Open-door learning: A new potential form of learning to help those who can't afford or go to school.

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Abstract:

Often overlooked, education can make or change a person's quality of life. Yet, most do not consider the lack of education as a problem. New York City's school system is not fully accessible for two-thirds of people with physical disabilities (JORGENSEN, 2023). Moreover, 95 Percent of Low-Income Students Cannot Afford College (Bidwell, 2017). To reduce the lack of students not attending school because of financial and physical barriers, this project proposes making use of the 85% of people who own smartphones in America and Google Cardboard to create a virtual learning environment (Pew Research Center, 2021). The software will be an app that uses Unity and Blender to create a multi-platform classroom. Unity is a game engine that partners with Google Cardboard to bring realistic games. Google provided a Cardboard SDK mainly to support Google Cardboard in Unity, which can take advantage of the lens to make the user's experience more realistic with virtual reality (Google, 2021). Blender is a 3-dimensional modeling software; I can use the program to create 3-dimensional objects to place around the classroom (Blender, 2020). The teacher will have free reign to customize everything in the classroom: theme, ambient noise, resources accessible for students, and most importantly the board to any slide show or papers. Through this, physically challenged students and impoverished students may learn in an environment mimicking actual classrooms, providing a cost-effective and safe solution.

The present technology and innovations:

Back in 2019, Covid-19 started to rampage our society. This caused a chain reaction in schools, which led to many students having their education stalled or canceled. To adjust, many educators had to vigorously adapt to new software and transport all their learning material into the digital world(Photopoulos, Tsonos, Stavrakas & Triantis, 2022). The software most teachers relied on was Zoom. However, it had a fatal flaw, and that was that students didn't interact like a normal school, which caused students to stay muted and have their cameras off, which caused "Zoom fatigue". As documented, 91.76% of people face a degrading attention span as time goes on (Nesher Shoshan & Wehrt, 2022).

Alternatives to this type of virtual learning, like self-learning, have been preached as a solution, which also creates affordable education and accommodates the physically challenged. However, synchronous learning platforms like Zoom were found to be more effective than asynchronous learning like self-learning because of the teacher's presence (Zhang, Chang, & Mercado, 2022). My solution to this major problem is an app that utilizes Google Cardboard to create an interactive virtual classroom. Unlike Zoom, Students will be obligated to respond because there is no way to hide from the presence of the teacher, who can see the actions of each student. Similarly to asynchronous learning, it will be affordable because most people only have to buy the Google cardboard item or they can just make one using recyclable materials. All this culminated in the creation of a novel, affordable education tool. Not only that, but, this app will make it so students can interact with the screen, creating an answer through a looking system. This solution is in response to Google Cardboard not having any way to exhibit inputs besides in terms of vision.

My proposal is already feasible because of the nature of how Unity is a game engine, meaning it is proficient at pumping out multiplayer-interactive games. Not only that, but I used Unity for 2 years and Blender for 4 years, meaning the game and models used for the classroom will be top-tier and imitate the realistic nature of life.

Logistics of a virtual learning environment:

For this project proposal to be implemented, I will use Unity and Blender. Using the cardboard SDK library provided by Google and Blender's multifaceted capabilities for creating 3-dimensional models, I will create a functional classroom environment that helps students with physical disabilities and students who are impoverished. To be more in-depth, the project will start with an empty unity project. Then, I will configure the Google SDK using c#Unity's programming language. Then, I will test each implementation of the classroom, such as look interaction, starting screen to engage, 3-dimensional audio, multiplayer, theme changes, customization, and creation of lesson plans with slide shows and images. I will also make models using Blender just like Figure 3 below.

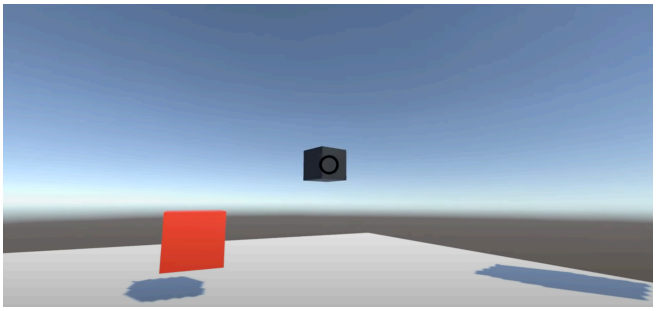

Figure 1 shows how looking at an object can interact with it, using crosshair enlargement to indicate interaction.

Figure 2 shows an example of a main menu that uses look interaction

Figure 3 shows an example of a 3D model created with Blender

This project will bring out a new frontier to education by removing the need to go to a school and making it accessible and cheap to all. I will make this app that can help schools create a learning environment for their students who can not get access to teachers. To use the app, however, a smartphone with a screen size of 4.5-6 inches is required and the software has to be an Android 5.0+ or iOS 12.1+ smartphone with gyroscope. To actualize this I have listed the problems required below

1. **Acquiring the models needed to switch themes and even player avatars:**

   I will need to spend a few months to create some models for this and I am positive that I can do so. However, to speed up the process, I might need to hire someone who can create a few models for this project.

2. **Lack of reach:**

   I need enough money to afford to publish the game to both the Google App Store and Apple Store to make them accessible to all. To do so, I have to allocate some of the budget to publishing.

3. **Lack of Testers:**

As I am a student, I may not be able to create all the features that a teacher would want to use, so I will need guidance from the MIT Think team on what other features I should implement. I also need a group of testers who can make sure there aren't any bugs that can disrupt the user experience.

4. **Danger for eyes:**

   The longer your screen time is, the larger the chance you may develop miosis in your eye, which can cause loss of vision (Lanca & Saw, 2020).

5. **Disregard of the application:**

   Even if my application is known, it can be disregarded by most as just another Zoom. They may not understand the real practical usage or viability of the application until used.

I also thought up some solutions to potential problems I may face that can slow the project down:

1. Due to the huge time commitment and focus needed to create an abundant amount of 3-dimensional models to create diversity, it will place strain on me, and to solve this I can hire people from Sketchfab to create models to relieve my workload.
2. A big risk is a lack of money because if I don't have money to publish the game or hire anyone to help increase the reach of the game, it will stay undetected and unknown, which will cause the application to be disregarded. To mitigate the cost, I will have to start posting videos on social media to garner attention or maybe even try finding investors who see potential in supporting this idea.
3. If I have a lack of testers, then I may be able to create an open demonstration at the school fair or a public fair to get testers. I will also have to ask teachers that I know personally if they would be willing to review my application. Getting adult guidance and

reviews from the target audience can help me refine the technology to be more suitable or easier to use.

4. To reduce the impact of eye strain, I will be using real-time adaptive blur to reduce the effects of stereoscopic vision, which is inherently found inside the Google Cardboard in the lens (Leroy, Fuchs & Morea, 2012).

Future timeline:

1. 2/20/24: Creating a default classroom in Blender. The classroom will have a smartboard mimicking a real classroom and have seats windows and doors that stand as decoration to imitate a normal classroom.
2. 3/10/24: Creating a main menu with room saves, room creation, an input button for a code, and an accept and deny list to make sure it is their student.
3. 4/30/24: Implement an imaging system to adjust how the images will be displayed on the board and a quiz-making system to create interactive quizzes with the look interaction system.
4. 5/10/24: Fixing any bugs that appear and getting insight from MIT Think and other teachers. Then publish an open-sourced version on Git Hub.
5. 5/28/24: Creating a way to import textbooks and worksheets to appear on the table of the students, make that interactive too, and track the scores to see what could be done better.
6. 7/30/24: Finish at least 4 different themes for the classroom, 10 different ambient sounds, 20 hair types, 20 different shirts and pants, and a way to save data to an account.
7. 8/15/24: Fix all bugs that may occur
8. 9/30/24: Publish the app in the App Store and Google Play Store. Then publishing an open-sourced version on GitHub

9. 9/31/24: Email and talk to a few teachers and schools to see if they are interested in getting a demonstration of the technology or if they can implement it inside their system.

I have already finished the look interaction system as shown in figure 1 and 2. It has been captivating seeing how a cheap piece of cardboard with a lens can be used with an average phone to create a platform that can detect both your real-life action but also project it into the virtual world. I have been quite bewildered by the possibilities Google Cardboard presents and feel the utmost joy in creating something that can be used to help society. Guidance and help from Mit Think is what makes the proposal possible and I am grateful for the opportunity. The budget allocated to me will serve to speed up the process and promote the utilization of the app. Most importantly, the guidance on the proposal and product stages will serve as verification for the success of progress. I look forward to working on this topic of advancing education and therefore contributing to the collective of the field of virtual reality and science through this proposal.

Item	Amount	Cost	Link
VR Glasses Cardboard	1	$12.90	https://bit.ly/3TQ1iQV
App Store publishing	1	$99 a year	https://apple.co/3vkEbDF
Android Store Publishing License	1	$25	https://bit.ly/3tFQs5d
3-dimensional models	As many as needed (10)	$0-$100	https://Sketchfab.com
Teacher(Demonstrator) for demonstration	1	$10-$50	https://www.fiverr.com/

Personal Experience & Interest:

Ever since I was 10 years old, I have wanted to work with vision technology. I remember going to Best Buy with my dad and I saw a virtual reality headset with a phone slot, so I asked

my dad to buy it for me. Afterward, I came home with the headset and used it to watch a YouTube video of a roller coaster, which scared me. This changed the course of my life as I found that the application of this technology can bring new experiences without leaving the comforts of your own home. Over the years, I started to pour all my attention into creating games to imitate realism. Ever since then, I've been enamored by the wonder and accessibility of the virtual reality headset. I learned how to use Roblox Studio, Unity, Blender, and Zbrush. All online software can help aid me in creating games that I feel passionate about Role-playing games similar to Runescape.

Then in my sophomore year of high school, I signed up for the Regeneron class as I heard it was difficult. Through this, I was introduced to Research competitions such as the Toshiba Innovation Competition and Samsung Proposal Competition. Throughout the whole month of October, I focused on finding my passion. Soon enough, I remembered liking virtual reality and having the experience of creating applications tailored to the virtual world. For the Toshiba innovation project, I submitted an idea combining virtual reality with a virtual atmosphere that would be akin to walking on a beach. Although it flopped because the goal was too vague, I gained experience, learning how to create a walking system based on just looking and learning how to better engage the user in mimicking realism. I made the program using C# and 3 3-dimensional models made from Blender. Preparing for my future in college, I wanna show everyone that there is a better way to teach students, a more affordable and accommodating solution. I don't want people to be restricted by their social-economic stranding or how they were born to fail, I want everyone to succeed in life through education.

References:

Blender Foundation. (2020). About Blender. Retrieved from https://www.blender.org/about/

Bidwell, A. (2017). Report: Low-Income Students Cannot Afford 95 Percent of Colleges. NASFAA. https://www.nasfaa.org/news-item/11647/Report_Low-Income_Students_Cannot_Afford_95_Percent_of_Colleges

Google. (2021). Getting Started with Google Cardboard SDK for Unity. Retrieved from https://developers.google.com/cardboard/develop/unity/quickstart

Jorgensen, J. (2023). Two-thirds of schools are not fully accessible to those with physical disabilities, report finds. Spectrum News.

Lanca, C., & Saw, S.-M. (2020). The association between digital screen time and myopia: A systematic review. *Ophthalmic Physiol Opt*, 216-229. https://doi.org/10.1111/opo.12657

https://ny1.com/nyc/all-boroughs/education/2023/08/22/two-thirds-of-schools-are-not-fully-accessible-to-those-with-physical-disabilities--report-finds#:~:text=A%20new%20report%20from%20Advocates%20for%20Children%20found%20that%20two,of%20them%20housing%20multiple%20schools

Leroy, L., Fuchs, P., & Moreau, G. (2012). Real-time adaptive blur for reducing eye strain in stereoscopic displays. ACM Transactions on Applied Perception, 9(2), Article No. 9, 1–18. https://doi.org/10.1145/2207216.2207220

Nesher Shoshan, H., & Wehrt, W. (2022). Understanding "Zoom fatigue": A mixed-method approach. Applied Psychology, 71(3), 827–852. https://doi.org/10.1111/apps.12360

Pew Research Center. (2021). Mobile Fact Sheet. Retrieved from https://www.pewresearch.org/internet/fact-sheet/mobile/

Photopoulos, P., Tsonos, C., Stavrakas, I., & Triantis, D. (2022). Remote and In-Person Learning: Utility Versus Social Experience.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9769479/#:~:text=The%20transition%20from%20onsite%20to,was%20happening%20all%20the%20time.

Zhang, R., Chang Bi, N., & Mercado, T. (2022). Do Zoom meetings really help? A comparative analysis of synchronous and asynchronous online learning during the Covid-19 pandemic. Journal of Computer Assisted Learning, Epub ahead of print. https://doi.org/10.1111/jcal.12740