**VR & AR Critical Evaluation**

Introduction

This document focuses on the development and design theory of the virtual and augmented reality experiences created to educate youths on some parts of the world that aren’t as prominent to everyday life. The project aims to educate users aged 11-16 on the Antarctic and arctic regions, and how the environment is affected by humans. It is important to educate the youth on how their future actions can either help or detriment such a large part of the world. In modern society, most people contribute to global warming by adding greenhouse gases such as carbon dioxide, methane, and nitrous oxide (Department for Environment, 2022) to the atmosphere which traps heat from the sun, eventually melting the ice.

The project was developed in the Unity Engine, following what was presented in lectures, and designed to function on a mobile device, using Vuforia for the AR project, and google cardboard for the VR project. 3D models and materials were created in 3ds max.

Design

Inspiration:

The project was inspired by “Greenland Melting” which focuses on the environmental effects of climate change in Greenland, and “Never Alone” which depicts climate change and different traditions within indigenous arctic communities through a concise story with interesting characters and narrative.

Breakdown:

The player will play as a character that has travelled from overseas into the arctic to observe the state of the wildlife and environment and analyse the effects of climate change on the ecosystem. Users retain information better if it is presented in an engaging and memorable way (Gupta, 2022), which is why the use of VR and AR technology is crucial for this project. The use of VR and AR provides a new and fascinating way to consume media which will hopefully result in more awareness and care towards the parts of the world which tend to go under the radar.

Both projects will aim to play on a mobile phone as this is the most intuitive way to utilise the AR and VR elements via the built-in camera, accelerometer, and gyroscope which allows the device to detect when it is being rotated or moved. Since the users will be constantly interacting with the game, the developer made the assets consistent and relevant to the environment and message that is being portrayed.

**Development**

Augmented Reality:

The AR experience will be delivered through a mobile device. Players will scan the following poster to have the interactive elements show, and they will press the model that pops up to reveal a text box which has information on that subject.

A group of cartoon animals

Description automatically generated

The poster was designed for augmented tracking and was uploaded to Vuforia engine which allowed it to be readable by the camera and interacted with. Using high contrast colours and sharp edges makes each image distinct and separated enough so that Vuforia wouldn’t have any problems with clashing image targets. All models were created in 3ds max and assembled in Unity 3D. The player can scan a specific part of the poster which causes text to show up that describes the effect of climate change on that specific object.

Virtual Reality:

This VR experience focuses on how climate change has affected different elements of life in the arctic. This experience will be played through a first-person camera that can teleport between set points that allow the player to interact with different objects in the world. Unlike the AR project, this is much more immersive for the player as they get to explore an entire environment which creates a more impactful experience.

**Evaluation**

Although virtual reality experiences started in the early-mid 1990s (Cross, n.d.), only in recent years has it become a prominent part of the gaming and education industry. The use of an augmented or virtual reality experience can increase the retention and consumption of information in young people drastically as it provides a much more engaging learning environment rather than sitting in a classroom listening to the information.

Pros:

Both VR and AR can provide scenarios and experiences that cannot be achieved from any other source such as the seeing the effects of climate change on the arctic or exploring a historical building that no longer exists. VR and AR technologies can formulate simulations that replicate real-world locations or concepts in a safe and low-risk environment, like exploring the arctic without having to travel there or worry about any dangers that might be occur there.

These technologies can also provide a more tailored experience by increasing or decreasing the difficulty depending on the students progress as an individual and give personalised feedback for each student. Creating gamified learning environments is much more fun and interesting as its much more like what they would do with their spare time, this would increase the attention span or each student exponentially leading to a more positive and beneficial learning environment (Ed.D, 2023).

AR technology enhances the real world by adding digital information to the surroundings allowing pre-existing learning material to also be enhanced and be utilised in a new, fresh, and exciting way. On the other hand, VR technology creates a wholly new immersive experience for the learner which can help if the student is a unique learner and struggles to take in new information through conventional means (www.linkedin.com, n.d.).

Cons:

One of the biggest challenges that companies face when implementing these technologies is the cost of the equipment, although it is a very useful tool to use when trying to educate a group of 11–16-year-olds, it is still a big financial decision and not all companies can afford to implement that into their curriculum especially and Oculus Rift or Sony VR headsets. Similarly, there are a lot of requirements and that need to be met to have a functioning experience, for example, the student must have a mobile phone or at least be provided with one. In the case of this project, the user must have an android phone otherwise the game isn’t playable. Another challenge is that creating an engaging and unique VR or AR experience requires specialist skills and a deep understanding of how the medium works and how to reach its full potential.

Furthermore, it is possible that some students with special learning needs cannot consume media through these technologies, if the student has visual impairments, then they cannot use the VR headset, or if the student has hearing impairments, then they may not be able to pick up on AR experiences that rely on audio cues.

The implementation of VR and AR technologies would require a specialist member of the team that can create the experiences and troubleshoot any problems that arise. It also tends to consume a considerable amount of processing power and bandwidth meaning that the company must accommodate this which further the cost of the equipment. (Ed.D, 2023)

Solutions:

Other alternatives to the Sony headsets or Oculus Rifts are Google cardboard and Goji cardboard headsets which are much more affordable, the students can assemble the headsets themselves and can take it anywhere they like. They are less interactive than the more expensive options, but they are more accessible to companies and students alike. To help overcome the skill and knowledge barrier, secondary schools can provide different resources to teachers to help them improve their knowledge on how to create and implement these experiences effectively into the curriculum, this would decrease the need for a specialised team to set up and troubleshoot any errors that occur because the educators could do it themselves. It is important teachers consider each students learning style and ability and encourage regular feedback on how they are receiving the information so that they can refine and improve the learning material for each student (Hsin-Kai Wu, Silvia Wen-Yu Lee, Hsin-Yi Chang, Jyh-Chong Liang, 2013).

**Conclusion**

In summary, secondary schools should be looking to implement augmented and virtual reality aspects into their learning system with cost effectiveness and accessibility in mind to allow students to take in new information in a more varied and interesting way. Educators should also look into researching and developing their own knowledge of these technologies so that they can better teach the material to the students. By understanding the benefits that VR and AR bring to education, schools around the world can enhance their learning environments by creating fun and interactive learning experiences for young pupils that are already familiar with technology to begin with.

Knowing that a more interactive learning environment boosts the retention of information, this project would have benefited from more interactive elements, such as, more individual assets that can be interacted with, animation for element that pops up, and possibly have the environment change over time or after the user has interacted with the object.

Bibliography

Cross, A. (n.d.). *Council Post: The Evolution Of Virtual Reality: Exploring The Past, Present And Future*. [online] Forbes. Available at: https://www.forbes.com/sites/forbesbusinesscouncil/2023/11/09/the-evolution-of-virtual-reality-exploring-the-past-present-and-future/#:~:text=In%20the%201980s%20and%201990s.

Department for Environment, F. and R.A. (Defra) webmaster@defra gsi gov uk (2022). *Overview of Greenhouse Gases - Defra, UK*. [online] naei.beis.gov.uk. Available at: <https://naei.beis.gov.uk/overview/ghg-overview>.

Ed.D, J.E. (2023). *Immersive Learning: How Virtual And Augmented Reality Are Transforming Higher Education*. [online] eLearning Industry. Available at: <https://elearningindustry.com/immersive-learning-how-virtual-and-augmented-reality-transforming-higher-education#:~:text=VR%20and%20AR%20can%20provide%20immersive%20language%20learning%20experiences%2C%20allowing>.

Gupta, D. (2022). *11 Strategies for Improving Learning Retention (2023) | Whatfix*. [online] The Whatfix Blog | Drive Digital Adoption. Available at: <https://whatfix.com/blog/learning-retention/>.

Hsin-Kai Wu, Silvia Wen-Yu Lee, Hsin-Yi Chang, Jyh-Chong Liang (2013), ‘Current status, opportunities and challenges of augmented reality in education’, *Graduate Institute of Science Education, Taiwan.*

www.linkedin.com. (n.d.). *Exploring the Pros and Cons of AR & VR in EduTech*. [online] Available at: https://www.linkedin.com/pulse/exploring-pros-cons-ar-vr-edutech-extern-labs-qq94c#:~:text=AR%20enhances%20the%20real%20world [Accessed 3 Jun. 2024].