Accessibility in XR in Higher Education

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Abstract

With the start of the COVID-19 pandemic and the immediate shutdowns that had to occur, schools and corporations were left with limited options when it came to social interactions and proper facilitation of education and training. With the rise of technology and its enhancements over the last 20-30 years, people are looking for easier ways to improve social interaction while also utilizing technology. XR technology has become one of the most popular rising technologies and higher education institutions are incorporating it into education. This research study is going to explore whether or not XR technology is accessible for students with visual imparities at The University of Tampa. Due to components of Virtual Reality (VR) within the scope of XR technology having to utilize goggles for users to have the ultimate experience, it might not be ideal for anyone with visual imparities. This preliminary study used a mixed-method approach to analyze and collect data. Surveys were sent out to professors, students, and staff members of the FMX, Communications, Recruitment, and Events departments at the University of Tampa, and a small sample of three students and one professor, and one staff member were interviewed. The data collected suggests that regardless of visual imparities, XR technologies are widely found not accessible to many students and faculty members at UT. There is an overall lack of knowledge and specific funding for the technologies needed for students to learn and practice XR technology and for UT to embrace XR and put it into practice for recruitment events.

Problem Statement and Purpose of Study

Our research question will answer whether XR can improve accessibility due to visual imparity. Our exclusion criteria would include the students who are 18 years or older who are participating in our research study and who have not used XR technology or do not know what it is.

Research Question

1. Is XR Technology accessible in higher education for people with visual imparities at The University of Tampa?
2. Could the University of Tampa community be positively or negatively affected by the inclusion of XR in classrooms and recruitment methods if it is not currently utilized?

Literature Review

Due to the recent pandemic that caused global shutdowns, schools, and universities had to turn to different styles of learning that did not require face-to-face participation. The immediate shutdowns showed how unprepared most colleges and universities were for online classes and how to properly handle them but also how inaccessible most programs were. The advancements in video technology (ZOOM, WebEx, Microsoft Teams) showed the potential of being able to learn online through different styles of learning but were limited in accessibility. When schools and universities switched to mandated online learning, a lot of students lost out on the social interaction that comes with being in a school setting. “With the dramatic shift to online learning with the arrival of the COVID-19 pandemic, faculty, staff, and students within

higher education worldwide have made the sudden but necessary initial steps to incorporate technology into the learning environment in ways never imagined. However, forward-thinking administrators are wondering, “what comes next?” Simply shifting lectures to web conferencing is not revolutionary. Declining freshmen US enrollment by 13% has caused major financial instability in higher education budgets" (Smalley, 2020). Administrators face the need to make brave and creative choices. “Administrators also want to insulate their institutions from the negative repercussions of the next major instructional interruption.” (Dodds, 2021, p.4). Not only did students lose out on social interaction, but students also lost out on accessibility to technology, and participation in different subject matters like art, nursing, biology, and chemistry. “Yet, today education matters when individuals talk about computer programming” (Lueck, 2021). Those class subjects can be taught online but there are components of those subjects that are best completed in person.

When it comes to training, medical students have to lose out on a year's worth of hands-on learning that is critical for them to be able to perform in their desired roles. “XR can cause a positive paradigm shift in healthcare education if they continue to implement it with a learner-centric viewpoint instead of a technology-centered one” (Logeswaran, 2021, p. 83). It is also critical for these subjects to have accessibility as we saw with the pandemic limited what students could learn along with what faculty could teach without showing them. “Students, faculty, and staff with disabilities at universities have faced many digital accessibility barriers during the COVID-19 pandemic. While the legal requirements for digital accessibility at universities are clear, the mechanisms for managing digital accessibility are not yet well established” (Lazar,

2022, p.749). In addition, author Ian Hamilton supported Lazar on how people simply are not physically able to wear bulky devices on their heads (Hamilton, 2018). Past research has been done on barriers to XR technologies in students with disabilities in the past. “Urging and highlighting the need for real-world validation, end-user participation, and an explanation of XR-based accessibility aids” (Kasowski, 2022). Scientists continue to conduct studies through the years, finding that “XR developers' lack of awareness of accessibility standards that many may need, neurodivergent individuals go into sensory overload while using XR technologies and have an overall negative experience. They conclude that research is needed to further explain the connections and struggles that neurodivergent individuals have with XR technologies and further improvements are needed for accessibility” (Lukava, 2022).

XR is one of the newest technologies that is being invested in higher education as it can take students out of the classroom but still give them the same hands-on learning experience in a virtual space, which also gives students access to these classes. “The sense of emergency to achieve efficiency of accessibility features in a Virtual Reality (VR) environment is extremely critical” (Teofilo, 2018). The University of Tampa currently offers “virtual tours” of campus for prospective students that are simply two-dimensional videos posted to YouTube. There are both auditory and visual components to these online tour videos. Unfortunately, those who are visually impaired are left to only hear vague explanations of the campus tour in only the English language. As technology has advanced, old practices such as virtual tours may need to be revamped with a three-dimensional component to really give prospective students a better feel for campus life without having to step foot in a classroom. Paired with audio

explanations of the campus tour, a virtual reality experience for students to explore campus without physically being there will give a more realistic experience. This means that often three-dimensional (3D) modeled applications use an unrealistic VE and, therefore, do not provide a full depiction of real-world environments. Panoramas can be used to showcase complicated set-ups that are hard to model and are computationally expensive to view in virtual reality (VR). Yet, utilizing 360° panoramas can provide a low-cost and quick-to-capture alternative with photo-realistic representations of the actual environment.

XR is the umbrella term used to describe Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR). We will be researching the University of Tampa students who are currently in the Film, Animation, and New Media Program (FMX), on whether XR is a tool that can be used for accessibility due to visual imparity and see if it can be used in other programs like biology and medicine. It also presents a challenge as to how these technologies would be able to give accessibility with how heavily biology and medicine rely on face-to-face interactions. “The challenges created by replacing physical presence with compulsory remote communication open new possibilities for XR-supported remote collaboration and learning. The present unexpected scenario requires refreshing learned lessons and reviewing what has been successful to cope with the new demands on remote support” (Estrada, 2022, p.774).

Research in XR focuses on key aspects of the technology. Rarely is there work addressing the logistics and practicalities of presenting XR technology to the public outside researchers directly involved with XR.

Having XR technologies, to begin with, art, animation, and film can extend to education, medicine, and biology which would allow for more inclusivity and diversity to be involved in each area of study. “The integration of collaborative e-learning, AR, VR, and MR evolves into Extended Reality (XR), allowing the user to bend reality. Most likely, these will also evolve into Mobile AR and Location-Based VR. Education for Sustainable Development, or Education for Sustainability (EfS), is a process that develops people’s awareness, competence, attitudes, and values, enabling them to be effectively become involved in sustainable development at the local, national, and international levels, and helping them to work towards a more equitable and sustainable future. In particular, it enables people to integrate social and cultural considerations with environmental and economic decision-making” (Bucea-Manea-Ţoniş, 2020, p.1).

Data Collection

In our search for an answer to our research question, we investigated current accessibility and student opinions on extended reality (XR) technologies to answer our research question of whether XR can be used to improve accessibility due to visual imparity.

We sampled from the Film, Animation, and New Media (FMX) and Communications (COM) departments, as well as faculty members from the FMX department, to gather most of our data. We also sampled the staff in the undergraduate recruitment and event planning department to gauge their opinions. The Sample population we were able to gather was 14, who agreed to take a survey, and then we interviewed the 4 people who all consented to a recorded Zoom interview.

Data Analysis

To analyze the data, researchers first examined the cumulated results from the survey. Bar graphs and Pie graphs were used to summarize the information and made it easier to visualize how XR is used in higher education. These statistical graphs and charts were created on the results page of our Google Survey.

Interview Results

When interviewing one of the participants (Participant A), it was fascinating how XR could be utilized in classes every day but isn't because of funding and everyone doesn't have the same phone or tablet device. "The equipment is not there yet, we can use our iPhones or an iPad but not everyone has an iPhone or an iPad so there are still technological limitations and price limitations. If we want to use something like true XR technology like the HoloLens because it's 3,000 dollars or if we want to use the new Meta Quest it's still 1,600 dollars, which is why these technologies are still being used by commercial enterprises". Another interviewed participant (Participant B) showed an understanding of XR but not to the extent that Participant A had. It was interesting to find out that even though both knew more about VR technology, both used AR technology more as it is more readily available on their phone with games, such as *Pokémon GO* Participant B stated, "The games are cheaper and more easily accessible on their phone than VR".

Similarly, when interviewing Participant C–a staff member who works in recruitment and UT events, they had slim background knowledge of XR technologies but understood how the benefits would expand the possibilities of undergraduate recruitment. "If it were affordable and accessible," Participant C explained, "then we

could reach millions and share information and virtual tours of the campus to so many prospective students worldwide." Each year the UT undergraduate population gets 70% of its students from out-of-state, 20% from Florida, and 10% from international. If we had capabilities for potential international and out-of-state students to "visit" campus without all of the expenses of traveling to Tampa, more students would gain an interest in UT and it could potentially help grow our international population.

Comparably, Participant D is a student from the Film, Animation, and New Media (FMX) department who has some experience when it comes to XR technology but does agree that UT has limited accessibility when it comes to XR technology. This student was in high school during the COVID-19 pandemic and utilized XR technology to take "virtual field trips" during their last couple of years of school. When asking this student about XR accessibility, specifically when it comes to how they view students with visual impairments utilizing it, the student thinks that the university is severely lacking resources. This student stated that the university should advertise the services more frequently to students so students know that they have options. This student was passionate about utilizing XR in their studies and hopes that UT can provide this technology to more students in the future. The student stated, "It could be beneficial to any student in any department because it can better their education and help them learn about new perspectives that they might not have had before". This student also stated that since technology is continuing to develop that anyone with visual disabilities should be able to participate in using the technology, hopefully sooner rather than later, since graphics and interfaces are constantly changing.

Participant E, a UT communications student, emphasized the idea of using more of the latest technologies because they heavily use specific tools and equipment related to the projects they work on. Virtual Reality (VR) was one of the main technologies used and stated during the interview. They explained that accessibility and further understanding of XR do not meet their expectations at UT, stating that " With all the good things about VR, there are some drawbacks." Participant E stated that the University of Tampa is always building new spaces to complement the technical aspects needed to support learners and elevate their learning experience.

Discussion/Findings

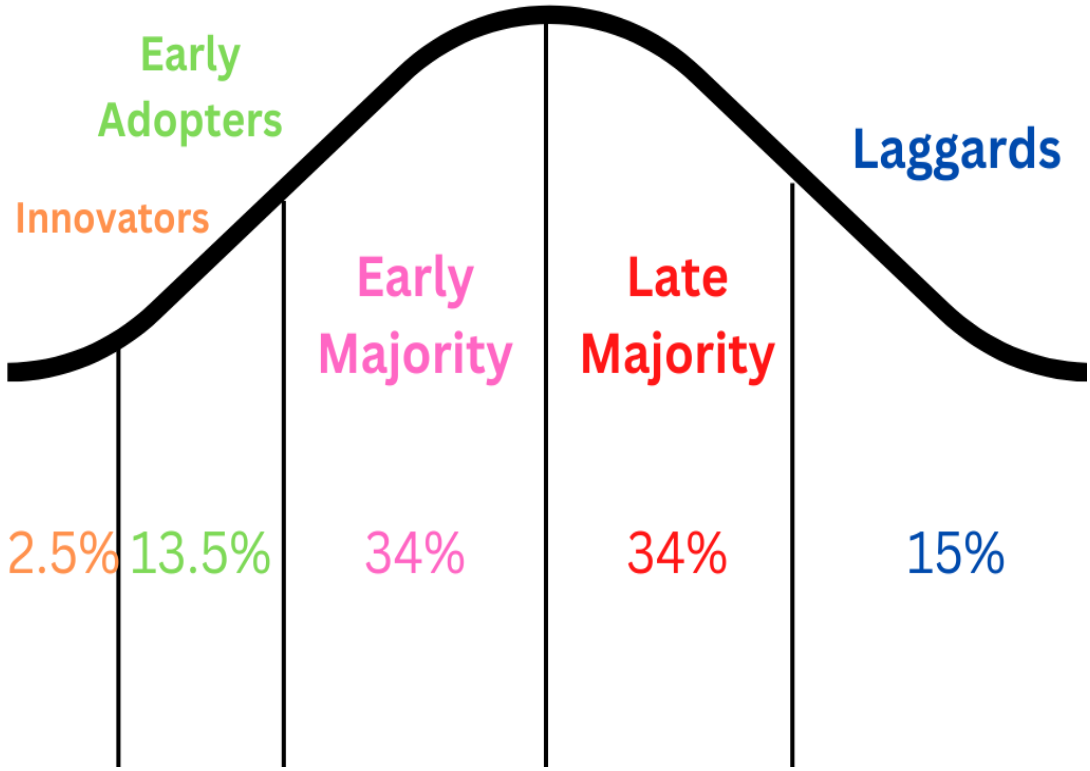
From the data that has been collected from the survey in the researcher's preliminary study, they have found that many staff and faculty have more knowledge about extended reality (XR) technologies in comparison to students. Our research has also shown what XR technology is most well known as and that's Virtual Reality (VR) in comparison to Augmented Reality (AR), and Mixed Reality (MR). This the Oculus Rift and Meta quest are all different types of easily recognizable VR technology. This was also backed by the results gathered from the survey on how XR will promote gestural interfaces and interactions as it is already being implemented through the Oculus Quest Pro and other VR devices as stated by one of the participants interviewed.

There was a group of 14 individuals who are either University of Tampa students, professors, or recruitment professionals who chose to partake in our survey. Even though they all may hold differing positions, titles, and majors at UT, there were many similar trends found in our results through the data that was collected. The majority of

people who took the survey have very low knowledge (somewhat to no idea) of what Extended Reality (XR) means as shown in Figure 1 below. This begins to explain why these technologies are not widely available or accessible at UT, as the majority of students, staff, and faculty surveyed started with minimal understanding and background knowledge of XR. Supporting the findings with “Rogers’s diffusion of innovation model”, stating that knowledge is formed when someone gets exposed to an existing innovation and acquires some understanding about its mechanisms and functions. Therefore, after the discussions, the findings showed that the research proved that the study supports and offers training to spread the concept of how XR could be useful in higher education and more specifically visual impairments.

Figure A

Figure A shows an example of Roger's Diffusion of Innovation Theory (2018.)



Throughout the survey and interview process, we found that the term XR is not as commonly known as one of its components–Virtual Reality (VR.) We also found that the students and faculty agree that XR technology is not fully accessible to individuals with visual imparities and that could be greatly improved. As more high-fidelity XR devices are created and are still in the process of creation, immersive experiences continue to expand their capabilities through the extension of the field of view (FOV), higher device refresh rates, unpopular display definitions as well as more advanced body, face, hand and most important "eye-tracking". Eye tracking works by continuously

measuring the distance between the pupil center and the reflection of the cornea. Measuring the distance changes depending on the angle of the eye and is measured by an infrared light that creates a reflection while cameras record and track the movements.

All these features support the creation of environments with real-life levels of realism, which will lead to further improvement in visual impairments. For example, the latest hardware developments amongst which are Varjo XR-3, Pico Neo 3 Pro Eye, HTC Vive Focus 3, and Pimax's 12K QLED VR will initiate new opportunities to support visual impairments in XR that will support learners in their educational journey. These high-technology tools are built-in eye tracking and foveated rendering and counterweight design.

Figure 1

The range is from 1 - 5, the number 5 being "I could teach someone all about XR" and 1 is having no idea what XR means.

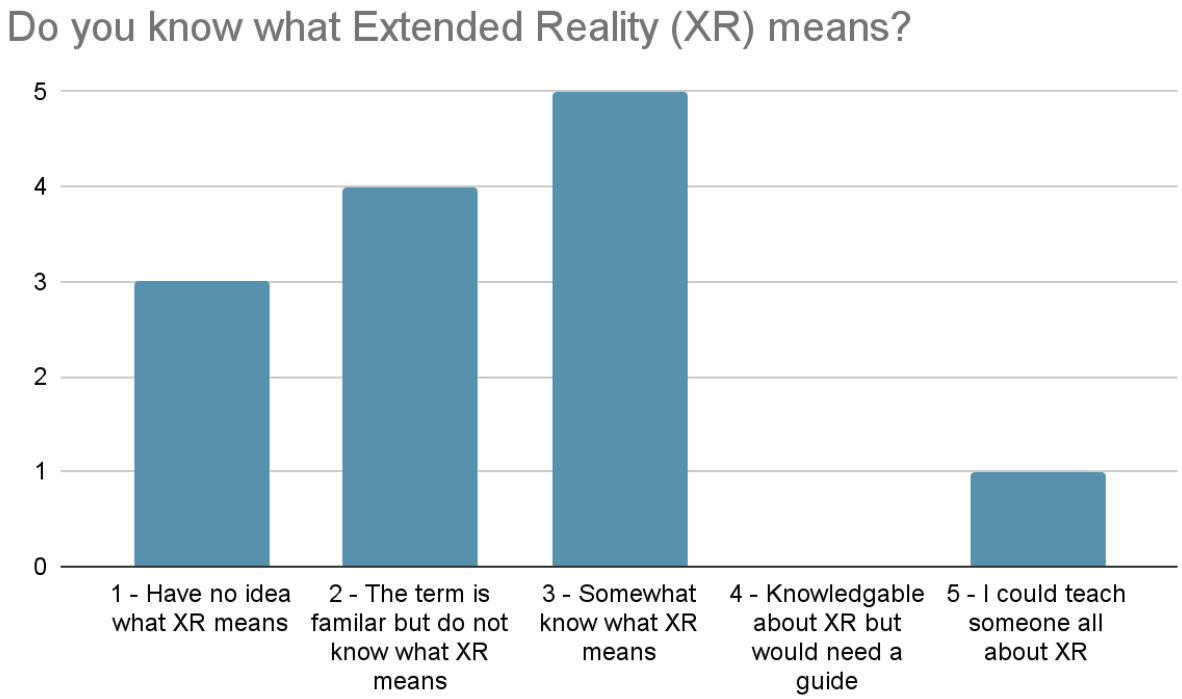


Figure 2

The range is from 1 - 5, the number 5 being "we use XR all the time" and 1 being "we don't use XR ever".

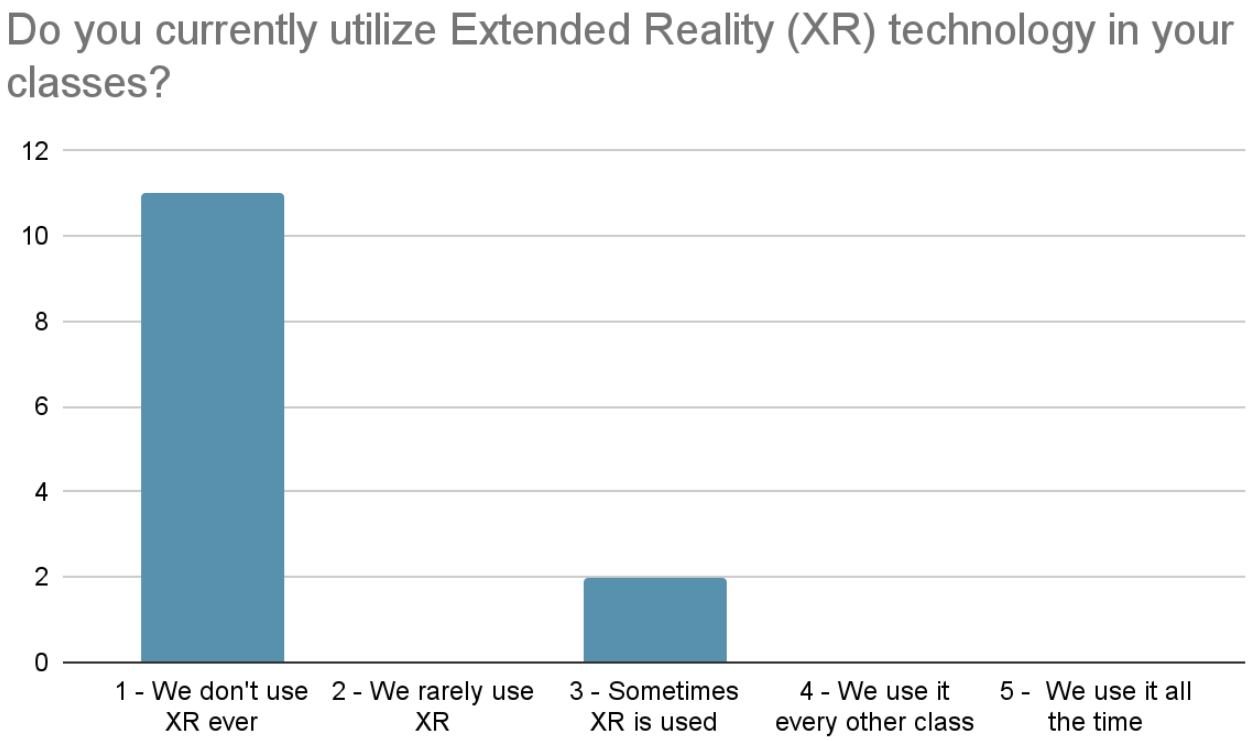
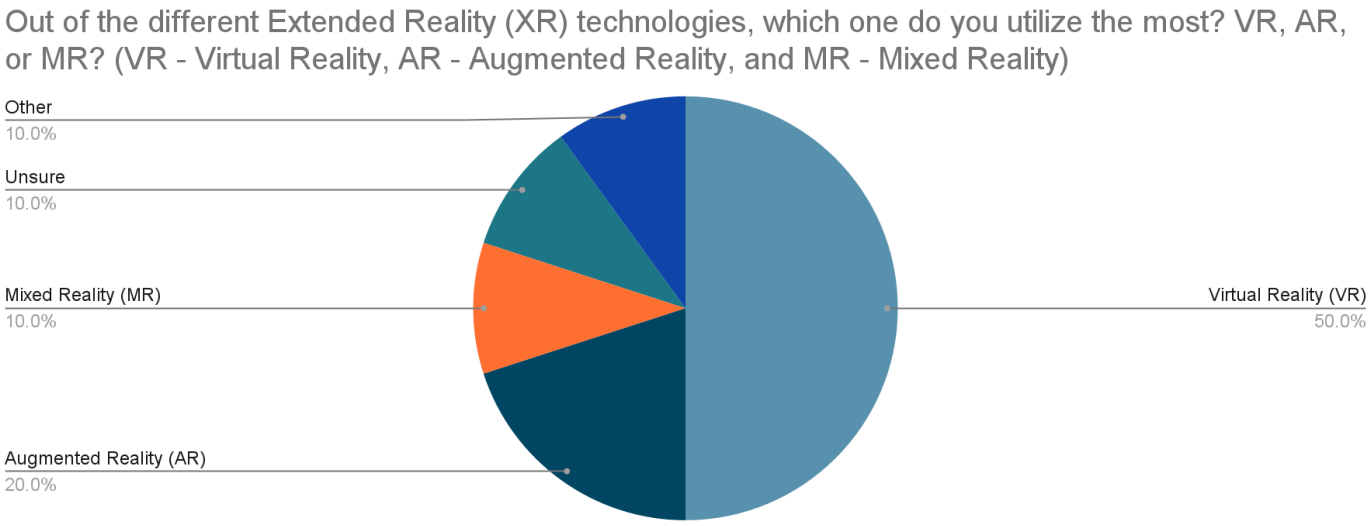


Figure 3 below shows that 50% of the UT community that was surveyed, uses VR the most–we came to the conclusion that VR is the “well-known” and widely popular of the given XR technologies. People associate VR automatically with Oculus headsets and Google cardboard games. If the XR terminologies were more common practice, students would recognize that they use AR almost every day if they have Snapchat and try out different filters.

Figure 3

A Pie Graph of the different Extended Reality (XR) technologies that are utilized most.



Conclusion

In conclusion, our research has shown that extended reality (XR) would be beneficial for students, faculty, and staff to be able to utilize in higher education. However, because of the cost of XR technologies that are needed to be able to have knowledgeable faculty, staff, and students would not be purchased or thought of as important to the University of Tampa. Along with the cost, another issue that needs to be further researched is the equipment itself as many VR headsets can be quite expensive. There is a lack of previous research into visual imparities and how XR technologies can

help bring a better learning environment to them and others with similar disabilities. “Eye-tracked XR simulations of three common conditions that affect visual perception: refractive errors (myopia, hyperopia, and presbyopia), cornea disease, and AMD (wet and dry)... Since some symptoms affect only parts of the visual field, we use eye tracking to implement gaze-dependent effects. Because eye-disease symptoms can vary greatly from one person to another, it was crucial to make the simulations as adjustable as possible to support a wide range of characteristics of the involved symptoms… We introduce the first medically informed AR/VR simulation of common eye diseases using an eye-tracked AR/VR HWD. In addition, we modified our earlier framework to make it easy to extend with further visual impairment simulations, already providing functionality to steer gaze-dependent effects with the eye tracker, seamlessly switch between VR, AR, or 360° image viewing, and expose adjustable parameters to modify the simulation at runtime” (Maeda, 2022, pgs.831-832). This shows that there are many levels of visual imparity that the use of XR technology can help bring a better learning environment to support those with visual disabilities, with new features like eye tracking, and also opens the door for further research into other disabilities to be able to use XR technologies in higher education.

Further research should be into XR technologies as related to disabilities such as muscular dystrophy, epilepsy, hearing impairments, and color blindness to see how these new technologies could open up more equal access to higher education. What these results mean for our research is that there is still a need for further research into XR and what its capabilities are, and how it can better benefit those in higher education. With how technology is rapidly evolving there is a need to be able to change from the

traditional face-to-face classrooms or provide a more inclusive way of interacting with each other if another pandemic happens again.

The University of Tampa isn't utilizing XR technology as the cost mentioned above deters the University from investing further. However, if the University of Tampa would invest in the technology it could potentially open the door to other departments to utilize the technology and not just the film, media, and communication departments. It was determined that the utilization of XR technology in the recruiting and admissions process would greatly benefit staff and prospective students. Technology has advanced with the addition and vastness of XR with virtual tour options possible for potential students. If UT partnered with a VR headset to create a VR students Point of View (POV) tour of campus, that would help increase the number of students that would have access to view campus, especially ones who are not able to make it to Tampa to take a tour. "Specifically, extended reality (XR) is a rapidly advancing technology with direct contributions to our understanding of low vision and an inherent ability to augment residual vision in a useful way… A popular trend for simulated prosthetic vision (SPV) is utilizing novel augmentation strategies to aid scene understanding. One approach is using computer vision to enhance certain image features or regions of interest, at the expense of discarding less important or distracting information. Various studies have explored strategies based on visual saliency, background subtraction and scene retargeting, and depth mapping to highlight nearby obstacles" (Kasowski, 2021, pgs. 3-16). It has already been shown that newly developed hand controls have helped those with disabilities to be able to play video games better, so now with new optical tracking sensors, it is taking settings to create ways to enhance images in the environmental space to create an easier way, for example, to assist with

those that have color blindness to be able to just go to their settings and select what setting they need for viewing.

Limitations

Preferably, this study would have benefited from surveying different students across multiple universities but the research study had limitations due to time and resources. The literature was also limited in what was available in visual accessibility in XR as the technology is ever-changing and developing. In the middle of the semester, one hurricane and one tropical storm hit, causing closures of schools and universities which did not help with our data collection. If surveys were sent out to other universities either across the country or in the State of Florida, they might have yielded more results which would have enhanced the reliability and validity of this study. Ideally, the study would have also benefited from gathering data across different departments at the University of Tampa, but the study was limited due to lack of access to students and professors in departments that weren't FMX or COM. This study was limited to the student body and staff at The University of Tampa to try and gauge where XR is currently used on campus if students and staff are aware of its capabilities, and if it is found accessible to students, and to the UT community with visual disabilities. Because our research is limited to one private university; we cannot say our data is the standard for other universities. Although accessibility might be prioritized more at a public or for-profit University, the researchers did not have the scope to evaluate this on a larger scale. There is room for further research and comparing the UT results to other universities nationwide.

Ethical Considerations

Participants were notified of the objectives, scope, and sequence of the research study and that their participation in this research study is purely voluntary, the subjects were free to click off the survey, skip questions, or end interviews at any time. Surveys were anonymously returned and the participants that were interviewed have not been named. To not interfere with students, faculty, and staff work all interviews were done outside of working hours, or upon agreed times by the students, faculty, and staff. All the applicable guidelines set forth by the Institutional Review Board were honored in order to protect the privacy of the participants and the objectivity of this study.

Suggestions for Further Research

Due to the limited timeline that was available to conduct this research study, we suggest future research into how XR could help with other disabilities, and how it could be made better accessible in terms of obtaining the technology for those in higher education. Also, future research is needed in a larger variety of educational settings to see if and how educators and institutions utilize XR technology and if it is inclusive to those with disabilities. Our research is specific to UT–a private, medium-sized, not-for-profit University–the researchers were limited to this scope but eager future research expanding upon this may unfold.

References

Bucea-Manea-Ţoniş, R., Bucea-Manea-Ţoniş, R., Simion, V. E., Ilic, D., Braicu, C., & Manea, N. (2020). Sustainability in higher education: The relationship between work-life balance and XR E-Learning facilities. *Sustainability, 12(14), 5872*. http://dx.doi.org/10.3390/su12145872

Dodds, H. (2021). Immersive learning environments: designing XR into higher education. *A Practitioner's Guide to Instructional Design in Higher Education.* https://edtechbooks.org/id_highered/immersive_learning

Estrada, J., Forland, E. (2022). Running an XR lab in the context of COVID-19 pandemic: Lessons learned from a Norwegian university. *Education and Information Technologies, 27.* https://link.springer.com/article/10.1007/s10639-021-10446-x

Hamilton, I. (2018). A Practitioner Reflection on Accessibility in Virtual Reality Environments.*The Computer Games Journal* volume 7, https://doi.org/10.1007/s40869-018-0061-z

Kasowski, J., Johnson, B., Neydavood, R., Akkaraju, A., Beyeler, M. (2022). A Systematic Review of Extended Reality (XR) for Understanding and Augmenting Vision Loss. *Human-Computer Interaction, volume 2. arXiv:2109.04995*

Lazar, J. (2022). Managing digital accessibility at universities during the COVID-19 pandemic. *Univ Access Inf Soc* 21, 749–765. https://doi.org/10.1007/s10209-021-00792-5

Logeswaran, A., Munsch, C., Chong, Y. J., Ralph, N., & McCrossnan, J. (2021). The role of extended reality technology in healthcare education: Towards a learner-centered approach. *Future healthcare journal*, *8*(1), e79–e84. https://doi.org/10.7861/fhj.2020-0112

Lueck, A., Bachen, C. (2021). Composing (with/in) extended reality: How students name their experiences with immersive technologies. *Computers and Composition, 62.* https://doi.org/10.1016/j.compcom.2021.102679

Lukava, T., Ramirez, D. Z. M., Barbareschi, G. (2022). Two sides of the same coin: accessibility practices and neurodivergent users' experience of extended reality. *Journal of Enabling Technologies*, 10.1108/JET-03-2022-0025.

Maeda, K., Aoyama, K., Watanabe, M., Hirose, M., Ito, K., Amemiya, T. "VisionPainter: Authoring Experience of Visual Impairment in Virtual Reality", *Human Interface and the Management of Information: Applications in Complex Technological Environments*, *vol.13306, pp.280, 2022*. https://ieeexplore.ieee.org/abstract/document/9090438/citations#citations

Teofilo, M., Lucena, V., Nascimento, J., Miyagawa, T., Maciel, F. (2018). Evaluating accessibility features designed for virtual reality context. *IEEE International Conference on Consumer Electronics (ICCE)*. https://ieeexplore.ieee.org/abstract/document/8326167/authors#authors

Appendices

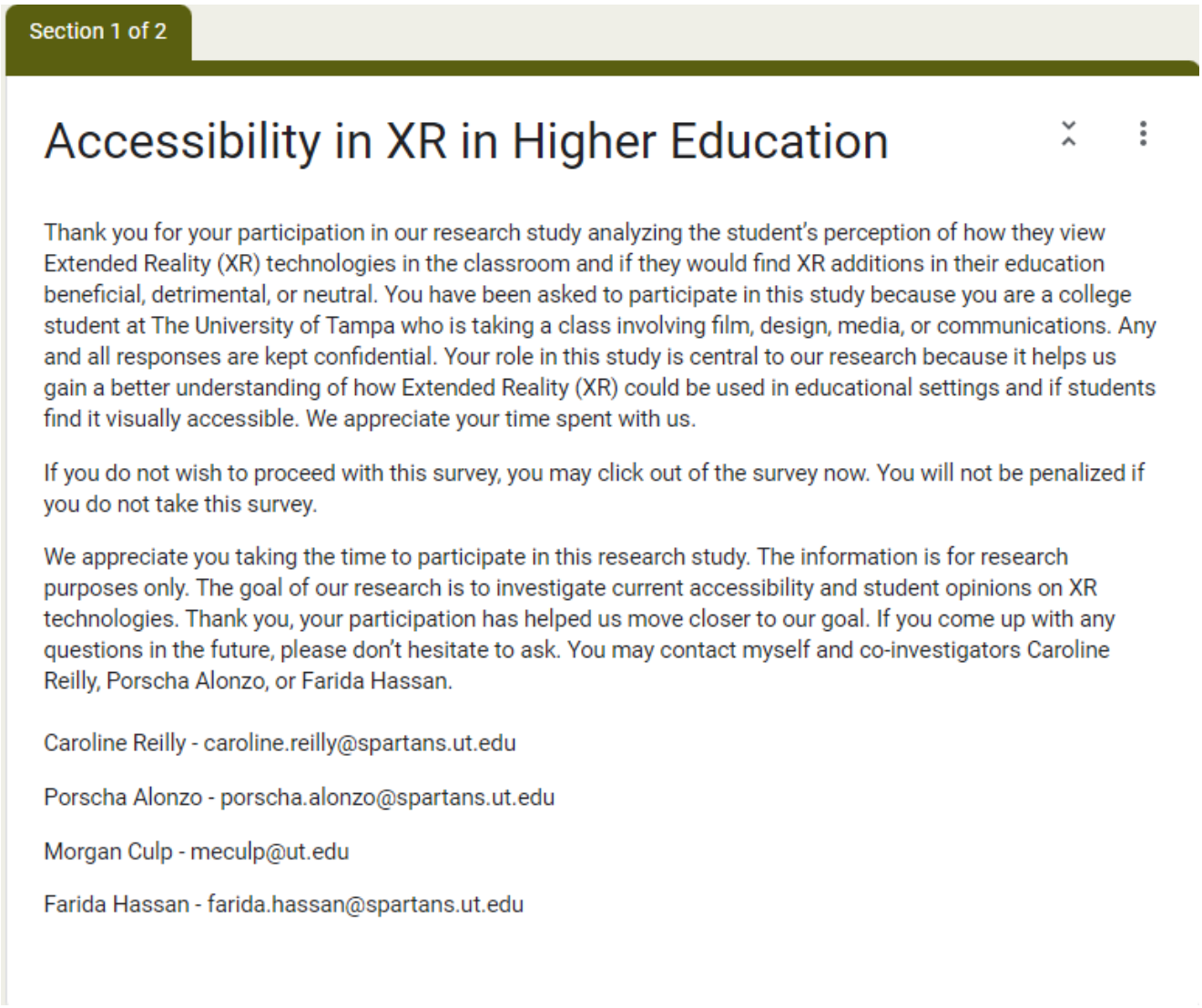
Appendix 1- Summary of the Interview Questions and Responses

Questions	**Responses**
Do you know what Extended Reality (XR) Means?	The responses were graded on a scale of 1-5 where 3 people rated their knowledge at a 1, 5 people rated their knowledge at a 2, 5 people rated their knowledge at a 3, and one person rated their knowledge at a 5.
What is Extended Reality (XR) used for? Please explain.	Out of the short answer responses, the general consensus of the surveyees

	knows what XR is used for. Some examples that were listed were for gaming, education, and how it's a more realistic approach to virtual reality.
Do you currently utilize Extended Reality (XR) technology in your classes?	The responses were graded on a scale of 1-5 where 1 would be no XR technology is used in class and 5 would be used often. 11 of the 16 survey respondents answered with 1, 2 answered with 2, and one response answered with a 5.
If you answered with a 4 or 5, please explain below.	Only one surveyee answered with a 5 and they responded to the question stating that they use a 5D screen in one of their classes that they utilize all of the time where they draw and clarify steps by writing it out on the screen.
Out of the different Extended Reality (XR) technologies, which one do you utilize the most? VR, AR, or MR? (VR - Virtual Reality, AR - Augmented Reality, and MR - Mixed Reality)	Out of the responses from the surveyees, 45.5% of the responses indicate that Virtual Reality is utilized the most. Augmented Reality is listed next as the most utilized, followed by Mixed Reality. 9% of respondents answered "unsure" and 9% responded with none.
If you do not currently utilize any of the different Extended Reality (XR) technologies: VR, AR, or MR (VR - Virtual Reality, AR - Augmented Reality, and MR - Mixed Reality) which one do you know the most about?	Out of the responses, 92% responded stating that they utilize Virtual Reality (VR) the most. Only one surveyee responded stating that they utilize Augmented Reality more. MR did not receive any responses.
Do you believe the University of Tampa has good accessibility for people with visual imparities? Some examples of visual imparities would be color blindness, low vision, light sensitivity, albinism, etc.	On a scale of 1 to 5 with 1 being the least accessible and 5 being the most accessible, most responses landed with 1-4. Most responses stated 2 or 3 meaning somewhat accessible.
Do you have any suggestions on how accessibility can be better implemented throughout the University of Tampa, specifically for people with visual imparities? Please Explain.	Only 8 surveyees responded to this free text question and most responses suggested flash warnings should be included before videos with flashing lights and that there should be more braille accessibility available to students.

Do you think Extended Reality (XR) could be used in other departments? Please explain why or why not.	With the responses being short responses, most surveyees mentioned that XR could be utilized in sports, theater, nursing, marine biology, and health.
Do you think Extended Reality (XR) will promote gestural interfaces and interactions, or not? For context, a gestural interface is an interface where computers use gestures of the human body, typically hand movements, but in some cases other limbs can be used.	Out of the 10 responses, all of them were positive responses stating that yes, XR promotes gestural interface. Some surveyees responded that it enhances real-life scenarios and really helps with education.
Do you believe the University of Tampa will further invest money and resources into Extended Reality (XR) or other technologies to further enhance education in the classroom? Please explain your reasoning.	This question got a mixture of responses. Some were positive and some were negative. Some responses state that UT will invest more money to be up to date with the latest technology while others do not think other departments would receive funding faster than any department that utilizes XR technology.

Appendix 2- Screenshot of the Survey (Excerpt)



Section 1 of 2

Accessibility in XR in Higher Education

Thank you for your participation in our research study analyzing the student's perception of how they view Extended Reality (XR) technologies in the classroom and if they would find XR additions in their education beneficial, detrimental, or neutral. You have been asked to participate in this study because you are a college student at The University of Tampa who is taking a class involving film, design, media, or communications. Any and all responses are kept confidential. Your role in this study is central to our research because it helps us gain a better understanding of how Extended Reality (XR) could be used in educational settings and if students find it visually accessible. We appreciate your time spent with us.

If you do not wish to proceed with this survey, you may click out of the survey now. You will not be penalized if you do not take this survey.

We appreciate you taking the time to participate in this research study. The information is for research purposes only. The goal of our research is to investigate current accessibility and student opinions on XR technologies. Thank you, your participation has helped us move closer to our goal. If you come up with any questions in the future, please don't hesitate to ask. You may contact myself and co-investigators Caroline Reilly, Porscha Alonzo, or Farida Hassan.

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Section 2 of 2

Thank you for taking our survey!

We appreciate you taking the time to answer our survey!

Do you know what Extended Reality (XR) means?

	1	2	3	4	5	
Have no idea what XR means	○	○	○	○	○	I could teach someone all about XR

What is Extended Reality (XR) used for? Please explain.

Short answer text

Do you currently utilize Extended Reality (XR) technology in your classes?

1 = We don't use XR ever 5 = We use it all the time

	1	2	3	4	5	
We don't use XR ever	○	○	○	○	○	We use it all the time

If you answered with a 4 or 5, please explain below.

Short answer text

Out of the different Extended Reality (XR) technologies, which one do you utilize the most? VR, AR, or MR? (VR - Virtual Reality, AR - Augmented Reality, and MR - Mixed Reality)

- VR (VR - Virtual Reality)
- AR (AR - Augmented Reality)
- MR (MR - Mixed Reality)
- Other...

If you do not currently utilize any of the different Extended Reality (XR) technologies: VR, AR, or MR (VR - Virtual Reality, AR - Augmented Reality, and MR - Mixed Reality) which one do you know the most about?

- VR (VR - Virtual Reality)
- AR (AR - Augmented Reality)
- MR (MR - Mixed Reality)
- I know and utilize the above XR technologies
- Other...

Do you believe the University of Tampa has good accessibility for people with visual imparities? Some examples of visual imparities would be color blindness, low vision, light sensitivity, albinism, etc.

	1	2	3	4	5	
Strongly Disagree	○	○	○	○	○	Strongly Agree

Do you have any suggestions on how accessibility can be better implemented throughout the University of Tampa, specifically for people with visual imparities? Please Explain.

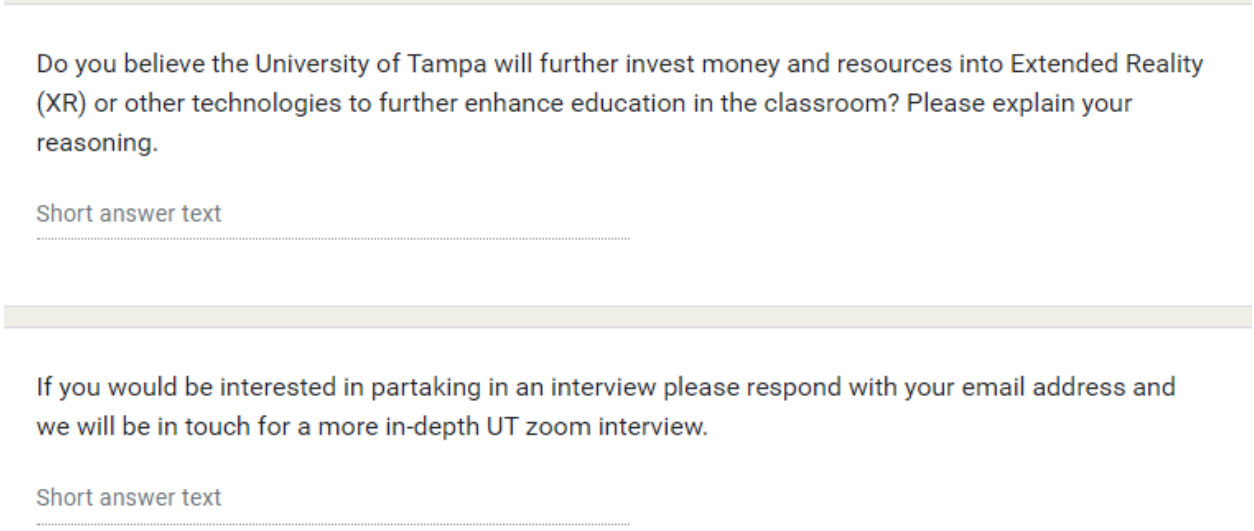
Short answer text

Do you think Extended Reality (XR) could be used in other departments? Please explain why or why not.

Short answer text

Do you think Extended Reality (XR) will promote gestural interfaces and interactions, or not? For context, a gestural interface is an interface where computers use gestures of the human body, typically hand movements, but in some cases other limbs can be used.

Short answer text



Appendix 3- Informed Consent Form (direct from IRB proposal)

Investigators are required to obtain agreement from research participants before collecting data. Participants must be told:

1) A statement that the study involves research, an explanation of the purposes of the research and the expected duration of the subject's participation, a description of the procedures to be followed, and identification of any procedures that are experimental;

The study of accessibility in extended reality (XR) in higher education involves research. Students at the University of Tampa will be recruited for this interview asking for volunteers to be interviewed to discuss their perception of a positive relation between extended reality (XR) accessibility in higher education leading to more well-developed programs and students with a wider variety of skills or whether is it ineffective. The interview is estimated to last between 15-30 minutes. The students will be interviewed using a survey created in google forms. The co-investigators will remain flexible to meet with their interviewees whenever appropriate. The interview will be recorded on the

Zoom application. This study contains a minimal risk level as it neither challenges nor risks any physical harm or social beliefs.

2) A description of any reasonably foreseeable risks or discomforts to the subject;

There are no foreseeable risks or discomforts to the subject.

3) A description of any benefits to the subject or to others that may reasonably be expected from the research;

There are benefits to knowing how extended reality (XR) is accessible in higher education or not for students, faculty, and staff. There are no monetary or other benefits to the subject or others that may reasonably be expected from the research.

4) A disclosure of appropriate alternative procedures or courses of treatment, if any, that might be advantageous to the subject;

There will be no alternative procedures or courses of treatment as we will be asking for the students, faculty, and staff to fill out a survey.

5) A statement describing the extent, if any, to which confidentiality of records identifying the subject will be maintained;

There will be videos recorded if necessary but those will only be for the researchers to review for final results. There will be no records identifying the subject as this study is focused on if extended reality (XR) is accessible in higher education for students, faculty, and staff. We will not be asking questions related to names, gender, and if they have a disability or not. Students will only be recognized as students in the study as well as faculty and staff.

6) For research involving more than minimal risk, an explanation as to whether any compensation and an explanation as to whether any medical treatments are available if injury occurs and, if so, what they consist of, or where further information may be obtained;

For this study, there will be no research beyond minimal risk.

7) An explanation of whom to contact for answers to pertinent questions about the research and research subjects' rights, and whom to contact in the event of a research-related injury to the subject;

The information is for research purposes only. The goal of our research is to investigate the motivation factors and effectiveness of accessibility in XR in higher education and if it can be used in other programs. Thank you as your participation has helped us move closer to our goal. If you come up with any questions in the future, please don't hesitate to ask. You may contact myself and my co-investigators Porscha Alonzo, Morgan Culp, or Farida Hassan at our respective spartan emails.

Caroline Reilly - caroline.reilly@spartans.ut.edu
Porscha Alonzo - porscha.alonzo@spartans.ut.edu
Morgan Culp - meculp@ut.edu
Farida Hassan - farida.hassan@spartans.ut.edu

8) A statement that participation is voluntary, refusal to participate will involve no penalty or loss of benefits to which the subject is otherwise entitled, and the subject may discontinue participation at any time without penalty or loss of benefits to which the subject is otherwise entitled;

For this study, if you are uncomfortable and refuse to participate you will receive no penalty and you may discontinue participation at any time without penalty. Identifiers will be removed and that data made available to other researchers.

9) One of the following statements about any research that involves the collection of identifiable private information or identifiable biospecimens:

i) ✓ Identifiers might be removed and the data made available to other researchers

ii) The identifiable information will not be made available to other researchers