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# **Abstract**

This project aims to provide students with disabilities the same in class learning experience through virtual reality technology, 360-degree video capture, and the use of Arduino units. These technologies will be combined to facilitate communication between teachers in physical classrooms with students in virtual classrooms. The goal is to provide a person who is affected by a disability (which makes it hard to be in a traditional classroom) the same benefits of a safe and interactive learning environment.

**Background**

Promoting a positive learning environment for children is important because it engages them with the course content and helps them get the most out of their education experience. This task can be especially difficult when working with students with physical or mental disabilities because of an increased likelihood for bullying in the classroom. Unfortunately bullying has been and continues to be a major issue that plagues schools of all levels all across the world. Bullying has devastating effects on children and young adults. Some cases describe feelings of low morale or acute despair while others have led to fatal ends. There is no solution to bullying and many believe there may never be one, even with education of disabilities and inclusion efforts at an all-time high.

**Specifications**

To peak a student’s engagement in online lecture, two major things need to be accomplished. First is the feeling of being present in the actual classroom, second is the ability to ask questions and participate in lessons in real time. To address the first issue, this project utilizes a 360-degree camera that will be placed in a traditional classroom to capture the class environment. Through the use of YouTube’s streaming services, the virtual reality environment will be streamed onto a phone that is placed into a virtual reality viewer. To participate in class, an Arduino unit equipped with a radio frequency transmitter will be with the student and another Arduino unit equipped with radio frequency receiver and LCD display will be with the instructor in the classroom. The student will input their question/comment into their computer and send it to the instructor’s unit where it will come across on the LCD display. The Arduino unit's LED light will then blink alerting the instructor that a student has a question, the professor will turn off the LED once the question is answered and continue with the lecture.

**Results**

A project for creating a virtual reality classroom has been presented in this report and discussed in this report. We used a combination of Arduino equipment with a virtual reality simulator to be implemented into our design, this allowed us have a full on two way communication with the instructor and the students.

**Literature Review**

Authors Bonnie Bell Carter and Vicky G. Spencer addressed the severe impacts bullying can have on children with disabilities in “The Fear Factor: Bullying and Students with Disabilities.” This paper covers years of research and studies from multiple countries, verifying that bullying is an issue that has been around for quite some time and one that is not likely to go away anytime soon. The paper outlines the progression of education for students with physical, mental, and/or learning disabilities. Children with disabilities used to be and are often still educated separately from their peers in “special schools or different classes.” (pg.1) Education for students with disabilities has always focused on academic achievement but Carter and Spencer argue that the development of social skills through social integration is just as important. Carter and Spencer speculate that bullying continues to be an issue because there is a misunderstanding of what bullying really is, so much so there is no worldly acknowledged definition for bullying.

**Process**

**Feb 27th:**

Discussed and came up with a few problems the group would like to address.

1. Control an RC car using alternative methods

2. Digital Walking Stick for children with visual disability

3. **VR Interactive classroom for handicapped**

Came up with a few articles supporting that there is a connection between play deprivation and kids with specials needs.

A lack of creativity driven by incapability to adapt to common toys, deprives special needs children of motivation to learn games and enhance their learning skills.

<http://scholarworks.wmich.edu/cgi/viewcontent.cgi?article=1062&context=ojot>

Article which talks about kids with learning disabilities.

**March 6th**

Group decides on VR Interactive classroom with Arduino communication device.

**Parts List:**

**1.** Ricoh Theta S 360-degree camera

**2.** VR Headsets (20$ online / Everyone)

**3.** WIFI-Shield (Arduino ADAFRUIT) If Ethernet doesn’t work

**4.** RGB LCD Screen

**5.** YouTube Channel "AnywhereEducation"

Came up with an idea of using an app called "Blynk" that allows us to control the Arduino from our phones.

Preloaded Questions for RGB LCD:

1. Can you repeat the last part?

2. I don’t understand.

3. I understand now.

4. Will this be on the test?

5. When is the next test?

6. What is the homework?

7. Can you give an example?

**March 13th - 20th:**

Tasks for the next two weeks include.

1. Solder RGB LCD Screen
2. Test RGB Screen
3. Connect Ethernet Shield to Arduino
4. Two-way communication? (how will teacher and student communicate?)
5. Research Communication between two Arduinos using RGB LCD Screen
6. Purchase Ricoh Camera (Josh)
7. Test Livestream between Ricoh (YouTube..etc..) and VR/YouTube Full screen

YouTube channel link for our project "AnywhereEducation"

[**https://www.youtube.com/watch?v=vcOE2XAQHzY**](https://www.youtube.com/watch?v=vcOE2XAQHzY)

**March 27th**

Tested VR and 360 live stream, it works.

**April 3rd:**

Went into detail coding on how to make the two Arduinos communicate to each other, both the instructor and students' side of the spectrum.

**April 10th:**

Troubleshooting code and seeing if the light, and the two Arduinos can talk to each other, we managed to make then send a couple of preload questions to each other.

**April 17th:**

Managed to get all seven preloaded questions working, along with the ability of turning on and off the LED light on the instructor side of the Arduino.

**References**

Askins, Lindsey, and Brittany Diasio. "Children with Developmental Disabilities and Their Motivation to Play." *The Open Journal of Occupational Therapy* 4th ser. 1.4 (2013): n. pag. *Schlarworks*. OJOT, 29 Aug. 2013. Web. 17 Apr. 2017. <http://scholarworks.wmich.edu/cgi/viewcontent.cgi?article=1062&context=ojot>.

Carter, Bonnie Bell, and Vicky G. Spencer. "The Fear Factor: Bullying and Students with Disabilities ." *International Journal of Special Education* 21.1 (2006): 11-23. Web. <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.501.1121&rep=rep1&type=pdf>.