the students in the room have a better experience. Curtis and I have a discrete mathematics course in Conner Hall where the sound quality is dismal. The professor constantly must ask students to speak up and there have been many times where I am unsure of what the professor said. This classroom would be a perfect fit to improve quality of learning in a classroom.

What’s Next - Curtis McClelland

Looking at what the next steps truly are for “A Better Ear,” there are an infinite number of implementations and improvements that can be applied to our project in order to increase its functionality. We mainly looked to focus on specific areas in which it could be improved.

As the Research and Development contributor in this team, my job would be to actually attempt to implement new physical features to our project in order to improve upon the product. This could include anything from advances in hardware to creating a plan for our product to be used in a different setting entirely in which our invention could be implemented.

Technicologically: obviously there could be an upgrade in respects to the technology used for the system. We could implement a better microphone that could record clearer audio, we could pay for a more accurate transcription service to provide transcripts of lectures, we could invest in better earpieces for the students and teachers that could allow for clearer playback, and many other options.

Conceptually: there are many different ways our system can be improved upon. One that was mentioned in my personal role report was the potential for the system to implement some sort of interactive polling system in the classroom, helping those with disabilities aside, that could allow for student-teacher communication and allow for live, graded class exercises. Another way that this system could be improved upon would be with the addition of an interactive application that could allow the student to request transcripts with the push of a button, adjust volume to their earpiece, set delay on lecture audio, and a plethora of other features. This could likely be done through some sort of application interface that could interact with either dropbox or google drive, where audio clips and transcripts could be stored and released to the student. There could also be the option of tuning into the live feed of the lecture audio, which could be projected via radio frequency or internet transmission. These options could all be projected in a GUI application that could be available for students to download.

Allowing for these particular improvements will let students with ADHD or hearing disabilities be able to access the information they need when they need it. If they have a hard time hearing in class, they can listen to the lecture on recording later or read the transcript. If they have a hard time paying attention, they can read the information at a later time when they have the ability to focus. Additionally, with the inclusion of better hardware, this system will be able to be used in multiple different types of rooms and lecture halls. We can use better microphones to help pick up more audio from the students, and require less microphones in general. We could also implement speakers that could allow professors to decide whether or not they want to project their lecture throughout the hall. This could also allow the professor to project the questions of students over the speaker system to allow the whole class to hear it.

One more feature we could look further into could be the microphone/speaker set-up. Seeing how imperative it is to the success of the system, it is something we could focus on and continually improve. Strategically placed devices around the room will provide better coverage of sound, the question remains to be where the best locations for these microphones would be. Oftentimes, students have a hard time communicating to the teacher in large lecture halls. Not only is the system is designed for ADHD students, but it is also designed for teachers that may be hard of hearing. Microphone placement and displacement throughout the lecture hall is very important in regards to making sure the teacher can hear input from all of the students in the classroom, with no particular area left out.

Seeing as my role is the actual test engineer, I would be responsible for setting up tests in order to determine which design setup was the most effective for students with disabilities. For this extension of our project, I simply recorded the audio decibel levels to show how much better one position was than the other, volume wise, and have that be the location for hardware. In a future test, I might ask actual students with ADHD or hearing impairments to rate the different setups on a scale in order to determine which organization of hardware or which software characteristics help them the most. Finally, I believe there could be some sort of practical statistic based experiment, wherein there are four separate groups of students, one with ADHD and “A Better Ear”, one with ADHD without, one with hearing disabilities with “A Better Ear”, and one with hearing disabilities without. These two groups would engage in three lectures, and then would take an identical exam. The difference between scores of the two groups would be compared to their own disability, and the change would show whether or not “A Better Ear” had a significant impact on student’s grades.

John would be instrumental during this portion of deciding what to do next as he did a good bit of research on sound waves and what ideal setup could allow for best pickup with our specific microphone. He has suggested that we use a classroom in Conner Hall, one that we share a class that uses, in order to test our system. In this class, the teacher oftentimes has a hard time hearing student’s questions, and students have a hard time hearing the lecturer. Additionally, not all of the content in the lectures is presented online, so having a transcript of the lecture could be instrumental in doing well in the class.

Overall, there are many areas in which we can expand “A Better Ear,” not only to help students with ADHD and teachers and students with disabilities, but all students in general.