ECE 492

Design Proposal

Virtual Reality Program to Help Mason LIFE Students Improve Social Skills and Situational Awareness

Team Members:

Coralia Aguirre-Cruz
Marcela Angulo
Mara Barkley
Gerald Evans
Caitlin Fitzsimmons
Melanie Vu

Date of Submission: 10/12/2018
Faculty Supervisor: Dr. Nathalia Peixoto

Contents

Executive Summary

People who have intellectual and developmental disabilities (IDD) face many more challenges in their lives each day than those without these disabilities. Students face many challenges, such as educational challenges and employment challenges, [1] because they struggle with learning social skills and situational awareness. Tasks and interactions that are not difficult for people without disabilities could potentially cause those with IDD to derail their entire days and need more assistance than usual. Specifically, when students with IDD are faced with an unfamiliar situation, they may not know how to react, creating stress for them and possibly eliciting a negative reaction. Our project involves creating a Virtual Reality (VR) game which places students in a stressful real-life scenario and allows them to practice their decision-making skills. The VR environment creates a safe space in which students can develop their social skills and increase their situational awareness, so they can train themselves to be more comfortable with problems they face in the real world. The VR environment will be created with a VR headset that the student will wear while being seated in a swivel chair. The student will always be stationary in order to prevent injury. The game itself will be created with Unity and 360° camera footage in order to make the game as immersive as possible. Each event in the scenario will have multiple choices that the student can make by using a joystick specifically created to be accessible for individuals with IDD. Within each scenario, the student uses a joystick designed for individuals with IDD to select from multiple options. Each choice made by the student will influence the next scenario shown. This path will continue until they experience an entire module. This method allows the student to either accomplish the task with decisions that would result in a positive outcome, or achieve a non-ideal result, but because they are in a safe environment, there will be no real consequence. The program will also inform the monitoring teacher of the progress the student makes, allowing for the teacher to either assist the student or be able to see a positive growth. Our long-term goal is to create a game so useful that the students with IDD will not even need it one day because they will understand, through experience, how to make appropriate choices in daily experiences. Our short-term goal is to get positive feedback from both Mason LIFE students and faculty about the usability and usefulness of our program.

Problem Statement

Motivation

At George Mason University, Mason LIFE is dedicated to the success of students with intellectual and developmental disabilities in the professional world [2]. Mason LIFE's academic program coordinator, Dr. Heidi Graff, provided our group with multiple areas of interest to improve the students' classroom and housing experience, but expressed particular interest in helping students practice social skills and situational awareness. Based on Dr. Graff's input, some of the areas in which students need help are resiliency (the ability for students to cope with unexpected problems), communication, and social skills. For example, some Mason LIFE students struggle with distinguishing emotions or reactions that others may have to their actions. In regard to resiliency, some students have difficulty responding to unexpected situations appropriately. Even encountering a problem as trivial as a door being locked can deeply upset some students. Each individual reacts differently; however, Mason LIFE staff have noticed that most their students react poorly to such stressful situations. With no specific class or program for Mason LIFE students to be exposed to such situations, the purpose of our project is to help Mason LIFE students practice social skills in a controlled VR app in a lab environment, which will allow the evaluation of the students' learning progress.

Identification of Need

Dr. Graff indicated Mason LIFE needs a device that will help its students learn better decision-making skills. This will help the students with some life and social situations that they might encounter while being students at Mason, in a job setting or even at home. Dr. Graff expressed an interest in this device being used in a lab setting in order to monitor students utilizing it. A lab setting is a safe, controlled environment appropriate for students practicing skills. Another benefit of students being in a controlled environment is privacy; if they react poorly to a situation, they will not have to face stigma from people around them. Also, it will make the students more comfortable to be themselves and be open-minded about trying the VR headset system.

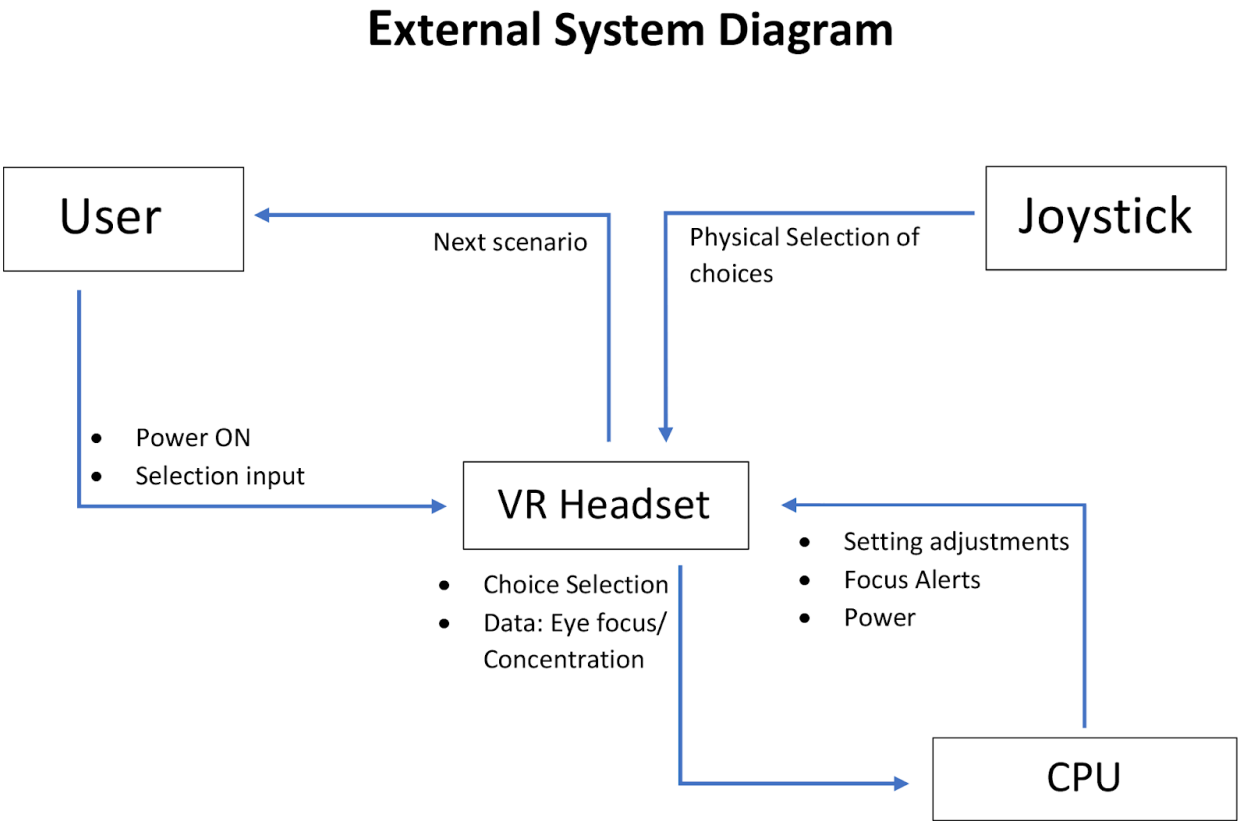
Market/Application Review

As mentioned above, students with intellectual disabilities are easily overwhelmed. Based on this fact, there are certain limitations to our design. Some points to focus on based on our audience's limitations are: audio cues, minimum stimulation, and resiliency. For example, some students have the ability to read, but others do not. These audio cues will help the students who have a hard time reading or even have a hard time engaging through text. Another area of interest/improvement is resiliency. Dr. Graff indicated that current and previous Mason LIFE students scored low in this area. Our project aims to help students build resiliency by using modules focused on retention and learning rather than memorizing, helping these students easily overcome challenges during and after their time at Mason. More importantly, many of these students do not like using wearable technology for extended periods of time, according to Dev Dhakshi, one of Dr. Peixoto's Ph.D students. Dev stated that a lot of the current students do not like to wear these devices for more than 15 minutes. This means that our group needs to keep the modules clean and simple, in order to have low stimulation and keep testing under 15 minutes.

There are also few VR systems made for adults with intellectual disabilities. The majority of the most cited papers from 1990-2017 about VR games created for people with intellectual disabilities were targeted at school-age children and simulated school-related scenarios [3]. Since the goal of Mason LIFE involves helping adults with intellectual disabilities transition to independent living through employment, Dr. Graff indicated there is need for a game to address those goals. Although VR games to help people with intellectual disabilities have been created for academic studies, there are few available for consumer purchase. Floreo is a VR learning tool made specifically for autistic children and features many modules involving simulating everyday situations, like crossing a street, or general educational gaming, such as identifying animals or gestures [4]. However, is not immediately available for purchase by consumers. Another VR "serious game," or game more focused on learning a life skill than pure enjoyment, aimed at people with intellectual disabilities is SIMmersion LLC's Virtual Reality Job Interview Training ("VR-JIT") [5]. The VR-JIT is a computer based game that simulates a job interview and offers over 2,000 variations of this interview. The game provides players with a list of options they can say into the computer's microphone and provides them with feedback on the quality of the choice they pick. However, this game does not use any sort of VR headset and is not immersive.

Approach

Problem Analysis with External System Diagram



There are three components to our design: (1) the VR headset, through which students will view scenarios and choices of how to respond, (2) the game itself, and (3) the joystick, which students will use to select in-game choices.

Approach Based on Conceptual Design

The design is comprised of three parts: the game, the headset and the joystick. The student will use all three to experience the scenarios we provide. A Mason LIFE staff member will also monitor student progress.

The game itself will be 5 to 10 minutes and use a VR headset to allow students to experience challenging scenarios. The game uses real life 360° footage for the backdrop to give the students a more realistic experience. The student will always remain seated in a swivel chair so they are safely stationary and also able to experience the 360° environment. A sketch of the student utilizing the system is below in Figure 1. As shown below, the student is seated in a chair

that can rotate. Depending on the student's preference, they can either put the joystick on their lap, or it can be affixed to the swivel chair's arm via Velcro. The headset will need to be connected to a PC if we utilize the HTC Vive, but we may decide to use a wireless system like Google Daydream and an Android depending on student's preference as discussed in Experiment One below. The red button on the chair is a "panic button" which will stop the game and alert the nearby staff member to help the student take off the headset. If the HTC Vive is utilized, that message will appear on the computer screen for the staff member to view.

Figure 1 - Sketch of Student utilizing System

We are focusing on creating one scenario with multiple variations. The variations can include the setting of the scenario and characters used in the scene. Each decision a student makes will have a randomized outcome so that no student can complete the game solely through memorization. A higher difficulty level set by the instructor will result in a higher chance of failure in order to help build the student's resilience. The scenario itself will be chosen after further consultation with Dr. Graff, but our potential ideas include simulating one of the following scenarios:

- Grocery Shopping
- Cooking
- Going to an event (such as movie theater or amusement park)

- Assisting customers in a retail or food service environment
- Asking for directions

Given that our game requires input from the user, we will be designing or modifying a controller to let the user select from the choices which are displayed in text and also read aloud. The students will be monitored while using the VR headset, to ensure their comfort and their focus. Proctors will have the ability to adjust settings in the program to coordinate with the user's needs and track the user's progress as they advance through the modules. A few setting options include difficulty level, audio cues, scenario selection and display options. Similarly, certain data will be tracked, such as module progress, the user's choices, focus retention, and the user's emotions, which the user will periodically be prompted to describe. While wearing the VR headset, the game will present the 360° view of the scenario with a couple choices to resolve the problem they face, along with intermediate questions such as "how are you feeling?" or "what do you think the character is feeling?". For users to choose their preferred option they will move and hold the joystick to the direction of the corresponding choice. Once they have selected their answer, they will be led onto a path to their next scenario. Alternatively, if the user is unable to focus, an alert will present itself. Through the headset we will be able to detect head movement, giving us the ability to identify if the user is focused on the task in front of them rather than just looking around. To ensure the user is focused on the task the program will notify both the user and the proctor. Depending on the proctor's comments, they can either adjust the program so the user can proceed to their next challenge or allow the user to take a break.

After our discussions with Dr. Graff, it was very clear that accessibility must be at the forefront of our design. Students should be prompted in multiple ways, such as through text and audio cues, so that students of all reading levels can participate. Text should be minimal, as many students do not have a high-school reading ability. VR headsets often come with controllers, but we realize we need to be open to designing our own controller or creating an enclosure for an existing controller if students have difficulty with the default controller. Many controllers on the market do not have the hallmarks of joystick accessibility: being large in size (so the user can easily handle it) and having tactile feedback (so the user knows their input has been recognized). Tactile switches have not only an audible click, but the users can actually feel

they have moved the joystick. Tactile switches are also much less sensitive to movement than analog joysticks are, meaning it is harder for the user to accidentally move a cursor. Understandably, the large size and lack of sensitivity of such a joystick would not make such a controller popular with the gaming population, but for students with IDD, these features can make using a joystick easier.

Alternative Approaches

To create the VR system described, we have a few options for both the VR headset and controller. It is important that we have multiple ways to create our system in case students are uncomfortable with a certain type of headset or controller. We will determine which options are most appropriate by getting student feedback as shown in Experiment One below.

HTC Vive

One option includes using the HTC Vive headset. An advantage of using the HTC Vive headset is its processing power, which would allow students to have a more immersive and less disorienting VR experience. However, it is a bulkier headset and requires a gaming PC as well as a wired connection.

Android and Google Daydream

Another option includes using an Android smartphone and Google Daydream for the VR headset. This combination would be advantageous in that the Google Daydream and smartphone combination weighs slightly less than the HTC Vive and is made to be comfortable to wear. The Android and Daydream are also wireless, which is convenient in that students could use it without a special lab setup. The disadvantage to this combination is that, based on conversations with Dev and group members, the Android generally gives a choppier VR experience which could be disorienting.

Modifying Existing Controller

Since the controllers available for Daydream and HTC Vive have multiple buttons and touchpads on them, they may be too complicated for students to use, particularly when they are in a VR environment and unable to see the physical controller. These controllers are also hand-held, which may be uncomfortable to students who would prefer to keep them on a flat surface. To alleviate this problem, we can create an enclosure for the controller via 3-D printing to create

a built-in flat surface. The controller could then either be held in the student's lap, or potentially attached to the arm of a swivel chair with Velcro.

Creating our own Controller

Both the HTC Vive and Daydream have controllers made especially for use with these headsets. However, the controllers for these systems are designed for gamers and are highly responsive and sensitive to movement. Based on research on assistive switches described above, controllers that are highly sensitive can be frustrating to individuals with impaired motor skills, as their movements can unintentionally trigger buttons. If students struggle with existing controllers, it may be necessary to create a large, tactile controller of our own, potentially using MSP430.

Panic Button

There is also a need for a large, easily accessible button which students can press to stop the game and alert the staff nearby to help them take off equipment. This can be described as a "panic button," so if a student is experiencing distress, they can quickly get help to take off the equipment. This button can be created with MSP430 or could potentially be implemented by using an already existing button on the controller.

Introduction to the Background/Phenomenology Supporting the Project

There are examples of games created to help people with IDD learn social skills, especially those with autism, who often struggle with maintaining eye contact and interpreting emotions [6]. These games range from low-tech card games [7] to high-tech augmented reality glasses to help autistic individuals recognize emotions [8]. During research on this project, we came across an example of "virtual reality" to teach social skills to students with autism [9]. However, the game itself is from 2005, and the "virtual reality" within this game is more along the lines of a standard computer game with embedded video. While this game was fascinating to read about, it is extremely text-heavy and so would be inappropriate for most students in the Mason LIFE population. However, the evaluation of this game provided us with excellent ideas for our own game. For example, generalization, or the ability of a player to take skills they learn in-game and apply them to real-life, is aided by providing a player with multiple variations of the same scenario. The variations could include setting, people involved and elements of

randomness. Additionally, the reward/correct method of providing feedback to students is shown to be much more appropriate than pass/fail. It is important to give positive reinforcement to students, but simply telling a student that they made a poor choice and forcing them to continue through the scenario will not aid them in learning as much as correction will. More recent sources have also described in-depth the principles from the game described above: teaching generalization through various settings, coupled with the potential for experiential learning, is one of the potential advantages of VR in teaching skills [10].

Researchers and parents of people with IDD alike have seen the value of using games to teach social skills. Some researchers feel that getting experience in social situations and understanding social rules allows for the students to have an easier time socializing [11]. One mother even stated that her "son plays social therapy games at a local social skill group where they let him practice with his peers" and it made a strong positive impact [12]. The ability to educate through its immersive experience has made VR an attractive tool in the education community [13]. In addition, the cyberspace environment allows the users to have a controlled learning process where they will advance at their own pace [13]. Even though there are various applications that use VR for education purposes, there are not many that target individuals with special needs. Researchers have agreed that this technology will allow individuals with specials needs to understand their learning capabilities and strengths better in a specific scenario [14]. There is also evidence that utilizing principles of "gamification," such as positive reinforcement, creation of different paths within a scenario and instant feedback, can help produce behavioral changes [15].

Whether we create an enclosure for an existing controller or create a controller with MSP430, it must be accessible. Before we decided on creating a VR project, our group did research on adaptive switches which are defined by Tecla, one of the primary manufactures of these switches, as: "...an input-output device that allows the individuals with physical disabilities user to independently activate assistive technology devices and switch-enabled devices such as an iPhone" [16]. Although we are not creating such a device, there are design considerations utilized in adaptive switches which we will use in our controller. For example, tactile feedback is an important aspect of making a controller accessible-- the feedback allows a user to feel that

they pressed a button or moved a joystick. Also, tactile feedback tends to make the joystick less sensitive, which will help prevent accidental key presses for students with motor skill issues.

Project Requirements Specification

Mission Requirements

M1. Create a Virtual Reality game in Unity to help students with intellectual disabilities simulate and work through stressful scenarios.

M2. Students are presented with different ways of handling a stressful situation and are evaluated and guided based on their decisions.

M3. The game must be accessible to students who cannot read or have poor reading skills by utilizing voiceovers and minimal in-game text.

Input/Output Requirements

IO1. Students shall utilize a Virtual Reality headset, such as HTC Vive or Google Daydream, to play the game.

IO2. Students shall use an accessible controller to make in-game selections.

IO3.·The instructor within the class will be able to pre-program difficulty levels for students.

External Interface Requirements

EIR1. The controller shall be powered or charged via a USB cable.

EIR2. The controller used will be large enough that students with motor skill issues can handle it more easily.

Functional Requirements

FR1. The game shall provide students with possible ways to handle a stressful situation.

FR2. The game shall track the student's decisions and will produce a progress report at the game's conclusion for the instructor to read.

FR3. The student progress report provided to faculty at the end of the game should consist of multiple factors, such as the decision they made, the time it took for them to make the decision and how many times it took for them to respond appropriately.

FR4. The game shall not lag (response time should be << 1s).

FR5. The peripheral device (controller) will have a 3-D printed enclosure so students can put it on a flat surface.

FR6. The joystick will be charged via USB cable.

FR7. The game shall be approximately 5-10 minutes long.

FR8. The game will have multiple variations of a single scenario for students to encounter.

FR9. The game should be able to communicate the student's progress to the appropriate faculty member.

FR10. The game should exhibit good qualities of "gamification" (including positive reinforcement) to encourage students.

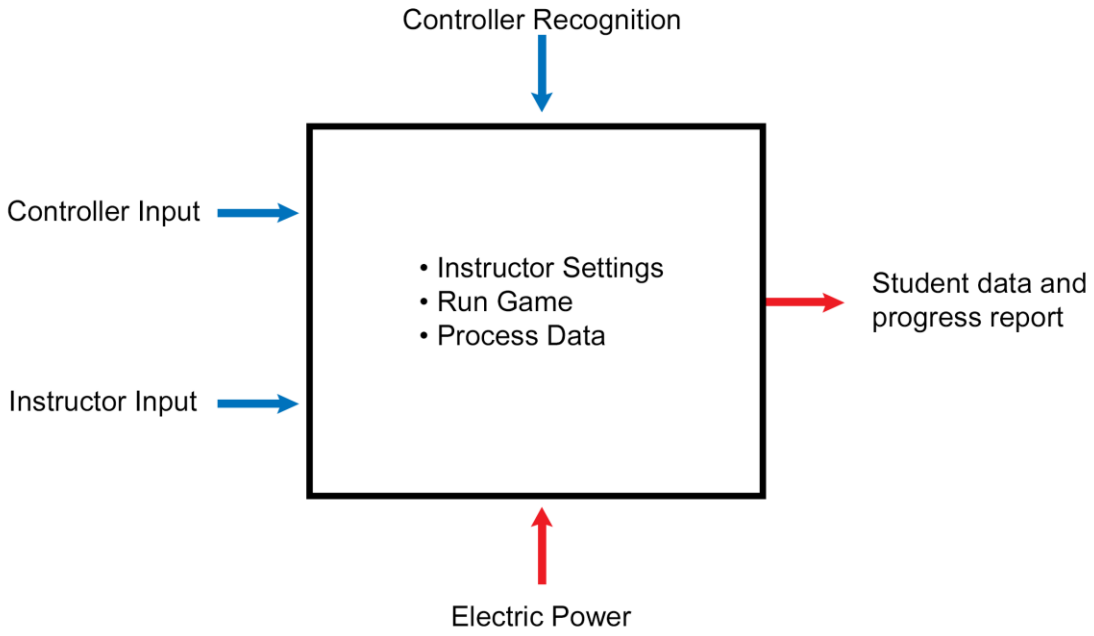
Technology and System Wide Requirements

TS1. The game will be created using the Unity game engine (which uses C++ for scripting).

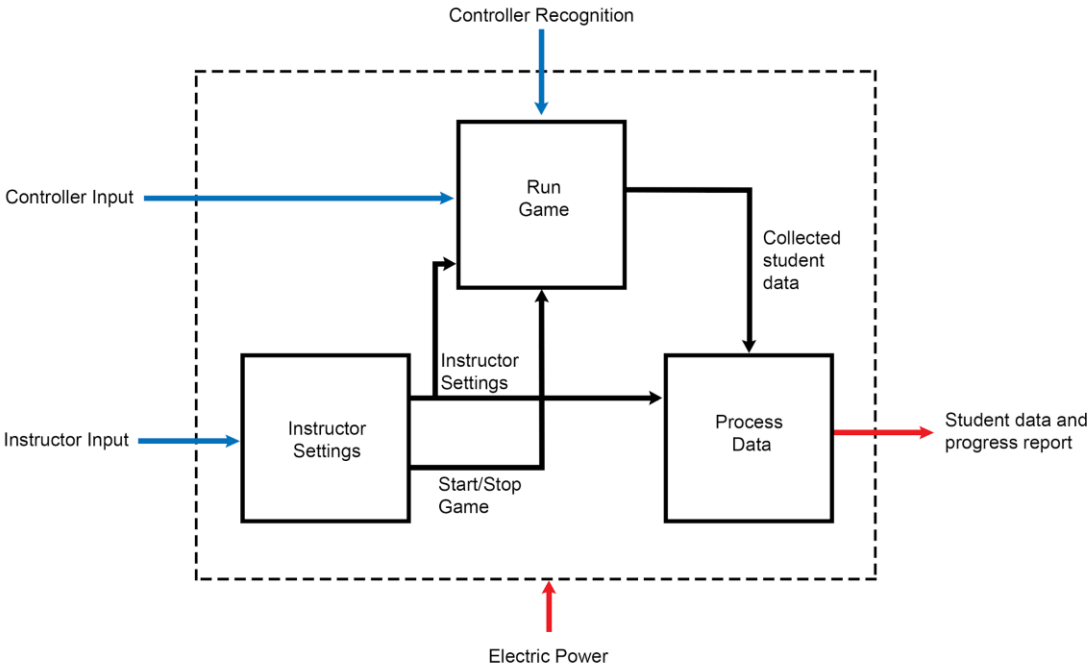
System Design

Functional Decomposition

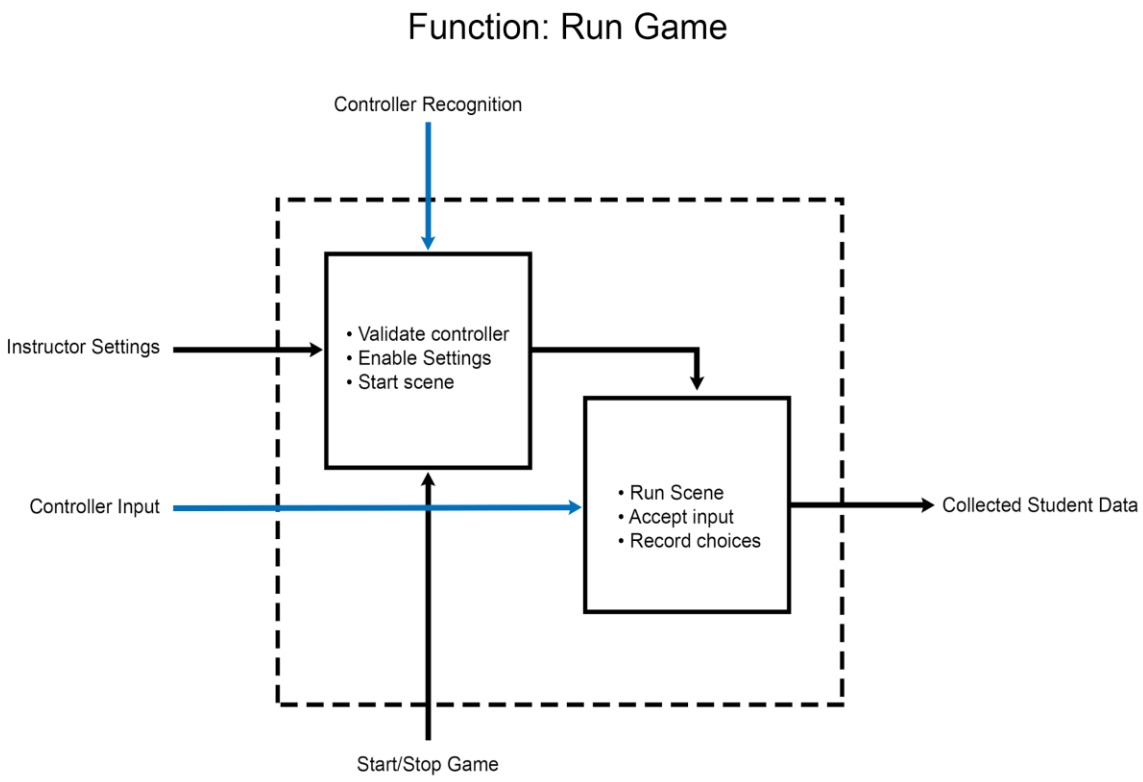
Level 0

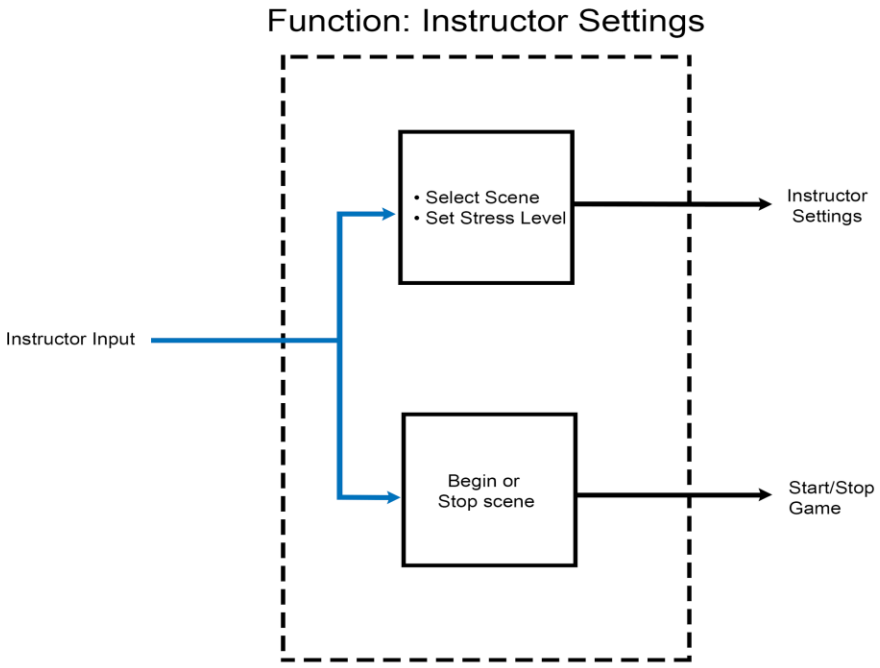


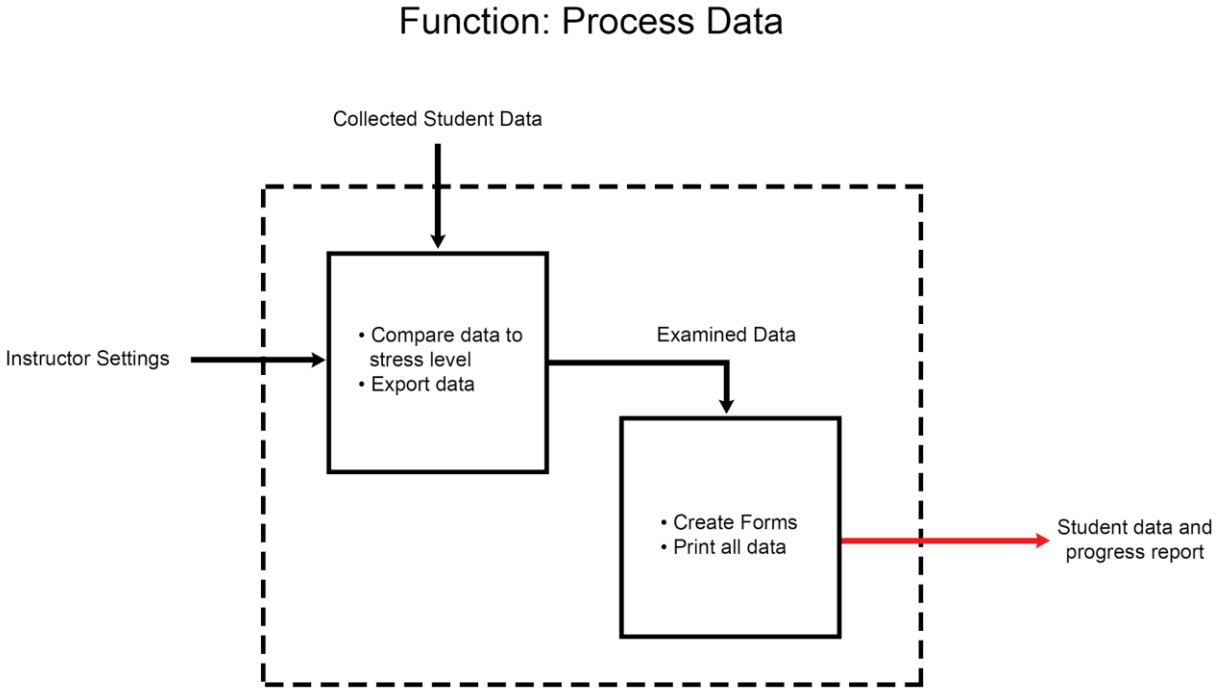
Level 1



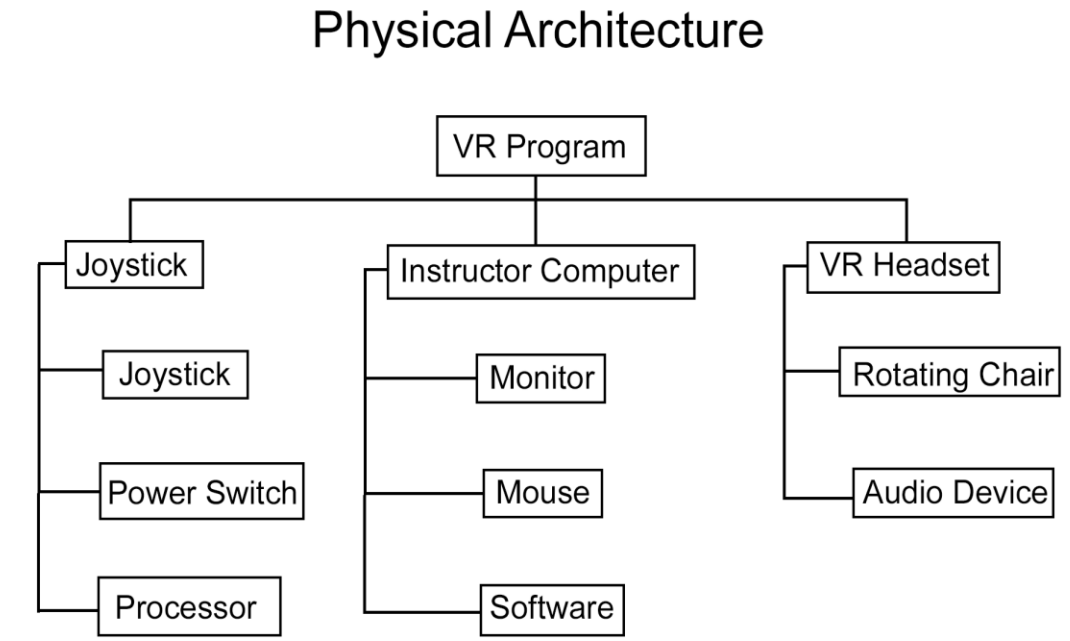
Level 2

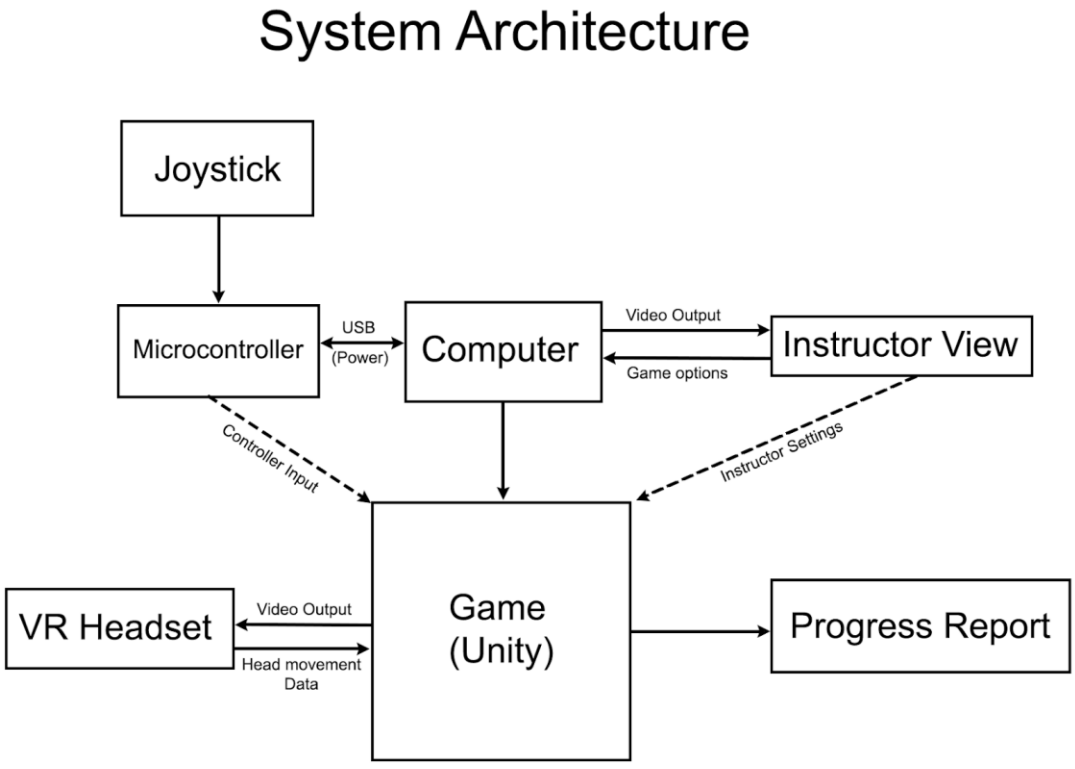

Function: Run Game
Controller Recognition
Instructor Settings
• Validate controller
• Enable Settings
• Start scene
Controller Input
• Run Scene
• Accept input
• Record choices
Collected Student Data
Start/Stop Game


Function: Instructor Settings
• Select Scene
• Set Stress Level
Instructor Settings
Instructor Input
Begin or
Stop scene
Start/Stop
Game


Function: Process Data
Collected Student Data
Instructor Settings
• Compare data to
stress level
• Export data
Examined Data
• Create Forms
• Print all data
Student data and
progress report

System Architecture





Component Selection

To select the components we will use, we will need to meet with students to understand what they are and are not comfortable with using as shown in Experiment One below.

Preliminary Experimentation Plan

Experiment One: Meeting with Mason LIFE Students to Test Different VR Headsets

Our group will coordinate with Mason LIFE staff to get a preliminary sample of students to test out different VR headsets (particularly Google Daydream and HTC Vive) with a demo 360 video game. This will allow us to determine which headset is more comfortable and usable for students, as well as evaluate whether they struggle with using the included controller. Criteria we need to consider include: students' level of comfort with the headset, students' level of comfort within the VR environment and students' ability to use the controller. The result of this experiment will be used to select our VR headset and controller.

Experiment Two: Testing Report Creation

A debug menu will be created so a tester can walk through each scenario and each possible outcome. At the end of each scenario, we will ensure an accurate progress report is created for each student. Throughout the process, the tester will make notes of any problems with functionality they encounter, such as:

- Controller responsiveness, including functionality of "panic button"
- Headset responsiveness
- Inaccurate evaluations – were you given positive feedback for a "bad" decision, or vice versa?

This will be an iterative process which must occur before the focus group test described in Experiment Three.

Experiment Three: Focus Group

Dr. Graff at Mason LIFE will help us to assemble a focus group of both students and faculty to test the game. Considering that the focus group is intended to give our group feedback on the

success of our project, we will choose our selection criteria to obtain the most feedback from students and faculty [17].

We will only utilize students who meet the following selection criteria [18]:

- Students must be enrolled in Mason LIFE
- Students must be able to move their head freely.
- Students must feel comfortable viewing screens and should not have eye problems that preclude them from using a computer, watching TV, etc.
- Students should feel comfortable with the idea of trying on a VR headset (i.e. students with anxiety about putting something over their eyes should not be included). If necessary, we can bring a VR headset with a different game and allow students to try it before we conduct the focus group.

Priority will be given to students nominated as good candidates by Mason LIFE faculty. Additionally, we may express a preference for using students who participated in Experiment One. Criteria which would be helpful for the focus group include:

- Ability to express themselves, whether verbally or by writing.
- Prior positive experience with using VR headsets.

We will ask for feedback from both students and faculty about the following criteria. Potential focus group questions are also listed:

Students

- Accessibility
  - What did you think about the game controller?
  - What did you think about the headset?
  - What did you think about the words on the screen?
  - What did you think about the voice you heard?
- Usefulness
  - How did this game make you feel?
  - What did you like best about this game?
  - What would make this game better?

Faculty

- Accessibility
  - How do you think the students interacted with the game?
  - Did students express frustration with the game?
- Usefulness
  - What did you think about the progress report created at the end of the game?
  - How do you feel about VR systems, such as this one, being used in a classroom setting?
  - What would improve this system, from the standpoint of a faculty member?

- What would improve this system, from the standpoint of a student?
- What problems do you see with students utilizing a VR system?

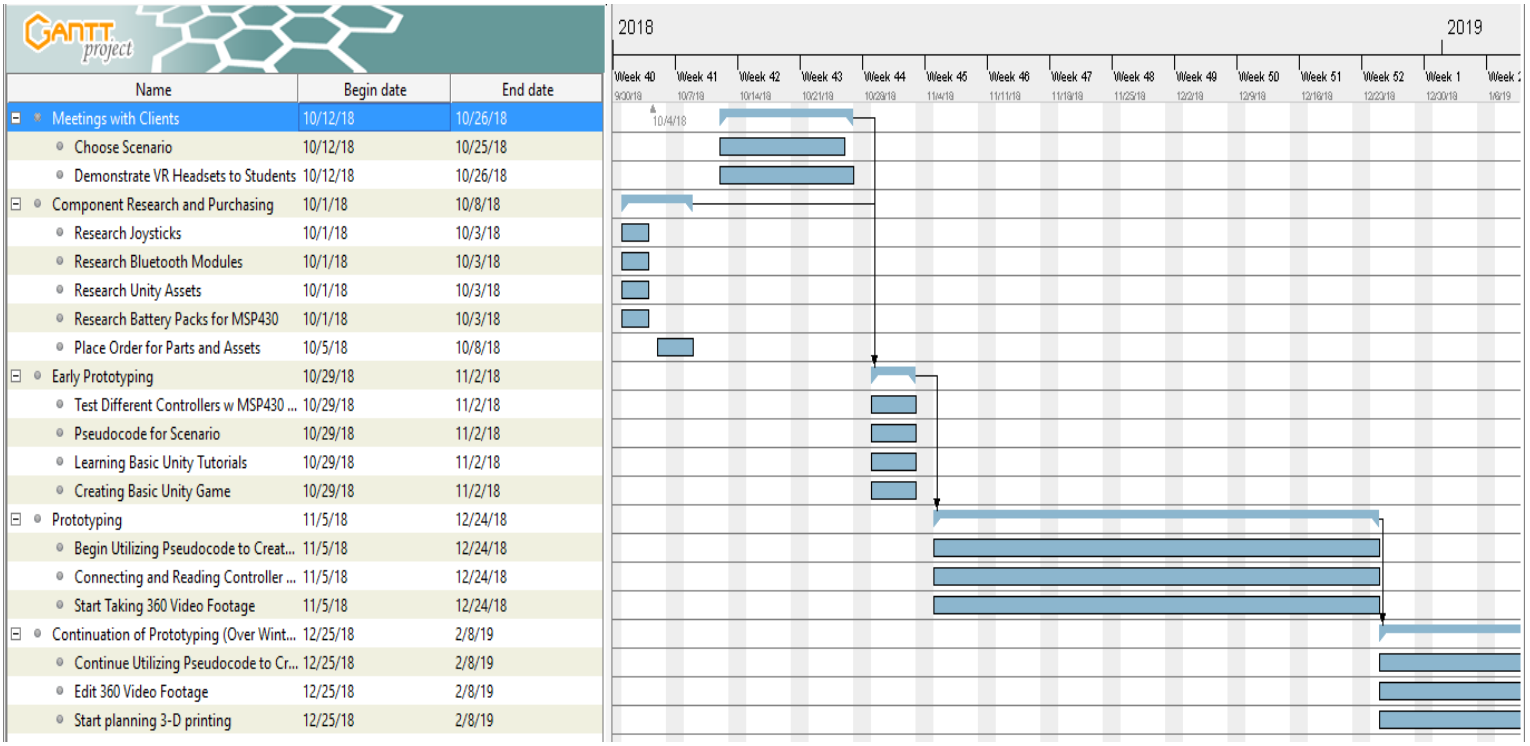
Preliminary Project Plan

List of Tasks

ECE 492 Tasks

- · Component Research and Purchasing (10/01/18-10/10/2018)
    - Research Joysticks — Caitlin, Gerald, Melanie
    - Research Bluetooth Modules — Caitlin, Gerald, Melanie
    - Research Unity Assets — Caitlin, Gerald, Melanie
    - Research Battery Packs for MSP430 — Caitlin, Gerald, Melanie
    - Research 360° Video Technologies — Mara, Coralia and Marcela
    - Research 360° Video in Unity — Mara, Coralia and Marcela
    - Purchase Components — Caitlin
- Meeting with Clients (10/12/2018-10/19/2018)
    - Meeting Mason LIFE students and trying different headsets and controllers (Starting Experiment One) — Coralia, Mara, Marcela
    - Discussion with Mason LIFE staff to pick scenario implemented — Everyone
- Early Prototyping and Learning (10/10/2018-11/02/2018)
    - Test Different Controllers with MSP430 and Bluetooth — Caitlin, Melanie
    - Pseudocode for Scenario — Coralia, Mara, Marcela
    - Learning Basic Unity Tutorials — Gerald, Coralia, Melanie
    - Creating basic Unity game which accepts user input; can later be used for testing with Mason LIFE students — Gerald, Caitlin, Melanie
- · Prototyping (11/03/2018-12/04/2018)
    - Begin Utilizing Pseudocode to Create Game Framework — Gerald, Melanie
    - Connecting and Reading Controller Input in Unity — Caitlin, Melanie
    - Start Taking and Editing 360° Video Footage — Coralia, Mara, Marcela
- · Continuation of Prototyping (Over Winter Break) (12/05/2018-01/21/2019)
    - Continue Utilizing Pseudocode to Create Game — Gerald, Melanie, Caitlin
    - Edit 360° Video Footage for use next semester — Mara, Coralia and Marcela
    - Start planning 3-D printing and PCB — Mara, Coralia and Marcela

Allocation of Responsibilities



Name	Begin date	End date
Meetings with Clients	10/12/18	10/26/18
Choose Scenario	10/12/18	10/25/18
Demonstrate VR Headsets to Students	10/12/18	10/26/18
Component Research and Purchasing	10/1/18	10/8/18
Research Joysticks	10/1/18	10/3/18
Research Bluetooth Modules	10/1/18	10/3/18
Research Unity Assets	10/1/18	10/3/18
Research Battery Packs for MSP430	10/1/18	10/3/18
Place Order for Parts and Assets	10/5/18	10/8/18
Early Prototyping	10/29/18	11/2/18
Test Different Controllers w MSP430 ...	10/29/18	11/2/18
Pseudocode for Scenario	10/29/18	11/2/18
Learning Basic Unity Tutorials	10/29/18	11/2/18
Creating Basic Unity Game	10/29/18	11/2/18
Prototyping	11/5/18	12/24/18
Begin Utilizing Pseudocode to Creat...	11/5/18	12/24/18
Connecting and Reading Controller ...	11/5/18	12/24/18
Start Taking 360 Video Footage	11/5/18	12/24/18
Continuation of Prototyping (Over Wint...	12/25/18	2/8/19
Continue Utilizing Pseudocode to Cr...	12/25/18	2/8/19
Edit 360 Video Footage	12/25/18	2/8/19
Start planning 3-D printing	12/25/18	2/8/19

Potential Problems

Knowledge and Skills to be Learned

Our group will have to learn the following skills:

- Utilizing Unity
    - Learning or brushing up on basic C++
- 360° video filming and editing
- MSP430
    - Two group members have completed ECE 447 and so have had experience with the MSP430. Another member is currently enrolled in ECE 447.

Risk Analysis

The mark of our project's success is the positive reception from Mason LIFE students and faculty. Therefore, the biggest risk to our project's success is being unable to deliver a system that is suitable for Mason LIFE students. For example, if the students in our focus group

become frustrated at the game because it is not responsive, or they cannot understand what the game is prompting them to do, our project will be less successful.

An additional concern is that our project may be accessible and usable by Mason LIFE students, but there is no marked improvement in student scores over time. If students' scores do not increase, it may indicate that the game itself is not teaching students or is not evaluating them in a meaningful way. Clearly, the provided game evaluation to faculty is as important as students learning from the game.

Since Virtual Reality applications are not widely used in special education programs, our project is exploratory in nature and even some degree of failure can be useful to future groups who desire to create similar games. Even though there is some risk involved, our project has the potential to explore a new application of assistive technology.

References

[1] Afia, "Current Issues and Opportunities for Individuals Living with IDD," 21 May 2018. [Online]. Available: https://afiahealth.com/current-issues-opportunities-individuals-living-idd/. [Accessed 30 September 2018].

[2] George Mason University, "Overview | Mason LIFE," Helen A. Kellar Institute for Human disAbilities, [Online]. Available: https://masonlife.gmu.edu/overview. [Accessed 27 September 2018].

[3] G. Lorenzo, A. Lledó, G. Arráez-Vera and A. Lorenzo-Lledó, "The application of immersive virtual reality for students," *Education and Information Technologies,* pp. 1-25, 2018.

[4] Floreo Tech, "Floreo Tech - Learning Modules," September 2018. [Online]. Available: https://floreotech.com/. [Accessed 29 September 2018].

[5] M. J. Smith, E. J. Ginger, M. Wright, K. Wright, L. B. Humm, D. Olsen, M. D. Bell and M. F. Fleming, "Virtual Reality Job Interview Training for Individuals With," *The Journal of Nervous and Mental Disease,* vol. 202, no. 9, pp. 659-667, 2014.

[6] National Autism Resources, "Social Skills," [Online]. Available: https://www.nationalautismresources.com/social-skills/. [Accessed 30 September 2018].

[7] Brain Power, LLC, "Empowered Brain™ by Brain Power™," 01 October 2018. [Online]. Available: http://www.brain-power.com/autism/.

[8] Virtual Reality Aids, Inc., *Video Enhanced VR for Teaching Restaurant,* Virtual Reality Aids, Inc., 2005.

[9] *Virtual Reality: A Possible Social Skills Intervention for Students with Autism.* [Film]. Arkansas State University, 2017.

[10] Autism Society, "Social/Relationships - Autism Society," [Online]. Available: http://www.autism-society.org/living-with-autism/autism-through-the-lifespan/adulthood/socialrelationships/. [Accessed 27 September 2018].

[11] Autism Speaks, "Social Skills and Autism," [Online]. Available: https://www.autismspeaks.org/social-skills-and-autism. [Accessed 27 September 2018].

[12] T. Jeffs, "Virtual Reality and Special Need," *THEMES IN SCIENCE AND TECHNOLOGY EDUCATION*, pp. pp. 253-268, 2009.

[13] V. Dekker, M. H. Nauta, E. J. Mulder and A. de Bildt, "A randomized controlled study of a social skills training for preadolescent children with autism spectrum disorders: generalization of skills by training parents and teachers?," *BMC Psychiatry,* vol. 14, no. 189, 2014.

[14] A. Pandey, "6 Killer Examples Of Gamification In eLearning," eLearning Industry, October 6 2015. [Online]. Available: https://elearningindustry.com/6-killer-examples-gamification-in-elearning. [Accessed 2018 01 10].

[15] Tecla, "Introduction to 7 Common Adaptive Switches," 03 October 2017. [Online]. Available: https://gettecla.com/blogs/news/introduction-to-assistive-switches. [Accessed 30 September 2018].

[16] Eliot & Associates, "Guidelines for Conducting a Focus Group," 2005. [Online]. Available: https://datainnovationproject.org/wp-content/uploads/2017/04/4_How_to_Conduct_a_Focus_Group-2-1.pdf. [Accessed 27 September 2018].

[17] Center for Innovation in Researching and Teaching, "Effective Focus Group Questions," [Online]. Available: https://cirt.gcu.edu/research/developmentresources/research_ready/focus_groups/effective_questions. [Accessed 29 September 2018].