

DM3107 Major Research Project

To what extent is the growth of immersive design
beneficial in educational settings?

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04/05/2022

Word Count: 10,113

Abstract:

Immersive design refers to the use of technologies such as augmented reality (AR) and virtual reality (VR) for design. As technology advances, immersive design is increasingly being considered in the production of everyday applications such as social media, gaming and retail. This dissertation aims to evaluate the effectiveness of using immersive design for education. Reviewing literature helped to identify how immersive design has already been integrated into educational settings, providing a basis for primary research to build upon. A significant benefit of immersive design which was highlighted in the research was that the interactivity facilitated by these technologies contributed to higher engagement levels. Two online questionnaires were distributed, with the purpose of investigating how individuals view immersive design, including those who may use the technology for learning and educators who will use it for teaching. The results reflected a fairly positive response to the integration of immersive design in education, where respondents were generally open to the idea of using AR and VR. The consensus amongst teachers was that pupils engage more when technology is involved and therefore found that the increased use of immersive design would be beneficial. The preferred learning style of the respondents appeared to be a significant factor in determining their attitude towards immersive design, whilst other variables such as age and education status showed no direct link. On the basis of the results, it was concluded that immersive design is beneficial in educational settings to a great extent, however should be used alongside traditional teaching methods, rather than completely replacing them. Once further research has been conducted on the long term effects of frequent exposure to immersive technology, this should be reconsidered.

Contents:

Abstract.....	2
List of Figures.....	4
Glossary.....	4
Introduction.....	5
Aims.....	5
Objectives.....	5
Thesis Statement.....	5
Dissertation Structure.....	6
Literature Review.....	7
Introduction.....	7
Application of immersive design in schools.....	7
Application of immersive design in medical training.....	8
Application of immersive design in astronaut training.....	9
Applying learning theory to immersive design.....	10
Summary.....	10
Methodology.....	12
Time Management.....	15
Results and Analysis.....	16
Questionnaire A.....	16
Questionnaire B.....	25
Summary.....	27
Discussion.....	28
Conclusion.....	31
Reference List.....	32
Bibliography.....	37
Appendices.....	38
Appendix 1.....	38
Appendix 2.....	39
Appendix 3.....	41
Appendix 4.....	49
Appendix 5.....	50
Appendix 6.....	52
Appendix 7.....	58

List of Figures:

Figure 1: The Technology Acceptance Model (Chuttur, 2009).

Figure 2: Gantt chart outlining how time is managed throughout the data collection process.

Figure 3: Pie chart identifying age of participants.

Figure 4: Pie chart identifying education status of participants.

Figure 5: Pie chart identifying employment status of participants.

Figure 6: Pie chart identifying the industries participants work in.

Figure 7: Pie chart identifying familiarity which Questionnaire A participants have with AR and VR.

Figure 8: Graph outlining how participants have used VR and AR previously.

Figure 9: Pie chart identifying the preferred learning style of participants.

Figure 10: Pie chart identifying whether participants engage with current learning resources.

Figure 11: Pie chart identifying whether participants have used AR and VR for learning previously.

Figure 12: Pie chart identifying whether participants complete workplace training regularly.

Figure 13: Pie chart identifying whether participants would find immersive design beneficial.

Figure 14: Pie chart identifying whether participants would prefer to use immersive or traditional learning methods.

Figure 15: Pie chart identifying familiarity which Questionnaire B participants have with AR and VR.

Figure 16: Pie chart identifying whether pupils engage with learning methods.

Figure 17: Pie chart identifying whether pupils engage more when technology is involved.

Figure 18: Pie chart identifying whether teachers would find the increased of AR and VR beneficial.

Figure 19: Pie chart identifying whether teachers think AR and VR technology could replace traditional teaching methods.

Glossary:

VR: Virtual Reality - Technology which allows the user to experience a simulated environment

AR: Augmented Reality - Technology which enhances a users experience of the real world by overlaying digital visual elements.

Introduction:

This dissertation investigates immersive design and how it is implemented into the education sector. Immersive design can be described as the process of designing things using immersive technology (Spacey, 2017). Immersive technology refers to any technology which serves to extend or replace versions of reality. This includes developments such as Virtual Reality (VR) and Augmented Reality (AR). Immersive design has been chosen as the topic of interest for this essay due to its rapid growth in recent years. By 2027, the global VR and AR market is predicted to generate \$165.3 billion USD in revenue (Market Research Company Focuses On Providing Valuable Insights On Various Industries, 2021). This highlights the relevance of immersive design in today's global economy, therefore it will be interesting to investigate how this may benefit education and training in particular. Furthermore, as part of their sustainability goals, the United Nations emphasises the need for quality education to stimulate socioeconomic mobility and provide a more sustainable future for all (Education - United Nations Sustainable Development, 2021). Immersive design could therefore provide a solution to this, however the impacts of this technology need to be researched further.

Aims:

The aim of this dissertation is to evaluate the effectiveness of immersive design in educational settings. This includes applications of AR and VR technology in schools and workplace training. In order to achieve this, objectives have been set.

Objectives:

- To identify the different applications of immersive design in education.
- To identify the benefits and limitations of using immersive design as an educational resource.
- To understand whether traditional learning theories can be applied to immersive design.
- To identify how immersive design will evolve in the future.

Thesis Statement:

Immersive design is increasingly being incorporated into everyday applications including education. The high levels of interactivity that these technologies facilitate are beneficial for capturing the interests of individuals, which will enhance learning experiences.

Dissertation Structure:**Literature Review:**

The literature review chapter explores how immersive design can be integrated into educational settings including schools, medical training and astronaut training. Learning theory is also introduced and applied to the context of immersive design.

Methodology:

The methodology chapter outlines the primary data collection process, including the chosen methods and a breakdown of how time will be managed throughout the investigation.

Results and Analysis:

The results and analysis chapter will discuss the findings from the primary data and identify any links between relevant variables.

Discussion:

The discussion chapter will summarise any key findings from the primary data and compare them with the secondary sources discussed in the literature review. The relevance of these findings will be outlined, including any limitations in the study and recommendations will be made for future research.

Conclusion:

The conclusion chapter will summarise the research outcomes in relation to the thesis statement, aim and objectives.

Literature Review:

Introduction:

Immersive technology began emerging in the 19th century, when Wheatstone (1838) invented the Stereoscope, a device which allowed users to view an image from two slightly different perspectives in each eye, creating the illusion of a three-dimensional (3D) projection (Thompson, 2017). Since then, immersive design has evolved drastically and is increasingly being incorporated into everyday applications including educational resources. In a survey of 8,288 teachers (NewSchools, Gallup, Inc., 2019), 65% claimed to use digital learning tools on a daily basis. The trend towards integrating technology into education has been escalated due to the COVID-19 pandemic, which contributed to over 1.2 billion children being out of the classroom following school closures (Li, Lalani, 2019). Immersive design is also growing in popularity for conducting workplace training, with 26% of businesses using VR or AR to train its employees (Gilbert, 2021). Studies have shown that 87% of the global workforce are disengaged with their organisation (O'Boyle, 2016). The trend towards immersive training applications could therefore be an attempt to engage the workforce more, to increase productivity. The shift to a more virtual approach to learning has impacted individuals differently.

Application of immersive design in schools:

Studies have found that using immersive technology is an effective learning method. For example, Lieu et al (2020) noted how VR encourages students to actively participate with the virtual simulations, resulting in higher levels of academic achievement than pupils who were taught using more traditional teaching methods. This trend could also be a consequence of reduced distractions from a classroom setting, by being fully immersed in the learning experience. Furthermore, researchers at the University of Maryland (UMD) (Are virtual reality and augmented reality the future of education?, 2018) supported the idea that pupils learn better with immersive technology, in an experiment using the 'memory palace' method. This is a method which has been used since ancient times, involving individuals storing images in an imaginary physical location, which is suggested to make them easier to recall (Remembering More of Everything: The Memory Palace, n.d.). The experiment by UMD consisted of participants being split into two groups and viewing images of celebrities, which had been placed in an imaginary location, following the memory palace format. Whilst one group did this using a desktop computer, the other group wore a VR headset. Participants were then asked to recall which celebrity had been located in the different areas of the scene. The results showed that those who wore the VR headsets had an 8.8% higher recall accuracy than those using the desktop computer. This could be because they were able to fully explore the scene as if they were actually there, making it more memorable and therefore highlighting the benefits of using immersive teaching resources for retaining information.

Barton (n.d) identified the exploration of physical locations as one of the core uses of immersive technology. Whilst she refers to this idea in regards to travel agents using VR to advertise holiday

destinations, it can also be applied to exploring historical locations, to make history lessons a more immersive experience, by making students feel like they are actually in particular historical locations. For example, Harvard University has made use of technological advancements and archeological records to develop the Giza Project (Digital Giza | About the Giza Project, n.d.), a collection of 3D models of the pyramids of Giza, which students are able to explore using VR, alongside digital reconstructions of historic artefacts. Through immersive applications such as the Giza Project, individuals are able to gain a more in-depth understanding of these historical sites, by gaining access to hard to reach areas and having the freedom to explore, in contrast to reading through a textbook (Guillette, 2019).

It has been suggested that using immersive technology in schools may have some legal and ethical issues (Hawkinson and Klaphake, 2020). In particular, the increasing use of these technologies can threaten privacy regulations, due to the large amounts of data they require. For example, VR headsets track the motion, head movements, eye movements and vocal commands of the user. Several policies aim to protect children, such as the children's online privacy protection act, however regulations may need to become stricter to accommodate the increasing use of technology by young people. Safety concerns have also been brought up (Dunleavy, Dede and Mitchell, 2008), where being too immersed in VR and AR simulations can cause students to not consider their real life surroundings, particularly when being used in outdoor spaces. For example, there have been incidents involving people jumping in front of traffic whilst using AR applications such as Pokemon Go (BBC News, 2016). There is however arguably a low risk of this occurring in educational settings, as they tend to take place in controlled environments, where the user is supervised. Furthermore, immersive technology has been found to pose risks to the wellbeing of children. In particular, a study by Kaimara, Oikonomou and Deliyannis (2021) identified cybersickness, obesity, radiation and sleep disorders as common concerns about children's development. They refer to cybersickness as nausea, disorientation and oculomotor issues occurring as a result of experiencing virtual environments through mediums such as VR headsets, large screens and curved screens, and has been found to occur more during use of VR games than regular 2D or 3D games. Melatonin is a sleep hormone which has been found to be more sensitive to light in children than in adults. This means that exposure to bright screens at night can result in children experiencing sleep disorders, where the melatonin becomes less concentrated. Sleep disorders have been shown to negatively impact academic achievement. Gaultney (2010) found that those who reported having no sleep disorders had a higher GPA than those who reported having at least one sleep disorder. This suggests that despite immersive design benefiting students positively in regards to helping them retain information more easily, when consumed in large amounts or late at night, it can damage their academic performance.

Application of immersive design in medical training:

Another way which immersive technology can be applied for educational purposes is for training medical professionals. Using VR, medical students can experience 360° CGI reconstructions of the human anatomy in detail and interact with realistic replications of common surgical

procedures (Virtual Reality in Healthcare, 2021). A benefit of this is that VR simulations provide a more realistic experience than animal models, videos and e-learning due to the intricacies that can be projected using 3D graphics (Li et al, 2017). Furthermore, VR allows trainees to gain an understanding of handling instruments and body structures in a controlled, risk-free environment, resulting in increased surgery speed and lower levels of accidents. Despite this, the use of VR in medical training also poses some limitations. For example, the development and implementation of VR is expensive, due to the hardware and software required (Baniyadi, Ayyoubzadeh and Mohammadzadeh, 2020). Studies have found that the initial cost of implementing a VR training exercise is \$327.78 per participant, in comparison to \$229.79 for the live alternative (Farra et al., 2019). Over time however, the cost per participant of VR training reduces, whilst remaining fixed for live training. This is because the high initial costs of implementing VR can be spread over a higher number of participants over time. This contrasts with the recurring costs of training through live exercises, such as using up hospital space and taking staff away from their duties to serve as trainers. As well as educating medical students, VR can also be an effective method for helping patients improve their understanding of medical treatments before undergoing them, which therefore improves their overall satisfaction (Virtual Reality in Healthcare, 2021). Some patients however may be reluctant to use VR (Baniyadi, Ayyoubzadeh and Mohammadzadeh, 2020), particularly older people, who are generally less familiar with the application of modern technology. 87% of people over the age of 75 have never been online (No isolation, 2021), therefore the idea of being fully immersed in VR may seem off putting.

Application of immersive design in astronaut training:

Astronauts require extensive training to equip them with the technical knowledge and ability to perform complex tasks in space (Trukhanov, 2021). Due to the high costs and risks involved, it is impractical to train astronauts in space (McGowin, Fiore and Oden, 2021). Traditional astronaut training has therefore been located in classrooms and swimming pools (Baughman, 2019), however more recently, space agencies have made use of the opportunities which immersive design can offer to improve training practises. For example, VR simulations allow astronauts to experience realistic situations, through the way they can interact (Bosch Bruguera et al, 2019). Bosch Bruguera et al discussed how immersion has been improved through the use of features such as hand tracking, placement of joysticks and wide field of view; all of which enable a more realistic training simulation. Furthermore, the way VR simulates disorientation, motion and zero gravity (Logan, 1998) has shown to increase the sense of realism. Spatial disorientation tends to occur as a result of the lack of gravity in space has been suggested to impact the safety of astronauts (Liu et al., 2016). Studies have shown that training astronauts in these environments can therefore reduce the effects of motion sickness and spatial disorientation during spaceflight (Harm, Stroud and Klaus, 2005), by preparing them so that they are used to these conditions. In particular, this study highlights a 53% reduction in nausea symptoms. Furthermore, through immersive methods, astronauts from around the world are able to train in the same virtual environments, whilst geographically separated, allowing them to work together to prepare for upcoming missions (Trukhanov, 2021). This however depends on the facilities available at these

locations. Whilst immersive technology has been proven to increase the effectiveness of astronaut training, recommendations have been made on how it can be developed further. For example, Bosch Bruguera et al (2019) noted how training scenarios could be made more realistic by incorporating multi-user simulation, eye tracking, haptic feedback and system failure simulation. All of which they considered achievable as technology develops and more advanced hardware and software becomes available.

Applying learning theory to immersive design:

When evaluating the effects of immersive design on education, traditional learning theories need to be considered, to gain a better understanding of the way that individuals process information. Traditionally, learning strategies have been heavily text based and dialogic, however the introduction of more immersive virtual approaches allow for more complex learning experiences and empowerment through increased user interactivity (De Freitas et al., 2009). McGowin, Fiore and Oden (2021) discussed the theoretical considerations for implementing immersive design into education to identify whether VR and AR are viable learning methods. They use the term 'learning affordances' to describe uses of technology which stimulate sensory or cognitive experiences which help support learning. For example they outlined how abstract ideas need to be converted into experiences. VR achieves this by placing the user into a virtual space, where they are able to interact with concepts. This helps support the idea that individuals learn better by actively doing something, rather than just observing it. Furthermore, they mention the idea of how learning can be achieved by exploring manipulations of reality, where it is not physically possible to interact with something. They reference the example of the user exploring the human body on a micro-level as a cell, using VR. In particular, this learning theory is evident in medical training scenarios, where students use VR to explore the human body in great detail (as stated previously). Dunleavy, Dede and Mitchell (2008) use a similar idea in their study, where they aimed to identify how AR interactions aid or hinder learning. They found that whilst students were highly engaged by the interactivity and collaborative nature of the simulations, hardware and software issues caused counter-productivity and demotivation. This is due to more time being spent trying to resolve technical issues, than actually learning.

Summary:

To summarise, immersive design provides a more engaging experience for users than traditional training methods, due to the more interactive nature of it. This is beneficial for education where individuals tend to process information better by actively participating rather than just reading out of a textbook (McGowin, Fiore and Oden, 2021). Other benefits include lowering the risk of certain training activities, by completing them virtually. Whilst initial costs of implementation may be high, over time may save costs in other areas (Farra et al., 2019). For example, hiring individuals to lead training activities, or the costs of fixing mistakes caused by inadequate training. As immersive technology continues to increase in popularity and becomes more accessible, the costs of hardware may also decline (Pettinger, 2019). The general consensus understood from secondary research suggests that immersive design can benefit educational practices, however there are

improvements that can be made as technology progresses. Despite this, there are also limitations which need to be considered such as the risk of cybersickness (Kaimara, Oikonomou and Deliyannis, 2021) as well as the opportunity cost of technical issues wasting time (Dunleavy, Dede and Mitchell, 2008). When referring to the United Nations goal for quality education for all (Education - United Nations Sustainable Development, 2021), the findings in this report highlight the potential benefits of using immersive design for improving education. However, due to the costs of implementing the technologies and training those to use it, immersive educational resources may be harder to deliver in lower income countries.

Methodology:

This chapter will outline the methodology chosen to achieve the research aim of evaluating the effectiveness of immersive design in educational settings.

Secondary research was conducted in order to write the literature review. The main purpose of this research was to gain an understanding of how immersive technologies such as augmented and virtual reality are currently being used in education and how this may impact individuals. The sources were identified using academic databases such as Google Scholar (n.d.) and OneSearch (n.d.). This helped provide reassurance that the information being referenced was well researched and credible, where it was written by industry professionals. Using academic databases also allowed for a more direct research method, where searches could be refined to find the more relevant sources. Where relevant scholarly sources couldn't be found, blogs and articles written by those in the industry were used. Since immersive design is a fairly recent development, particularly in the education sector, it meant that there weren't as many academic sources available, however online blogs provided more information on current trends. Whilst this meant that a wider range of information could be gathered, considerations had to be made as to how valid the sources were. This is because online content is often produced for a specific purpose, such as to sell a product or deliver an argument, which could therefore skew the information. Further research into the sources therefore had to be conducted to ensure that the intentions of the text were authentic.

The triangulation model (Triangulation, 2010) will be used, by comparing primary and secondary sources. By comparing the findings from academic studies with the opinions and experiences of individuals, it will help to achieve a deeper understanding of the research topic and therefore answer the thesis statement more accurately. The chosen primary research method for this study is a questionnaire. This method has been chosen as it allows for both qualitative and quantitative data to be collected. The quantitative data will mainly regard the demographics of the respondent, allowing the qualitative data to be categorised more easily, which could help to identify trends. For example, by analysing how the age of a respondent may correlate with their opinion on a topic. Furthermore, questionnaires can be distributed to high volumes of participants quickly and easily. Using interviews as a method was considered, however it would have been extremely time consuming in comparison, therefore would have been less suitable due to the limited time frame available for research. Furthermore, there was a risk of the data being skewed due to interviewer bias, where the researcher may influence a certain response to be given.

As part of this study, two questionnaires will be distributed. Whilst one will target the general public (particularly those in education) and be shared on social media (Questionnaire A), the other will be aimed specifically at school teachers (Questionnaire B). Teachers will be the ones integrating immersive technologies into their practices therefore it is essential to gather their feedback on the subject. A gatekeeper will be used to gain access to the teachers. In this instance, one primary school teacher and one secondary school teacher have already agreed to

fulfil this role. By gaining access to those involved at different levels of education, a greater insight can be achieved into how immersive design may be integrated into education as a whole. For example, there may be differences in how primary and secondary school teachers view immersive design, which will need to be considered when drawing conclusions from the data. The decision to produce two separate questionnaires will help to provide a deeper understanding of the subject, by gathering data from educators as well as those in education. This is because opinions may differ based on how the individual may use immersive technologies, such as whether they are using them to teach or learn. Questionnaire B will be distributed on social media platforms as it is an easy way to reach students and those who complete workplace education. Teachers and students typically live busy lifestyles and are therefore limited for time. A questionnaire therefore proves to be a suitable research method as it can be completed in the participants own time, increasing the convenience of it. This could result in a higher response rate and thus increase the representativeness of the study. Furthermore, by allowing the respondents more time to complete the questionnaire, they may feel less pressured and be able to give more thought out responses.

The questionnaires will be created using Google Forms. This platform has been chosen as it helps to simplify the entire data collection process, from the creation of the survey, until the data analysis stage. For example, data responses are automatically put into pie charts and bar graphs where relevant. Furthermore, Google Forms allows the researcher the option to view each response individually. From this, they may be able to identify trends by linking responses together. For example, whether someone's age or occupation may affect their opinion on immersive design. Google Forms also allows the creator of the questionnaire to toggle whether or not the user should be required to input their email address upon completion. By switching this setting off, the responses can remain anonymous. This may motivate participants to give more honest and in depth responses. The online nature of Google Forms means that the participants do not physically interact with the researcher. This can be beneficial by reducing the potential for interviewer bias, where the researcher's presence may influence the responses given.

Despite questionnaires being an effective research method, considerations need to be made, particularly in regards to how practical and ethical the data collection will be. For example due to the online nature of the questionnaire, there is a risk of questions being misunderstood, which could result in them being answered incorrectly and therefore impacting the credibility of their responses. Furthermore, the population size will need to be considered to gain an understanding of how representative the findings may be. Due to time and budgeting constraints, the sample used is likely to only be a small proportion of the groups of interest (students, teachers and those who complete workplace education). Opportunity sampling will be used to collect the responses. This is where the researcher selects anyone who is willing and available to participate (Opportunity Sampling, n.d.). In some instances this may not be an effective method, such as when targeting a niche group, however the target population for this study is particularly mainstream, therefore identifying participants based on convenience is still likely to produce a fairly representative result. It does however need to be taken into account that some groups are

more likely to participate in the study than others. For example younger people who are more computer literate than older people. This may result in a skew in the responses. In order to prevent this, one of the questions will identify the age group of the participant, which will allow the responses to be grouped during the analysis stage. This will help to provide a clearer insight on the subject. Ethical issues which need to be considered include informed consent. Participants will need to agree to their responses being included in the study and have the right to refuse this. To ensure this happens, the questionnaires will start by asking participants for their consent. The questionnaire will also come with a description, providing transparency about the research and what the responses will be used for. To further ensure that the study is conducted ethically, the identity and personal information of the respondents needs to remain anonymous and confidential, to prevent any potential negative implications. For example if they had a controversial opinion on the subject, which could result in backlash from others. As previously mentioned, Google Forms allows the researcher to toggle whether or not the respondents email should be required to complete the survey. By deselecting this setting, the identity of the respondents will be completely unknown to everyone except themselves.

The main aim of the data analysis stage is to gain an understanding of different opinions of immersive design applications in education and whether certain factors may affect this. The two questionnaires will be analysed separately, however will be compared later on in the study, in order to identify any differences between the views of students and teachers. The data analysis stage will begin by looking through all of the responses, one question at a time, to gather a general overview. Google Forms automatically groups data into charts, which will save time and therefore allow for longer to be spent analysing the responses. The data will then be reviewed per individual response. By analysing the data from each respondent separately, trends may be identified. For example, whether there is correlation between someone's occupation and resistance to immersive technologies. Since some of the questions will require an open answer, the responses may be more difficult to compare. When generating conclusions they will therefore need to be generalised based on how positive or negative the opinion is.

Hypotheses can be generated based on a general awareness of current trends as well as the secondary sources mentioned previously. The 'Technology Acceptance Model' (Figure 1) can also be useful in predicting attitudes towards immersive design. The concept behind this model is that someone's attitude towards a technology is influenced by the perceived usefulness and the perceived ease of use. When applying this theory to the subject matter, it can be suggested that those who view AR and VR as useful and easy to use are more likely to have a positive attitude towards it. It can therefore be predicted that age will be a key factor in determining an individual's perspective on immersive design. Older people are typically less confident using recent technologies, than younger people, who have grown up using them. It is therefore predicted that they will be more reluctant to incorporate immersive design into education. Furthermore, the respondents occupation is also predicted to be an influential factor. Particular job roles may find more use in integrating immersive design into their training. For example, as mentioned in

previous chapters, AR and VR is increasingly finding more uses in medical training. Those who work in technology based roles may also be more willing to incorporate AR and VR, as they are likely to be more confident with these technologies than other professions. The preferred learning style of an individual is also predicted to influence how they respond. Since AR and VR provide a very visual and immersive experience, it can be assumed that using these technologies for education will appeal more to the visual or kinesthetic learner.

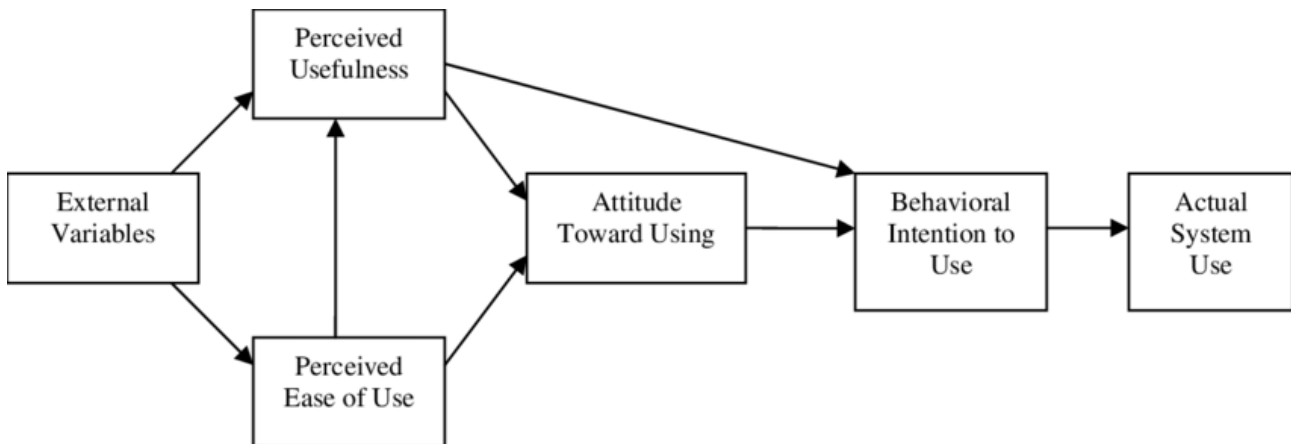


Figure 1: The Technology Acceptance Model (Chuttur, 2009).

Time Management:

To ensure that a sufficient amount of data is collected, participants will be given three weeks to respond to the questionnaire. The intention of this is to increase the response rate, by allowing individuals more time to complete the questions. A following week will then be dedicated to interpreting this data and presenting the research findings, in the form of tables and charts. Once the analysis has been completed, a written discussion can be produced in relation to the thesis statement. A Gantt chart has been used to visually organise time (Figure 2).

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
Create Questionnaire						
Distribute Questionnaire						
Gather Data						
Analyse Findings						
Discuss Findings						

Figure 2: Gantt chart outlining how time is managed throughout the data collection process.

Results and Analysis:

A combination of qualitative and quantitative data was collected using two questionnaires, which were distributed online using Google Forms. After the allocated time for completion had ended, the questionnaires were closed, and the analysis process was started. Questionnaire A, was distributed on social media, and targeted a more mainstream group. Questionnaire B targeted teachers in particular, who were accessed using individuals who work in schools, and therefore acted as gatekeepers. Questionnaire A received 46 responses, however on further inspection, one of these appeared to be a complete duplicate of another. It therefore was considered an outlier and removed from the data, due to it being invalid. Questionnaire B had a considerably lower response level, receiving only 5 sets of data. This could be due to teachers generally being limited for time. On initial discussion with the primary school gatekeeper, they warned that teachers tend to have an opposition to filling out forms, therefore the responses may be limited. In an attempt to encourage teachers to participate, the questionnaire was kept short, and most questions were multiple choice, however there were still very few responses. The number of responses gathered also relied on the success of the gatekeeper, rather than the researcher, due to the lack of first person access into schools. Despite this, the responses from questionnaire B are all valid and have helped to provide an insight into the views of this particular group.

Questionnaire A:

Questionnaire A was divided into three parts. The purpose of part 1 was to identify the demographic of the respondents, in order to help categorise responses and make comparisons. The most common age group for completing this survey was ages 20-29, making up 75.6% of the total responses (Figure 3). It has been found that people aged 16-29 spend the most time on social media (How Much Time Does The Average Person Spend On Social Media?, 2022). The questionnaire was distributed solely over social media, therefore it was highly likely that the age group who spend the most time using these sites would be more likely to participate. The other age groups showed significantly lower participation levels, receiving between 1 and 3 responses from each. AR and VR are emerging technologies which are likely to be implemented into everyday practices over time. It was therefore important to gather the opinions of the younger generations who are more likely to be affected by these developments. It will be interesting to compare their opinions with those of the other age groups.

How old are you?

45 responses

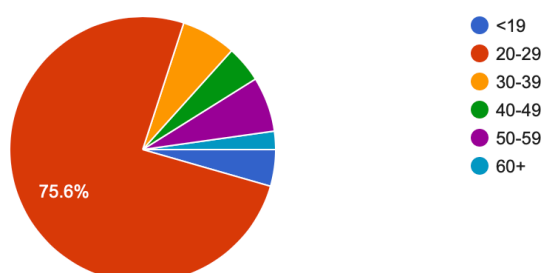


Figure 3: Pie chart identifying age of participants.

Education was a key area of interest for this study therefore it was important to identify the current education status of the participants. University undergraduate appeared to be the most common response, accounting for 44.4% of the data, followed closely by respondents who are not in education (37.8%), then university postgraduates (15.6%). Apprenticeship was the least common response, with only one participant selecting this option (2.2%). Overall, 62.2% of respondents are currently in some form of education. It will be interesting to identify whether the general consensus for those in education differs from those who are not.

What is your current education status?

45 responses

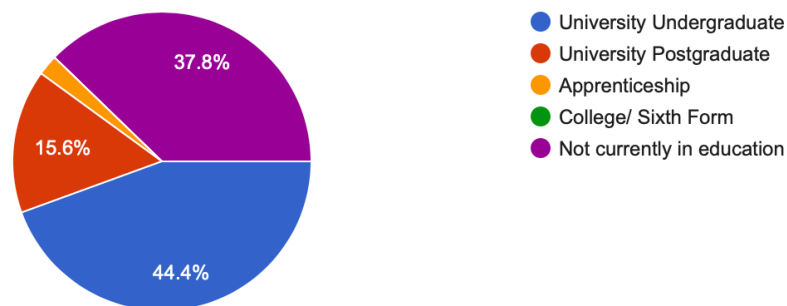


Figure 4: Pie chart identifying education status of participants.

Workplace training is being included in this study as it is still a form of education and is already utilising immersive technology in some industries. Part 1 of questionnaire A therefore also identifies whether the participants are employed and in which industries. The data shows that 71.1% of the respondents are currently employed.

Are you currently employed?

45 responses

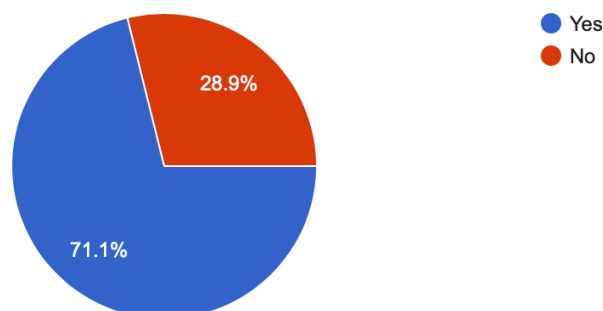


Figure 5: Pie chart identifying employment status of participants.

When asked which industry they work in, design and marketing was the most common response, accounting for 18.8% of responses. This was shortly followed by those in IT based roles (15.6%). Other responses included retail (9.4%), education (9.4%), hospitality (6.3%), healthcare (6.3%), cleaning (6.3%), service (3.1%), catering (3.1%), childcare (3.1%), building trade (3.1%), fundraising (3.1%), recruitment (3.1%), personal historian (3.1%) and prison services (3.1%). It is noticeable that a significant proportion of the responses came from individuals working in technology based roles. This could be due to people in these professions generally taking more interest in immersive technologies and therefore being more likely to participate. Furthermore, some people may not understand what immersive design is and therefore may have been reluctant to participate as a result of this.

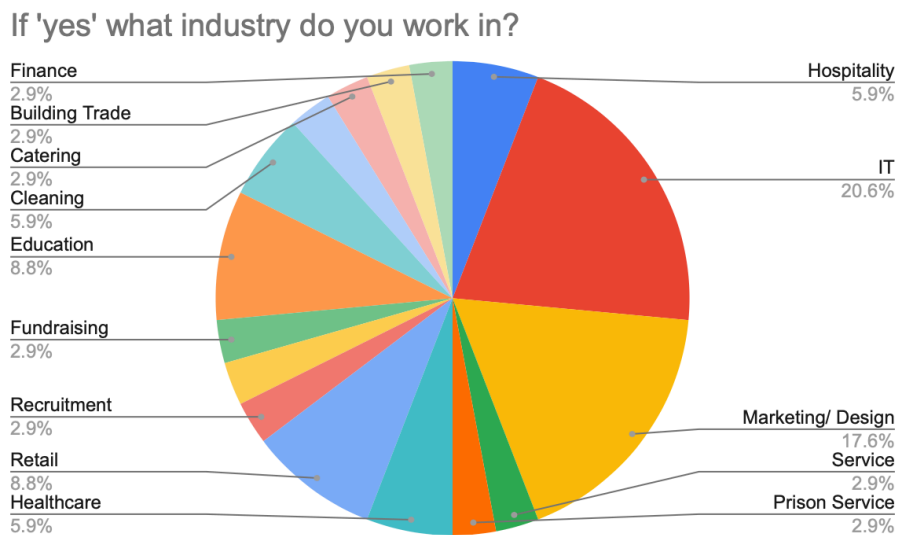


Figure 6: Pie chart identifying the industries participants work in.

Whilst part 1 of the questionnaire determined the demographics of the participants, part 2 identified their understanding and experience of AR and VR. When asked how familiar the participants were with these technologies, only 6.7% had never heard of them. On initial inspection of these figures, it was predicted that these responses would all be from participants in the higher age groups. This however was incorrect as whilst one response was from the over 60 category, one was aged 20-29 and the other was under 19. An additional 6.7% of respondents had heard of VR and AR but did not know what they are. The majority of participants claimed to have a basic understanding of VR and AR (57.8%), whereas 28.9% said they were knowledgeable on the subject. Immersive design is increasingly being integrated into mainstream media therefore these figures were expected.

How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?

45 responses

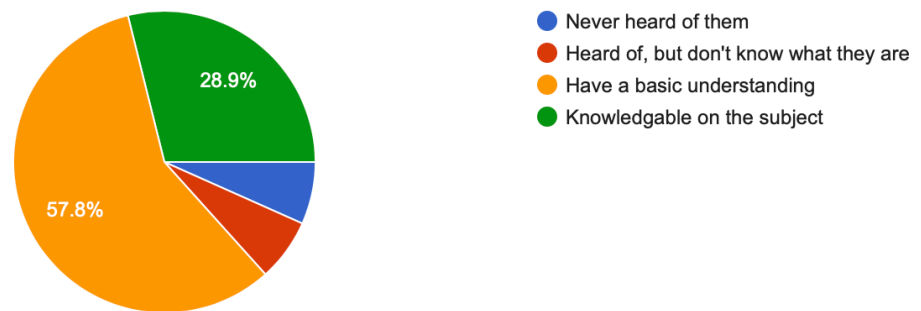


Figure 7: Pie chart identifying familiarity which Questionnaire A participants have with AR and VR.

When the participants were asked where they had experienced immersive technologies previously, social media was the most common response, with 71.1% having used AR/VR on these platforms. This was shortly followed by gaming (68.9%) and entertainment (48.9%). It was interesting to see that 20% of respondents had used immersive technologies for educational purposes. These responses will be particularly useful when analysing people's opinions on using immersive design in education, as they have experienced it already.

In what ways have you experienced VR/AR previously? (Tick all that apply)

45 responses

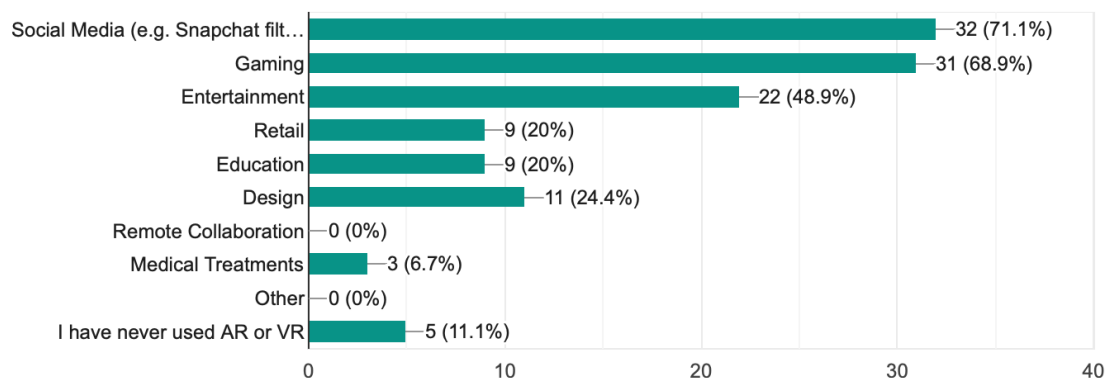


Figure 8: Graph outlining how participants have used VR and AR previously.

In order to gain an in-depth understanding of how beneficial immersive design may be in education, it is necessary to identify whether individuals have any concerns about the technology involved. Out of the 24 responses provided for this particular question, 10 presented some form of concern. The most common concern was brought up twice and involves VR and AR reducing spatial awareness which could therefore be unsafe in some environments. Despite this, when used in educational settings the risk of physical injury is likely to be lower as VR headsets would

be used in a classroom where the students are supervised. It was also mentioned in two responses how immersive technology could affect people mentally. In particular, one response noted how VR could be addictive as it provides escapism for the user. Similarly, the risk of mental illnesses being caused was mentioned in another response. Another concern raised included the risk of security breaches, where these technologies are increasingly becoming more capable of operating remotely. This could potentially be harmful in educational settings, particularly if children are involved. Despite these concerns, positive effects of immersive technology were also described. For example, it was noted how VR and AR technology could be beneficial in certain industries if used properly. The medical industry was used as an example. Furthermore, one response discussed how immersive technology is beneficial for engaging those with shorter attention spans. They did however counter this with how they did not want the value of traditional learning methods to be lost. Overall, this question provided a variety of qualitative responses, which highlight the honest opinions of individuals, whether these were positive, negative or more balanced.

Part 3 of the questionnaire aimed to apply the participants' opinions of immersive design to the context of education. It was important to identify their preferred learning style because resources utilising VR and AR technology are more likely to suit a visual or kinaesthetic learner. The data shows that 62.2% of respondents identified themselves as visual learners, followed by 24.4% kinaesthetic learners, then 8.9% who learn best through reading and writing, and just 4.4% describing themselves as auditory learners.

How would you best describe your learning style?

45 responses

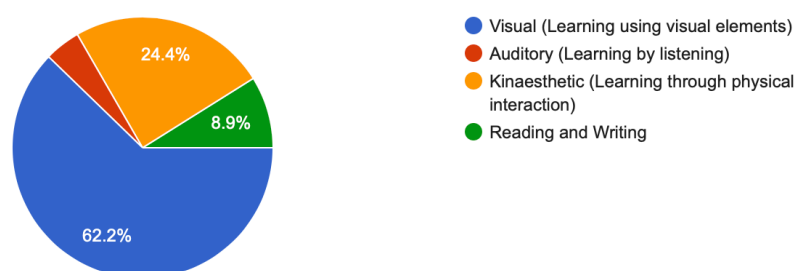


Figure 9: Pie chart identifying the preferred learning style of participants.

One of the key benefits of integrating immersive design into education is the increased engagement levels. It was therefore necessary to find out whether people find traditional learning methods engaging, to justify the need for VR and AR. The outcome was that 26.7% voted that they do find traditional methods engaging, 20% voted that they do not, and 53.3% said they only do sometimes.

Do you find it difficult to engage with current learning resources?

45 responses

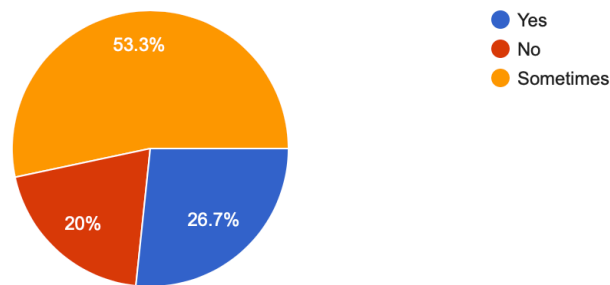


Figure 10: Pie chart identifying whether participants engage with current learning resources.

It was interesting to see that 80% of the respondents had never used VR or AR for any form of education. These technologies have only recently become more accessible to people, which could explain this figure. 88.8% of the participants who had used VR and AR for learning were in the 20-29 age range. This could suggest the trend towards utilising these technologies, where younger people are being taught with them.

Have you ever used VR/AR for any form of learning (includes workplace training)

45 responses

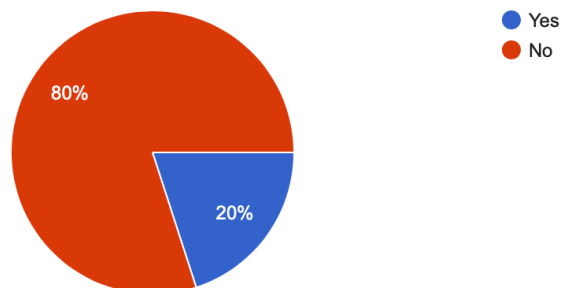


Figure 11: Pie chart identifying whether participants have used AR and VR for learning previously.

Workplace education is being included in this study therefore participants were asked whether they are regularly required to complete training for their job. Results showed that 44% of participants do partake in regular training, 31.1% do not and the remaining 24.4% were unemployed. Upon further inspection of the data, it was noticed how the figures do not match with the previous question regarding the participants employment status, as originally 28.9% stated that they were unemployed. This may impact the validity of the data therefore this error needs to be considered when conducting further analysis.

Do you have to complete regular workplace training?

45 responses

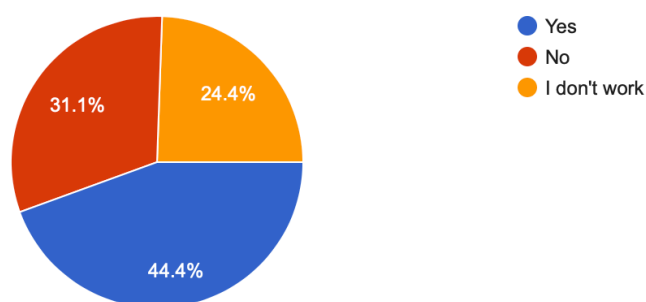


Figure 12: Pie chart identifying whether participants complete workplace training regularly.

In order to fully respond to the research aim, it is essential to gain an understanding of whether or not people favour the trend towards immersive design and whether they would find it beneficial in educational settings. When asked if they would benefit from using AR/VR learning resources, 42.2% voted yes, 6.7% voted no and 51.1% voted maybe. This indicates how people are generally open to the idea of integrating immersive design into educational practices.

Do you think you would benefit from using VR/AR learning resources?

45 responses

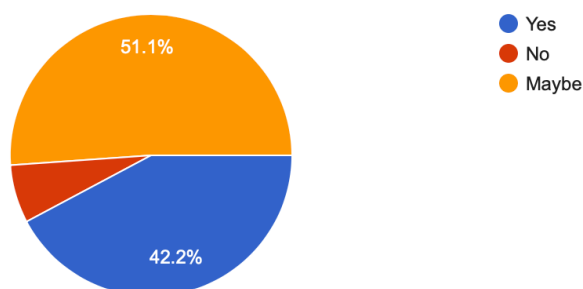


Figure 13: Pie chart identifying whether participants would find immersive design beneficial.

It can be argued that traditional learning methods are still beneficial in some instances. It was therefore interesting to identify whether participants would prefer to use traditional or more immersive methods. The general consensus was that people would rather use a combination of these, accounting for 80% of the responses. Despite this, 11.1% would prefer to solely use AR and VR resources for learning, whilst 8.9% would prefer to keep using more traditional methods. An open question was used to identify why these responses were given. The only response given in favour of solely using traditional methods was in regards to preferring to have the resources physically in front of them. Reasons given for preferring to use immersive methods relate to the increased practicality of them. It was noted how the sense of reality provided makes the resources easier to relate to. Furthermore, it was mentioned how VR and AR makes things more

interesting and easier to understand. In particular, this was seen as beneficial for early years education, where the interactivity makes the learning more enjoyable, by blurring the lines between playing and learning. Those who voted for using a combination of traditional and immersive resources provided reasons which mainly highlighted how both methods can be used in synergy to benefit the learning process. For example, it was mentioned how using a variety of methods makes learning more interesting and how VR can create the interactivity that traditional methods may struggle to provide. It was also suggested how writing notes following a VR experience may help the user to engrain the information in their mind. Furthermore, it was considered how different learning methods may be more beneficial for certain subjects. An example provided was how immersive technology may be more valuable when teaching subjects which require more practical skills. It was interesting to see how some participants have already identified a learning style which benefits them or do not have much of an understanding of AR and VR but are still open to trying these technologies. It was mentioned how a balance of both methods should be used until it is proven which one works best. Despite this, it should be considered how the effectiveness of each method is subjective to the preferred learning style of the user.

Would you rather use AR /VR than traditional learning resources/methods?

45 responses

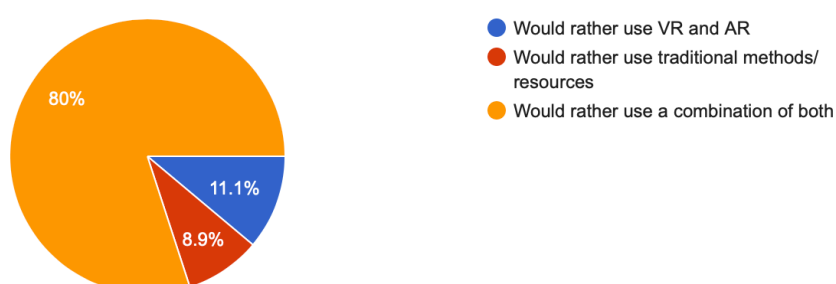


Figure 14: Pie chart identifying whether participants would prefer to use immersive or traditional learning methods.

Overall, the responses to questionnaire A were generally quite positive in regards to utilising these immersive technologies in education. Reviewing the responses individually has helped to identify potential correlations between the background of the participant and their outlook on the subject matter. Age was the first factor which was investigated. It was initially predicted that older participants would be more reluctant to use immersive technology. This was however disproven as 100% of those who responded that they would not benefit from AR/VR learning resources were aged 20-29. When looking at these responses individually, it was interesting to see how none of these participants are currently in education. Furthermore, when asked to present their concerns regarding the growth of immersive technologies, only those aged 39 and under had any. It is stereotypically assumed that older people are more negative towards the adaptation of these new technologies, therefore it was unexpected to see that this is not the case in this data set.

When comparing the age of an individual to their understanding of immersive design, it was shown that 58.8% of those aged 20-29 have a basic understanding, whilst 32.4% are more knowledgeable on the subject. For those aged 30-39, 33.3% had a basic understanding and 33.3% were more knowledgeable. 100% of respondents aged 40-49 claimed to have a basic understanding on the subject, in comparison to 66.6% of those aged 50-59, with the remaining 33.3% being more knowledgeable. 100% of participants under 19 and over 60 years old had never heard of AR or VR. There was only one response from each of these categories, therefore they cannot be considered as very representative. The number of people who considered themselves as having a greater understanding of immersive technology is fairly proportionate across the 20-29, 30-39 and 50-59 age categories. Overall, the data suggests that there is no direct link between age and opinions of immersive technology.

Education status was the next factor to be investigated. From the 62.2% of respondents who are currently in education, 92.8% claimed to have some sort of understanding of AR and VR. This contrasts to only 76.5% of those who are not currently in education. The difference between these figures could reflect how immersive design is being integrated into education, therefore students may have greater exposure to it. Current education status did not have much significance in terms of whether participants would find immersive learning resources beneficial, with 45.8% of students and 47.1% of those not in education voting yes. 44.4% of the participants claimed to also have to complete regular workplace training which suggests how it is not significant whether someone is in formal education or not, when identifying their views of immersive design in education as a whole.

From the proportion of participants who are employed, it was interesting to identify whether their occupation had an impact on their attitude towards immersive design. It was predicted that those working in technology based roles would show a more positive response. This was demonstrated when only 18.2% of those working in design, marketing or IT had concerns about the growth of immersive technology. This figure was slightly higher for those not working in technology based roles, at 22.9%. 100% of those working in technology based roles had at least a basic understanding of AR and VR compared to 82.3% of those who are not. It could therefore be suggested that people in specific occupations are likely to be better educated on the subject and therefore pose less concerns. Despite this, it was interesting to see that 90.9% of individuals working in design, marketing and IT would prefer to use a combination of immersive and traditional learning methods, whilst 9.1% would rather continue to use traditional methods. Out of the 5 responses that stated they would prefer to use VR and AR for learning, 60% were unemployed, 20% work in healthcare and 20% work in finance. Whilst there was a weak correlation between a person's occupation and their attitude towards immersive design, when applying the context of education, the data shows that employment is not a key factor.

The preferred learning style of an individual was predicted to influence their attitude towards using immersive design for education. From the respondents who voted 'yes' when asked if they

struggle to engage with educational resources, 41.6% were kinaesthetic learners and 41.6% were visual learners. The figures suggest how traditional methods are less suitable for these learning styles. Furthermore, when asked if they would find immersive learning resources beneficial, 45.5% of the kinaesthetic learners voted yes and 45.5% voted maybe. Using data from the visual learners, 46.4% voted yes and 50% voted maybe. 50% of auditory learners voted yes and 50% voted maybe, whilst those who learn through reading and writing showed a more negative response, with 75% voting maybe and the remaining 25% saying they would not benefit from immersive learning. It was also noticeable that 80% of the respondents who would prefer to solely use VR and AR learning resources were visual learners, with the remaining 20% being kinaesthetic learners. The highly visual and interactive nature of immersive design means that it is likely to benefit some people more than others, which could explain these figures. Overall, the data shows that there is a link between the preferred learning style of an individual and their attitude towards immersive design, with those who learn best through reading and writing seeing the least benefit in using these technologies. Despite this, the general consensus amongst the respondents is that they would prefer to use a combination of these new technologies and traditional methods for education, regardless of their learning style.

Questionnaire B:

The purpose of Questionnaire B was to identify whether teachers would find immersive design beneficial in a classroom setting. Those who participated teach a variety of different age groups, therefore it will be interesting to identify whether their responses differ. 80% of the responses were from primary school teachers and the remaining 20% were secondary school teachers. When asked how familiar the teachers were with AR and VR, 40% claimed to have a basic understanding, 40% were more knowledgeable and 20% had heard of the technologies, but did not know what they were.

How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?

5 responses

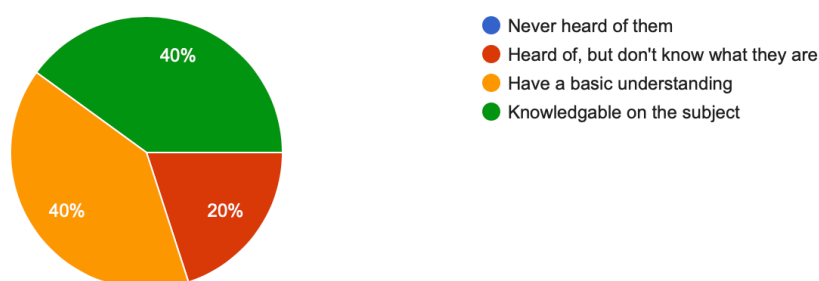


Figure 15: Pie chart identifying familiarity which Questionnaire B participants have with AR and VR.

In order to gain an understanding of how immersive design may be beneficial, it is important to identify which methods are currently used to teach and how pupils respond to these. A variety of different teaching methods were provided by the respondents. These include blended learning,

practical activities, use of an interactive whiteboard and verbal teaching. 60% of the teachers claimed that their pupils engage with these methods whilst the remaining 40% answered that they sometimes engage. The validity of this data needs to be considered where pupil engagement levels reflect how effective the teachers are at performing their job. They therefore may not want to reveal if pupils are not engaging with the way they teach.

Do you think that your pupils engage with these methods?

5 responses

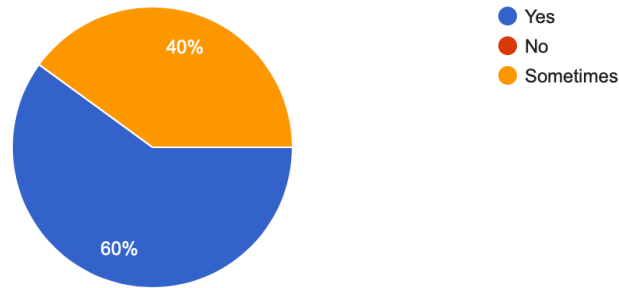


Figure 16: Pie chart identifying whether pupils engage with learning methods.

The remaining questions applied immersive design into the educational context. 80% of the respondents found that their pupils engage more when technology is involved and agreed that the increased use of AR and VR teaching resources would be beneficial. Most of the responses demonstrated a positive attitude towards immersive design and 60% agreed that AR and VR technology could replace traditional teaching methods, to some extent. There was no visible difference between the opinions of primary and secondary school teachers, which suggests how immersive design may provide similar benefits across the different levels of education.

Do you find that pupils engage more when technology is involved?

5 responses

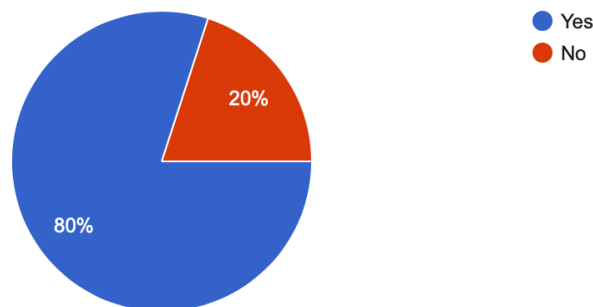


Figure 17: Pie chart identifying whether pupils engage more when technology is involved.

Would you find the increased use of AR and VR teaching resources beneficial?

5 responses

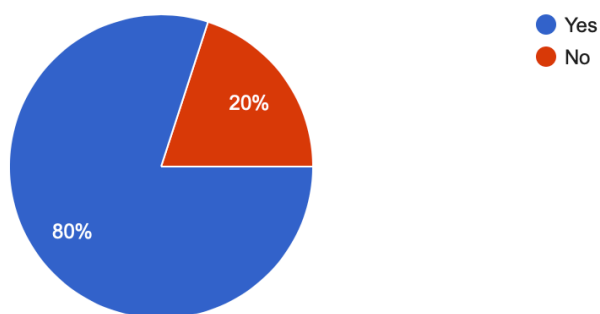


Figure 18: Pie chart identifying whether teachers would find the increased of AR and VR beneficial.

Do you think that AR and VR technology could ever replace traditional teaching methods?

5 responses

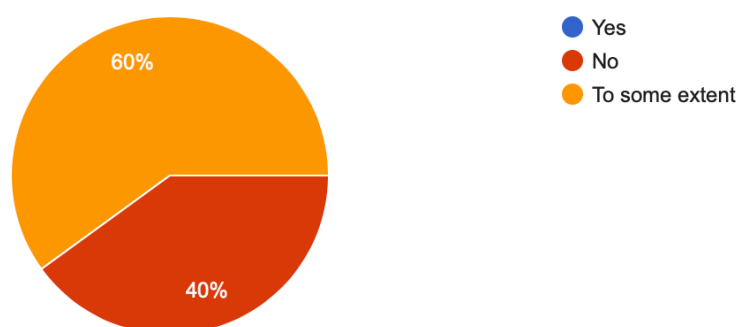


Figure 19: Pie chart identifying whether teachers think AR and VR technology could replace traditional teaching methods.

Summary:

To summarise, the data collected from the questionnaires reflects a generally positive response to the growth of immersive technology in educational settings. The respondents appeared to be open to the idea of integrating these technologies into their education, however the general consensus was that they would prefer to use them alongside traditional teaching methods, rather than completely replacing them. Pupils have been found to engage more when technology is involved, which further supports this idea. When investigating whether specific factors affected an individual's attitude towards AR and VR, age and education status proved to be insignificant. A weak correlation was identified between a person's occupation and opinion of immersive design in general, however when applying the responses to the context of education, this was also proven to be insignificant. The data from Questionnaire A indicates that the preferred learning style of an individual impacts their attitude towards integrating AR and VR into education, perhaps because these technologies are highly visual and interactive therefore benefit certain learning styles more.

Discussion:

The aim of this dissertation is to evaluate the effectiveness of immersive design in educational settings. This chapter will therefore highlight any relevant findings from the primary and secondary research, in relation to the thesis question 'to what extent is the growth of immersive design beneficial in educational settings?'. The secondary sources mentioned in the literature review explore the different applications of immersive design in an educational context and what the benefits and limitations of these are. The primary research builds on this by identifying the opinions and experiences which individuals have on the subject.

The data demonstrates a generally positive response to the integration of AR and VR technology. In particular, this is evident in Questionnaire A where the majority of respondents answered 'yes' or 'maybe' when asked if they would find using AR/VR learning resources beneficial. Furthermore, only 9% of respondents do not find current learning resources difficult to engage with. One of the benefits of immersive technology discussed in the literature review chapter is that it creates higher levels of engagement. It can therefore be suggested that AR and VR can be utilised to resolve problems regarding engagement in educational environments. Despite this, concerns were raised throughout the research. A common theme across the primary and secondary findings was that immersive technology may be dangerous in certain situations. This is due to the highly immersive elements limiting the user's physical awareness. The impact on the users wellbeing was also a key issue raised by Questionnaire A participants. It has been proven in previous studies how immersive technology affects mental health, where frequent use of these devices can contribute to cybersickness and sleep disorders (Kaimara, Oikonomou and Deliyannis, 2021). The data also outlines concerns regarding the threat of privacy regulations being breached, due to the large amounts of information which immersive devices are able to obtain. It is essential that these concerns are considered when answering the research question. Despite these concerns, the consensus reflected across the primary and secondary data is that immersive design is a beneficial development. In particular this is demonstrated by the small proportion of respondents who claimed that they would not find immersive educational resources beneficial (6.7%).

Regardless of this figure, the data suggests that immersive design would work best alongside traditional teaching methods, rather than completely replacing them. This is justified by the 80% of Questionnaire A respondents who stated they would prefer to use a combination of immersive and traditional methods, as well as 60% of the teachers from Questionnaire B who agreed that AR and VR could replace traditional teaching methods to an extent. Using AR and VR alongside traditional teaching methods would be an appropriate suggestion, when considering the previously discussed health risks associated with prolonged use of these technologies. It was interesting to see how the data collected from the questionnaires disproves the hypothesis that age is a key factor in determining an individual's attitude towards immersive design in an educational context. It does however need to be considered how the different age groups were

disproportionately represented in questionnaire A, as there was only one respondent over the age of 60. This makes it more difficult to make assumptions based on age. Another hypothesis was that an individual's preferred learning style would correlate with their attitude towards immersive design in education. This prediction was proven by Questionnaire A, which found that those who learn best through reading and writing saw the least benefit in using immersive technologies for education, in comparison to those with a visual, auditory or kinaesthetic learning style.

When conducting secondary research, the high costs of implementing immersive design were investigated (Baniasadi, Ayyoubzadeh and Mohammadzadeh, 2020). The United Nations set a goal to provide quality education for all (Education - United Nations Sustainable Development, 2021), which may be difficult to achieve, unless these technologies are able to be distributed for a lower cost in the future. This topic was also raised in the primary data, where there were concerns relating to those from lower socioeconomic groups being left behind as these technologies become more widely used. When considering academic achievement, pupils from wealthier backgrounds at private schools are more likely to have access to immersive resources, and consequently may perform better than pupils from schools in lower income areas.

Overall, the primary data from this study supports the secondary findings identified in the literature review chapter. In order to respond to the thesis question, traditional learning theories need to be considered, to identify whether immersive design is more or less capable of enabling individuals to retain information. Both forms of research highlight how immersive design can be beneficial in educational settings, particularly due to the interactive elements increasing engagement levels, making it easier for individuals to process information. This suggests how learning theory can be applied to immersive design, where users learn through interaction. It was interesting to find how the limitations of immersive design which were identified through secondary studies were also highlighted in the questionnaire responses. This supports the credibility of these ideas. Furthermore, this study is significant in terms of considering the perspective of the educators who will be distributing the immersive resources, and those who will be using them to learn. This has helped to produce a more informed response to the thesis question, in comparison to previous studies which tend to focus solely on how students view these technologies and not their teachers.

Limitations with this study can be identified. As previously discussed, some groups were disproportionately represented in Questionnaire A. This is because participants were gathered using opportunity sampling, which means that the data is based on the opinions of whoever was most convenient at the time. The most unexpected insight from this study was that there is no direct link between age and attitude towards immersive design, however it is difficult to identify whether this is an accurate statement or if it is a result of the lack of representation from older participants in the questionnaire. Despite this, when considering the representativeness of the sample, other factors such as occupation status present a true reflection of the research population. 71.1% of Questionnaire A participants were employed, which reflects the UK

employment rate of 75.5% (Employment in the UK - Office for National Statistics, 2022).

Opportunity sampling was initially chosen due to the time constraints of the study; however if additional time was available, a stratified sampling approach would produce a more representative set of data. Another limitation of the study is that Questionnaire B only received 5 responses, in comparison to the 45 responses for Questionnaire A. The use of gatekeepers to distribute the questionnaire meant there was a lack of direct contact between the researcher and teachers to encourage them to participate. This limits the representativeness of the data. Regardless of this, the use of open questions to collect qualitative data has allowed the study to remain high in validity.

Further research may be required to identify the long term effects of using immersive design for education. There is currently a lack of information in regards to this, due to these technologies only recently being integrated into everyday applications. It would therefore be interesting to identify if frequent exposure to AR and VR has any implications, in relation to academic achievement as well as physical and mental health. The lack of time and budget for this study meant that this information could not be researched first hand. As mentioned previously, Questionnaire B had a low response rate. Additional research on how teachers view immersive design in education would benefit this study. Questionnaire B only gathered information from primary and secondary school teachers, therefore it is recommended that future research investigates teachers from all stages of education, from early years up until university.

Overall, immersive design is considered beneficial in an educational setting due to the increased engagement which the technology is able to facilitate. However, traditional learning methods are encouraged to be used alongside AR and VR, to cater to the different learning styles.

Conclusion:

In conclusion, to a greater extent immersive design is beneficial in educational settings. This is because it has been shown to increase engagement levels, due to the increased opportunities for interactivity making the learning experience more interesting. Additional benefits which this dissertation identified include the increased accuracy and safety provided by recreating certain scenarios in VR, which is particularly useful for workplace training. The research has highlighted how immersive design can support learning theory, where interactive elements create a more complex learning experience than traditional methods. The data from this study therefore supports the thesis statement that immersive technology will enhance a user's learning experience. Both students and teachers demonstrated a generally positive response to the idea of immersive design, which suggests how integrating it into education is a viable solution to achieving high levels of academic engagement.

Despite this, immersive design should not be used in isolation and is recommended to be used alongside traditional teaching methods. This is because immersive design has shown to benefit some learning styles more than others, therefore using a combination of immersive and traditional learning resources will ensure that more people are catered for. Furthermore, concerns regarding the long term implications of immersive technology means that overexposure is not recommended until further research can be conducted.

As immersive technology develops, it is predicted to become more accessible as increased consumption causes the price of the required hardware and software to decrease. Moreover it can be anticipated that applications of immersive design become more subtle as it increasingly becomes used in everyday life. Immersive technology will become an essential resource for designers to become familiar with, as the user experience of products becomes more important to the consumer.

Based on the findings outlined in this dissertation, it can be concluded that the growth of immersive design is beneficial in educational settings. The technologies involved are able to provide high levels of interactivity, to assist traditional methods which cannot always achieve this, which consequently results in improved engagement and thus higher educational achievement.

Reference List:

- Baniasadi, T., Ayyoubzadeh, S. and Mohammadzadeh, N., 2020. Challenges and Practical Considerations in Applying Virtual Reality in Medical Education and Treatment. *Oman Medical Journal*, [online] 35(3), pp.e125-e125. Available at: <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7232669/>> [Accessed 14 November 2021].
- Barton, L., n.d. What is immersive technology. [Blog] *Advrtas*, Available at: <<https://advrtas.com/immersive-technology/>> [Accessed 19 November 2021].
- BBC News*, 2016. Pokemon Go: Man jumps into traffic playing smartphone game. Available at: <<https://www.bbc.co.uk/news/uk-northern-ireland-36854134>> [Accessed 15 December 2021].
- Bosch Bruguera, M., Ilk, V., Ruber, S. and Ewald, R., 2019. Use of Virtual Reality for astronaut training in future space missions - Spacecraft piloting for the Lunar Orbital Platform -Gateway (LOP-G). In: *70th International Astronautical Congress*. Washington D.C., pp.1-4.
- Chuttur, M., 2009. Overview of the Technology Acceptance Model: Origins, Developments and Future Directions. *Sprouts: Working Papers on Information Systems*, [online] 9. Available at: <https://www.researchgate.net/publication/277766395_Overview_of_the_Technology_Acceptance_Model_Origins_Developments_and_Future_Directions> [Accessed 8 April 2022].
- De Freitas, S., Rebolledo-Mendez, G., Liarokapis, F., Magoulas, G. and Poulouvassilis, A., 2009. Learning as immersive experiences: Using the four-dimensional framework for designing and evaluating immersive learning experiences in a virtual world. *British Journal of Educational Technology*, [online] 41(1), pp.69-85. Available at: <<https://bera-journals.onlinelibrary.wiley.com/doi/full/10.1111/j.1467-8535.2009.01024.x>> [Accessed 15 December 2021].
- Digital Marketing Blog*, 2022. How Much Time Does The Average Person Spend On Social Media?. Available at: <<https://www.digitalmarketing.org/blog/how-much-time-does-the-average-person-spend-on-social-media>> [Accessed 15 April 2022].
- Dunleavy, M., Dede, C. and Mitchell, R., 2008. Affordances and Limitations of Immersive Participatory Augmented Reality Simulations for Teaching and Learning. *Journal of Science Education and Technology*, [online] 18(1), pp.7-22. Available at: <https://www.jstor.org/stable/23036161?seq=1#metadata_info_tab_contents> [Accessed 15 December 2021].

Encyclopedia of Research Design, 2010. Triangulation. [online] Available at: <<https://methods.sagepub.com/reference/encyc-of-research-design/n469.xml>> [Accessed 27 April 2022].

Farnam Street, n.d. Remembering More of Everything: The Memory Palace. Available at: <<https://fs.blog/the-memory-palace/>> [Accessed 19 November 2021].

Farra, S., Gneuhs, M., Hodgson, E., Kawosa, B., Miller, E., Simon, A., Timm, N. and Hausfeld, J., 2019. Comparative Cost of Virtual Reality Training and Live Exercises for Training Hospital Workers for Evacuation. *CIN: Computers, Informatics, Nursing*, [online] 37(9), pp.446-454. Available at: <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7231540/>> [Accessed 14 November 2021].

Gaultney, J., 2010. The Prevalence of Sleep Disorders in College Students: Impact on Academic Performance. *Journal of American College Health*, [online] 59(2), pp.91-97. Available at: <<https://www.tandfonline.com/doi/full/10.1080/07448481.2010.483708>> [Accessed 25 November 2021].

Gilbert, N., 2021. 74 Virtual Reality Statistics You Must Know in 2021/2022: Adoption, Usage & Market Share. [Blog] *Finances Online*, Available at: <<https://financesonline.com/virtual-reality-statistics/>> [Accessed 12 December 2021].

Giza.fas.harvard.edu. n.d. *Digital Giza | About the Giza Project*. [online] Available at: <<http://giza.fas.harvard.edu/about/>> [Accessed 19 November 2021].

Guillette, S., 2019. Virtual reality: you've never seen history like this before. [Blog] *Verizon News Archives*, Available at: <<https://www.verizon.com/about/our-company/fourth-industrial-revolution/youve-never-seen-history-like-this>> [Accessed 19 November 2021].

Hawkinson, E. and Klaphake, J., 2020. Work-in-Progress—Legal and Ethical Issues in Immersive Education. *2020 6th International Conference of the Immersive Learning Research Network (iLRN)*, [online] Available at: <<https://ieeexplore.ieee.org/abstract/document/9155135>> [Accessed 24 November 2021].

Harm, D., Stroud, K. and Klaus, D., 2005. Preflight Adaptation Training for Spatial Orientation and Space Motion Sickness. *Aviat Space Environ Med*, 76(4), pp.352-356.

Baughman, A., 2019. *Evaluation of Virtual and Hybrid Reality Systems for Astronaut Training*. Master of Science Department of Aerospace Engineering Sciences. University of Colorado Boulder.

Kaimara, P., Oikonomou, A. and Deliyannis, I., 2021. Could virtual reality applications pose real risks to children and adolescents? A systematic review of ethical issues and concerns. *Virtual*

Reality, [online] Available at: <<https://link.springer.com/article/10.1007/s10055-021-00563-w#citeas>> [Accessed 24 November 2021].

Kurzweilai, 2018. Are virtual reality and augmented reality the future of education?. Available at: <<https://www.kurzweilai.net/are-virtual-reality-and-augmented-reality-the-future-of-education>> [Accessed 19 November 2021].

Li, C., Lalani, F., 2019. The COVID-19 pandemic has changed education forever. This is how. [Blog] *World Economic Forum*, Available at: <<https://www.weforum.org/agenda/2020/04/coronavirus-education-global-covid19-online-digital-learning/>> [Accessed 14 November 2021].

Li, L., Yu. F., Shi. D., Tian. Z., Yang. J., Wang. X., Jiang. Q. , 2017. Application of virtual reality technology in clinical medicine. *American journal of translational research* vol. 9, issue 9. p 3867-3880. [Accessed 13 November 2021].

Liu, X., Liu, Y., Zhu, X., An, M. and Hu, F., 2016. Virtual Reality Based Navigation Training for Astronaut Moving in a Simulated Space Station. *Lecture Notes in Computer Science*, pp.416-423.

Liu, R., Wang, L., Lei, J., Wang, Q. and Ren, Y., 2020. Effects of an immersive virtual reality-based classroom on students' learning performance in science lessons. *British Journal of Educational Technology*, [online] 51(6), pp.2034-2049. Available at: <<https://bera-journals.onlinelibrary.wiley.com/doi/full/10.1111/bjet.13028>> [Accessed 19 November 2021].

Logan, A., 1998. Training Beyond Reality. *IFAC Proceedings Volumes*, 31(33), pp.183-189.

McGowin, G., Fiore, S. and Oden, K., 2021. Learning Affordances: Theoretical Considerations for Design of Immersive Virtual Reality in Training and Education. *Proceedings of the Human Factors and Ergonomics Society Annual Meeting*, [online] 65(1), pp.883-887. Available at: <<https://journals.sagepub.com/doi/pdf/10.1177/1071181321651293>> [Accessed 15 December 2021].

No Isolation. 2021. *Why do many seniors have trouble using technology?*. [online] Available at: <<https://www.noisolation.com/research/why-do-many-seniors-have-trouble-using-technology>> [Accessed 16 November 2021].

O'Boyle, E., 2016. Organizations Going Above and Beyond to Engage Employees. [Blog] *Gallup*, Available at: <https://news.gallup.com/opinion/gallup/191765/organizations-going-above-beyond-engage-employees.aspx?g_source=EMPLOYEE_ENGAGEMENT&g_medium=topic&g_campaign=tiles> [Accessed 12 December 2021].

Ons.gov.uk. 2022. *Employment in the UK - Office for National Statistics*. [online] Available at: <<https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/bulletins/employmentintheuk/april2022>> [Accessed 30 April 2022].

tutor2u. n.d. *Opportunity Sampling*. [online] Available at: <<https://www.tutor2u.net/psychology/topics/opportunity-sampling>> [Accessed 5 April 2022].

Pettinger, T., 2019. Reasons for falling price of electronic goods. [Blog] *Economics Help*, Available at: <<https://www.economicshelp.org/blog/147811/economics/reasons-for-falling-price-of-electronic-goods/>> [Accessed 17 December 2021].

Scholar.google.com. n.d. *Google Scholar*. [online] Available at: <<https://scholar.google.com>> [Accessed 16 December 2021].

Spacey, J., 2017. What is Immersive Design?. [Blog] *Simplicable*, Available at: <<https://simplicable.com/new/immersive-design>> [Accessed 12 December 2021].

Thompson, C., 2017. Stereographs Were the Original Virtual Reality. [Blog] *Smithsonian Magazine*, Available at: <<https://www.smithsonianmag.com/innovation/sterographs-original-virtual-reality-180964771/>> [Accessed 15 October 2021].

Trukhanov, A., 2021. How VR Contributes to Space Exploration and Astronauts Training. [Blog] *PaleBlue*, Available at: <<https://pale.blue/2021/03/31/how-vr-contributes-to-space-exploration-and-astronauts-training/>> [Accessed 9 December 2021].

United Nations Sustainable Development. 2021. *Education - United Nations Sustainable Development*. [online] Available at: <<https://www.un.org/sustainabledevelopment/education/>> [Accessed 17 December 2021].

Visualise, 2021. Virtual Reality in Healthcare. Available at: <<https://visualise.com/virtual-reality/virtual-reality-healthcare>> [Accessed 12 November 2021].

VynZ Research. 2021. *Market Research Company Focuses On Providing Valuable Insights On Various Industries*. [online] Available at: <<https://www.vynzresearch.com/ict-media/augmented-reality-and-virtual-reality-market>> [Accessed 17 December 2021].

Wheatstone, C., 1838. XVIII. Contributions to the physiology of vision. —Part the first. On some remarkable, and hitherto unobserved, phenomena of binocular vision. *Philosophical Transactions*

of the Royal Society of London, [online] 128, pp.371-394. Available at: <<https://www.stereoscopy.com/library/wheatstone-paper1838.html>> [Accessed 15 October 2021].

Winch.primo.exlibrisgroup.com. n.d. [online] Available at: <https://winch.primo.exlibrisgroup.com/discovery/search?vid=44UOW_INST:config> [Accessed 16 December 2021].

Bibliography:

Future of Everything, n.d. What's The Future Of Graphic Design?. Available at: <<https://www.futureofeverything.io/future-graphic-design/>> [Accessed 4 September 2021].

International Conference on Digital Art and Graphic Design. 2021. [online] Available at: <<https://waset.org/digital-art-and-graphic-design-conference-in-june-2021-in-paris>> [Accessed 4 October 2021].

May, T., 2021. *The biggest trends in graphic design for 2021, as predicted by leading creatives*. [online] Creative Boom. Available at: <<https://www.creativeboom.com/features/the-biggest-trends-in-graphic-design-for-2021/>> [Accessed 4 September 2021].

medium, 2019. The past, present and future of graphic design. Available at: <<https://aorthar.medium.com/the-past-present-and-future-of-graphic-desine-20b869b297a>> [Accessed 4 September 2021].

Appendix 2: Questionnaire A questions

1. Do you give consent for your responses to be included in this study?

- Yes

- No

2. How old are you?

- <19

- 20-29

- 30-39

- 40-49

- 50-59

- 60+

3. What is your current education status?

- University Undergraduate

- University Postgraduate

- Apprenticeship

- College/Sixth Form

- Not Currently in Education

- Other

4. If 'Other' please specify

5. Are you currently employed?

- Yes

- No

6. If 'yes' what industry do you work in?

7. How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?

- Never heard of them

- Heard of, but don't know what they are

- Have a basic understanding

- Knowledgeable on the subject

8. In what ways have you experienced VR/AR previously? (Tick all that apply)

- Social Media

- Gaming

- Entertainment

- Retail

- Education

- Design

- Remote Collaboration

- Medical Treatments

- Other

- I have never used AR/VR

9. If 'other' please specify

10. Do you have any concerns regarding the growth of immersive technologies such as AR and VR?

11. How would you best describe your learning style?

- Visual
- Auditory
- Kinesthetic
- Reading and Writing

12. Do you find it difficult to engage with current learning resources?

- Yes
- No
- Sometimes

13. Have you ever used VR/AR for any form of learning (includes workplace training)

- Yes
- No

14. Do you have to complete regular workplace training?

- Yes
- No
- I don't work

15. Do you think you would benefit from using VR/AR learning resources?

- Yes
- No
- Maybe

16. Would you rather use AR /VR than traditional learning resources/methods?

- Would rather use AR and VR
- Would rather use traditional methods
- Would rather use a combination of both

17. Please explain why...

Appendix 3: Questionnaire A responses

Timestamp	Do you give consent for your responses to be included in this study?	How old are you?	What is your current education status?
2022/03/09 2:55:00 pm CET	Yes	<19	Not currently in education
2022/03/09 2:59:59 pm CET	Yes	40-49	Not currently in education
2022/03/09 3:00:18 pm CET	Yes	20-29	Not currently in education
2022/03/09 3:03:38 pm CET	Yes	20-29	University Undergraduate
2022/03/09 3:04:54 pm CET	Yes	20-29	University Undergraduate
2022/03/09 3:14:01 pm CET	Yes	20-29	University Postgraduate
2022/03/09 3:17:29 pm CET	Yes	40-49	Not currently in education
2022/03/09 3:22:06 pm CET	Yes	30-39	Not currently in education
2022/03/09 3:48:50 pm CET	Yes	20-29	Not currently in education
2022/03/09 3:54:42 pm CET	Yes	20-29	University Postgraduate
2022/03/09 3:55:35 pm CET	Yes	<19	University Undergraduate
2022/03/09 3:56:52 pm CET	Yes	20-29	University Postgraduate
2022/03/09 4:24:29 pm CET	Yes	20-29	University Undergraduate
2022/03/09 4:26:29 pm CET	Yes	20-29	University Postgraduate
2022/03/09 5:18:23 pm CET	Yes	20-29	University Undergraduate
2022/03/09 5:22:30 pm CET	Yes	30-39	Not currently in education
2022/03/09 5:23:41 pm CET	Yes	20-29	University Undergraduate
2022/03/10 2:58:13 am CET	Yes	20-29	University Undergraduate
2022/03/15 5:30:38 pm CET	Yes	20-29	University Undergraduate
2022/03/15 9:53:14 pm CET	Yes	20-29	University Undergraduate
2022/03/22 3:04:52 pm CET	Yes	20-29	Not currently in education
2022/03/22 5:55:36 pm CET	Yes	30-39	Not currently in education
2022/03/22 6:25:22 pm CET	Yes	50-59	University Postgraduate
2022/03/23 4:36:01 pm CET	Yes	60	Apprenticeship
2022/03/23 9:47:25 pm CET	Yes	20-29	University Postgraduate
2022/03/24 6:50:38 am CET	Yes	50-59	University Postgraduate
2022/03/25 7:13:41 am CET	Yes	20-29	University Undergraduate
2022/03/25 11:51:27 am CET	Yes	20-29	Not currently in education
2022/03/25 12:24:06 pm CET	Yes	20-29	University Undergraduate
2022/03/25 12:36:07 pm CET	Yes	20-29	University Undergraduate
2022/03/25 12:55:46 pm CET	Yes	20-29	University Undergraduate
2022/03/25 12:56:38 pm CET	Yes	20-29	Not currently in education
2022/03/25 1:41:58 pm CET	Yes	20-29	Not currently in education
2022/03/25 1:43:58 pm CET	Yes	20-29	Not currently in education
2022/03/25 1:44:51 pm CET	Yes	20-29	Not currently in education
2022/03/25 1:57:24 pm CET	Yes	20-29	Not currently in education
2022/03/25 3:05:15 pm CET	Yes	20-29	University Undergraduate
2022/03/25 3:16:33 pm CET	Yes	20-29	University Undergraduate
2022/03/25 5:59:03 pm CET	Yes	20-29	University Undergraduate
2022/03/25 7:53:50 pm CET	Yes	20-29	University Undergraduate
2022/03/25 8:41:29 pm CET	Yes	20-29	University Undergraduate
2022/03/25 11:42:18 pm CET	Yes	20-29	University Undergraduate
2022/03/25 11:46:43 pm CET	Yes	50-59	Not currently in education
2022/03/26 1:06:31 am CET	Yes	20-29	Not currently in education
2022/03/26 1:06:36 am CET	Yes	20-29	Not currently in education
2022/03/26 9:15:49 am CET	Yes	20-29	University Undergraduate

Timestamp	Are you currently employed?	If 'yes' what industry do you work in?	How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?
2022/03/09 2:55:00 pm CET	Yes	Service industry	Never heard of them
2022/03/09 2:59:59 pm CET	Yes	Digital Marketing	Have a basic understanding
2022/03/09 3:00:18 pm CET	Yes	Childcare	Have a basic understanding
2022/03/09 3:03:38 pm CET	No		Have a basic understanding
2022/03/09 3:04:54 pm CET	No		Have a basic understanding
2022/03/09 3:14:01 pm CET	Yes	Marketing	Have a basic understanding
2022/03/09 3:17:29 pm CET	Yes	Design & Marketing	Have a basic understanding
2022/03/09 3:22:06 pm CET	Yes	Software	Knowledgable on the subject
2022/03/09 3:48:50 pm CET	Yes	IT / Computer Systems	Knowledgable on the subject
2022/03/09 3:54:42 pm CET	Yes	Web 3.0/Accelerator/Start-ups	Knowledgable on the subject
2022/03/09 3:55:35 pm CET	Yes	Fundraising	Have a basic understanding
2022/03/09 3:56:52 pm CET	Yes	IT	Have a basic understanding
2022/03/09 4:24:29 pm CET	No		Heard of, but don't know what they are
2022/03/09 4:26:29 pm CET	Yes	IT	Have a basic understanding
2022/03/09 5:18:23 pm CET	No		Have a basic understanding
2022/03/09 5:22:30 pm CET	Yes	Online Marketing (Web Design & Development)	Have a basic understanding
2022/03/09 5:23:41 pm CET	No		Have a basic understanding
2022/03/10 2:58:13 am CET	No		Knowledgable on the subject
2022/03/15 5:30:38 pm CET	No		Knowledgable on the subject
2022/03/15 9:53:14 pm CET	No		Knowledgable on the subject
2022/03/22 3:04:52 pm CET	No		Never heard of them
2022/03/22 5:55:36 pm CET	Yes	Cleaning	Heard of, but don't know what they are
2022/03/22 6:25:22 pm CET	Yes	Personal Historian	Have a basic understanding
2022/03/23 4:36:01 pm CET	Yes	Prison service	Never heard of them
2022/03/23 9:47:25 pm CET	Yes	Hospitality	Knowledgable on the subject
2022/03/24 6:50:38 am CET	Yes	Healthcare	Have a basic understanding
2022/03/25 7:13:41 am CET	Yes	Automotive / Marketing	Knowledgable on the subject
2022/03/25 11:51:27 am CET	Yes	Recruitment	Have a basic understanding
2022/03/25 12:24:06 pm CET	No		Knowledgable on the subject
2022/03/25 12:36:07 pm CET	Yes	Cleaning.	Have a basic understanding
2022/03/25 12:55:46 pm CET	No		Have a basic understanding
2022/03/25 12:56:38 pm CET	Yes	Education	Have a basic understanding
2022/03/25 1:41:58 pm CET	Yes	Design	Have a basic understanding
2022/03/25 1:43:58 pm CET	Yes	Banking and finance	Knowledgable on the subject
2022/03/25 1:44:51 pm CET	Yes	Retail	Have a basic understanding
2022/03/25 1:57:24 pm CET	Yes	Building trade	Have a basic understanding
2022/03/25 3:05:15 pm CET	Yes	Catering	Have a basic understanding
2022/03/25 3:16:33 pm CET	Yes	Education	Have a basic understanding
2022/03/25 5:59:03 pm CET	No		Knowledgable on the subject
2022/03/25 7:53:50 pm CET	Yes	Retail	Have a basic understanding
2022/03/25 8:41:29 pm CET	No		Have a basic understanding
2022/03/25 11:42:18 pm CET	Yes	Retail	Knowledgable on the subject
2022/03/25 11:46:43 pm CET	Yes	Education	Knowledgable on the subject
2022/03/26 1:06:31 am CET	Yes	hospitality	Heard of, but don't know what they are
2022/03/26 1:06:36 am CET	Yes	hospitality	Heard of, but don't know what they are
2022/03/26 9:15:49 am CET	Yes	Health care	Have a basic understanding

Timestamp	In what ways have you experienced VR/AR previously? (Tick all that apply)
2022/03/09 2:55:00 pm CET	I have never used AR or VR
2022/03/09 2:59:59 pm CET	Design
2022/03/09 3:00:18 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment
2022/03/09 3:03:38 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Education;Design
2022/03/09 3:04:54 pm CET	Social Media (e.g. Snapchat filters);Gaming
2022/03/09 3:14:01 pm CET	Social Media (e.g. Snapchat filters);Gaming;Retail;Design
2022/03/09 3:17:29 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Design
2022/03/09 3:22:06 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Medical Treatments
2022/03/09 3:48:50 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Design
2022/03/09 3:54:42 pm CET	Social Media (e.g. Snapchat filters);Gaming;Design
2022/03/09 3:55:35 pm CET	Social Media (e.g. Snapchat filters);Entertainment
2022/03/09 3:56:52 pm CET	Gaming
2022/03/09 4:24:29 pm CET	Gaming
2022/03/09 4:26:29 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment
2022/03/09 5:18:23 pm CET	Social Media (e.g. Snapchat filters);Gaming;Retail
2022/03/09 5:22:30 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment
2022/03/09 5:23:41 pm CET	Social Media (e.g. Snapchat filters)
2022/03/10 2:58:13 am CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Education;Medical Treatments
2022/03/15 5:30:38 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment
2022/03/15 9:53:14 pm CET	Social Media (e.g. Snapchat filters);Gaming
2022/03/22 3:04:52 pm CET	Education
2022/03/22 5:55:36 pm CET	I have never used AR or VR
2022/03/22 6:25:22 pm CET	Gaming;Entertainment;Education
2022/03/23 4:36:01 pm CET	I have never used AR or VR
2022/03/23 9:47:25 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Design
2022/03/24 6:50:38 am CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Medical Treatments
2022/03/25 7:13:41 am CET	Social Media (e.g. Snapchat filters);Gaming
2022/03/25 11:51:27 am CET	Social Media (e.g. Snapchat filters);Gaming
2022/03/25 12:24:06 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Design
2022/03/25 12:36:07 pm CET	Social Media (e.g. Snapchat filters);Entertainment
2022/03/25 12:55:46 pm CET	I have never used AR or VR
2022/03/25 12:56:38 pm CET	Education
2022/03/25 1:41:58 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Education;Design
2022/03/25 1:43:58 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail
2022/03/25 1:44:51 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Retail;Education;Design
2022/03/25 1:57:24 pm CET	Gaming
2022/03/25 3:05:15 pm CET	I have never used AR or VR
2022/03/25 3:16:33 pm CET	Social Media (e.g. Snapchat filters)
2022/03/25 5:59:03 pm CET	Social Media (e.g. Snapchat filters);Gaming;Education
2022/03/25 7:53:50 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment
2022/03/25 8:41:29 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Education
2022/03/25 11:42:18 pm CET	Social Media (e.g. Snapchat filters);Gaming;Entertainment;Design
2022/03/25 11:46:43 pm CET	Gaming;Entertainment
2022/03/26 1:06:31 am CET	Social Media (e.g. Snapchat filters)
2022/03/26 1:06:36 am CET	Social Media (e.g. Snapchat filters)
2022/03/26 9:15:49 am CET	Social Media (e.g. Snapchat filters)

Timestamp	Do you have any concerns regarding the growth of immersive technologies such as AR and VR?
2022/03/09 2:55:00 pm CET	
2022/03/09 2:59:59 pm CET	Not really
2022/03/09 3:00:18 pm CET	
2022/03/09 3:03:38 pm CET	They are brilliant at countering the short attention spans of younger groups today, but I fear that too much digital will make people forget the value of physical learning.
2022/03/09 3:04:54 pm CET	
2022/03/09 3:14:01 pm CET	
2022/03/09 3:17:29 pm CET	
2022/03/09 3:22:06 pm CET	My main concerns are around privacy and security. The increase in remote military/policing/surveillance capabilities led by vr/ar technology may lead to increasing issues of the users of the software being disconnected to the people it affects.
2022/03/09 3:22:06 pm CET	
2022/03/09 3:22:06 pm CET	If used properly I think they could aid certain industries such as the medical one
2022/03/09 3:55:35 pm CET	Not many
2022/03/09 3:56:52 pm CET	-
2022/03/09 4:24:29 pm CET	
2022/03/09 4:26:29 pm CET	
2022/03/09 5:18:23 pm CET	
2022/03/09 5:22:30 pm CET	If the adoption rate of VR picks up and the technology improves to the point that it is near impossible to distinguish the experience from a real world one, I could see it becoming extremely addictive. Much like social media has transformed from a convenient way to stay in touch with friends and family into a never ending stream of micro dopamine hits, or battle royal games have meant it's hard to not have "just one more" game, Virtual Reality could just as easily be a place to get lost and escape the real world with no real by product of personal growth or contribution to society. I am less concerned that AR could become an addictive platform, but I do not relish the idea that it is used to overlay information during our every lives like receiving notifications or adverts.
2022/03/09 5:23:41 pm CET	yes- ar clips of altering people talking
2022/03/10 2:58:13 am CET	
2022/03/15 5:30:38 pm CET	AR could be dangerous if used in public by reducing situational awareness
2022/03/15 9:53:14 pm CET	Could lead to increase in mental illnesses
2022/03/22 3:04:52 pm CET	No
2022/03/22 5:55:36 pm CET	No
2022/03/22 6:25:22 pm CET	Not at all
2022/03/23 4:36:01 pm CET	
2022/03/23 9:47:25 pm CET	
2022/03/24 6:50:38 am CET	No
2022/03/25 7:13:41 am CET	
2022/03/25 11:51:27 am CET	
2022/03/25 12:24:06 pm CET	No not particularly
2022/03/25 12:36:07 pm CET	
2022/03/25 12:55:46 pm CET	
2022/03/25 12:56:38 pm CET	
2022/03/25 1:41:58 pm CET	Nope
2022/03/25 1:43:58 pm CET	Yes
2022/03/25 1:44:51 pm CET	No
2022/03/25 1:57:24 pm CET	Not really tbh
2022/03/25 3:05:15 pm CET	Potential injuries
2022/03/25 3:16:33 pm CET	How can we ensure that people of lower socioeconomic backgrounds are not left behind with these advancements?
2022/03/25 5:59:03 pm CET	
2022/03/25 7:53:50 pm CET	No
2022/03/25 8:41:29 pm CET	Beyond human control
2022/03/25 11:42:18 pm CET	
2022/03/25 11:46:43 pm CET	No
2022/03/26 1:06:31 am CET	
2022/03/26 1:06:36 am CET	
2022/03/26 9:15:49 am CET	

Timestamp	How would you best describe your learning style?	Do you find it difficult to engage with current learning resources?	Have you ever used VR/AR for any form of learning (includes workplace training)
2022/03/09 2:55:00 pm CET	Kinaesthetic (Learning through physical interaction)	Yes	No
2022/03/09 2:59:59 pm CET	Kinaesthetic (Learning through physical interaction)	Sometimes	No
2022/03/09 3:00:18 pm CET	Auditory (Learning by listening)	Yes	No
2022/03/09 3:03:38 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/09 3:04:54 pm CET	Kinaesthetic (Learning through physical interaction)	Yes	No
2022/03/09 3:14:01 pm CET	Reading and Writing	No	No
2022/03/09 3:17:29 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/09 3:22:06 pm CET	Auditory (Learning by listening)	Sometimes	No
2022/03/09 3:48:50 pm CET	Reading and Writing	Sometimes	Yes
2022/03/09 3:54:42 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/09 3:55:35 pm CET	Kinaesthetic (Learning through physical interaction)	No	No
2022/03/09 3:56:52 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/09 4:24:29 pm CET	Visual (Learning using visual elements)	Yes	No
2022/03/09 4:26:29 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/09 5:18:23 pm CET	Kinaesthetic (Learning through physical interaction)	Sometimes	Yes
2022/03/09 5:22:30 pm CET	Kinaesthetic (Learning through physical interaction)	No	No
2022/03/09 5:23:41 pm CET	Reading and Writing	Sometimes	No
2022/03/10 2:58:13 am CET	Visual (Learning using visual elements)	No	Yes
2022/03/15 5:30:38 pm CET	Visual (Learning using visual elements)	Yes	No
2022/03/15 9:53:14 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/22 3:04:52 pm CET	Reading and Writing	Yes	No
2022/03/22 5:55:36 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/22 6:25:22 pm CET	Kinaesthetic (Learning through physical interaction)	Sometimes	No
2022/03/23 4:36:01 pm CET	Visual (Learning using visual elements)	No	No
2022/03/23 9:47:25 pm CET	Kinaesthetic (Learning through physical interaction)	Yes	Yes
2022/03/24 6:50:38 am CET	Visual (Learning using visual elements)	Sometimes	Yes
2022/03/25 7:13:41 am CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 11:51:27 am CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 12:24:06 pm CET	Visual (Learning using visual elements)	No	Yes
2022/03/25 12:36:07 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 12:55:46 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 12:56:38 pm CET	Visual (Learning using visual elements)	Sometimes	Yes
2022/03/25 1:41:58 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 1:43:58 pm CET	Kinaesthetic (Learning through physical interaction)	Yes	No
2022/03/25 1:44:51 pm CET	Visual (Learning using visual elements)	Sometimes	Yes
2022/03/25 1:57:24 pm CET	Visual (Learning using visual elements)	No	No
2022/03/25 3:05:15 pm CET	Kinaesthetic (Learning through physical interaction)	Yes	No
2022/03/25 3:16:33 pm CET	Visual (Learning using visual elements)	Yes	No
2022/03/25 5:59:03 pm CET	Visual (Learning using visual elements)	Sometimes	Yes
2022/03/25 7:53:50 pm CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/25 8:41:29 pm CET	Visual (Learning using visual elements)	Yes	No
2022/03/25 11:42:18 pm CET	Visual (Learning using visual elements)	Yes	No
2022/03/25 11:46:43 pm CET	Visual (Learning using visual elements)	No	No
2022/03/26 1:06:31 am CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/26 1:06:36 am CET	Visual (Learning using visual elements)	Sometimes	No
2022/03/26 9:15:49 am CET	Kinaesthetic (Learning through physical interaction)	No	No

Timestamp	Do you have to complete regular workplace training?	Do you think you would benefit from using VR/AR learning resources?
2022/03/09 2:55:00 pm CET	Yes	Maybe
2022/03/09 2:59:59 pm CET	No	Maybe
2022/03/09 3:00:18 pm CET	No	Yes
2022/03/09 3:03:38 pm CET	I don't work	Maybe
2022/03/09 3:04:54 pm CET	I don't work	Yes
2022/03/09 3:14:01 pm CET	No	Maybe
2022/03/09 3:17:29 pm CET	Yes	Maybe
2022/03/09 3:22:06 pm CET	No	Maybe
2022/03/09 3:48:50 pm CET	No	Maybe
2022/03/09 3:54:42 pm CET	No	Maybe
2022/03/09 3:55:35 pm CET	Yes	Yes
2022/03/09 3:56:52 pm CET	No	Yes
2022/03/09 4:24:29 pm CET	I don't work	Maybe
2022/03/09 4:26:29 pm CET	No	Maybe
2022/03/09 5:18:23 pm CET	No	Yes
2022/03/09 5:22:30 pm CET	No	Yes
2022/03/09 5:23:41 pm CET	I don't work	Maybe
2022/03/10 2:58:13 am CET	I don't work	Yes
2022/03/15 5:30:38 pm CET	I don't work	Yes
2022/03/15 9:53:14 pm CET	I don't work	Yes
2022/03/22 3:04:52 pm CET	I don't work	No
2022/03/22 5:55:36 pm CET	No	Maybe
2022/03/22 6:25:22 pm CET	No	Maybe
2022/03/23 4:36:01 pm CET	Yes	Maybe
2022/03/23 9:47:25 pm CET	Yes	Maybe
2022/03/24 6:50:38 am CET	Yes	Yes
2022/03/25 7:13:41 am CET	Yes	Maybe
2022/03/25 11:51:27 am CET	Yes	Yes
2022/03/25 12:24:06 pm CET	I don't work	Yes
2022/03/25 12:36:07 pm CET	Yes	Maybe
2022/03/25 12:55:46 pm CET	I don't work	Maybe
2022/03/25 12:56:38 pm CET	Yes	Yes
2022/03/25 1:41:58 pm CET	Yes	Maybe
2022/03/25 1:43:58 pm CET	Yes	Yes
2022/03/25 1:44:51 pm CET	Yes	Yes
2022/03/25 1:57:24 pm CET	Yes	Yes
2022/03/25 3:05:15 pm CET	Yes	Maybe
2022/03/25 3:16:33 pm CET	Yes	Maybe
2022/03/25 5:59:03 pm CET	I don't work	Maybe
2022/03/25 7:53:50 pm CET	Yes	Maybe
2022/03/25 8:41:29 pm CET	Yes	Yes
2022/03/25 11:42:18 pm CET	No	Yes
2022/03/25 11:46:43 pm CET	Yes	Yes
2022/03/26 1:06:31 am CET	No	No
2022/03/26 1:06:36 am CET	No	No
2022/03/26 9:15:49 am CET	Yes	No

Timestamp	Would you rather use AR /VR than traditional learning resources/methods?
2022/03/09 2:55:00 pm CET	Would rather use a combination of both
2022/03/09 2:59:59 pm CET	Would rather use a combination of both
2022/03/09 3:00:18 pm CET	Would rather use a combination of both
2022/03/09 3:03:38 pm CET	Would rather use a combination of both
2022/03/09 3:04:54 pm CET	Would rather use a combination of both
2022/03/09 3:14:01 pm CET	Would rather use traditional methods/ resources
2022/03/09 3:17:29 pm CET	Would rather use a combination of both
2022/03/09 3:22:06 pm CET	Would rather use a combination of both
2022/03/09 3:48:50 pm CET	Would rather use a combination of both
2022/03/09 3:54:42 pm CET	Would rather use a combination of both
2022/03/09 3:55:35 pm CET	Would rather use a combination of both
2022/03/09 3:56:52 pm CET	Would rather use a combination of both
2022/03/09 4:24:29 pm CET	Would rather use a combination of both
2022/03/09 4:26:29 pm CET	Would rather use a combination of both
2022/03/09 5:18:23 pm CET	Would rather use a combination of both
2022/03/09 5:22:30 pm CET	Would rather use a combination of both
2022/03/09 5:23:41 pm CET	Would rather use a combination of both
2022/03/10 2:58:13 am CET	Would rather use VR and AR
2022/03/15 5:30:38 pm CET	Would rather use VR and AR
2022/03/15 9:53:14 pm CET	Would rather use VR and AR
2022/03/22 3:04:52 pm CET	Would rather use a combination of both
2022/03/22 5:55:36 pm CET	Would rather use traditional methods/ resources
2022/03/22 6:25:22 pm CET	Would rather use a combination of both
2022/03/23 4:36:01 pm CET	Would rather use a combination of both
2022/03/23 9:47:25 pm CET	Would rather use a combination of both
2022/03/24 6:50:38 am CET	Would rather use VR and AR
2022/03/25 7:13:41 am CET	Would rather use a combination of both
2022/03/25 11:51:27 am CET	Would rather use a combination of both
2022/03/25 12:24:06 pm CET	Would rather use a combination of both
2022/03/25 12:36:07 pm CET	Would rather use a combination of both
2022/03/25 12:55:46 pm CET	Would rather use a combination of both
2022/03/25 12:56:38 pm CET	Would rather use a combination of both
2022/03/25 1:41:58 pm CET	Would rather use a combination of both
2022/03/25 1:43:58 pm CET	Would rather use VR and AR
2022/03/25 1:44:51 pm CET	Would rather use a combination of both
2022/03/25 1:57:24 pm CET	Would rather use a combination of both
2022/03/25 3:05:15 pm CET	Would rather use a combination of both
2022/03/25 3:16:33 pm CET	Would rather use a combination of both
2022/03/25 5:59:03 pm CET	Would rather use a combination of both
2022/03/25 7:53:50 pm CET	Would rather use a combination of both
2022/03/25 8:41:29 pm CET	Would rather use traditional methods/ resources
2022/03/25 11:42:18 pm CET	Would rather use a combination of both
2022/03/25 11:46:43 pm CET	Would rather use a combination of both
2022/03/26 1:06:31 am CET	Would rather use traditional methods/ resources
2022/03/26 1:06:36 am CET	Would rather use traditional methods/ resources
2022/03/26 9:15:49 am CET	Would rather use a combination of both

Timestamp	Please explain why...
2022/03/09 2:55:00 pm CET	
2022/03/09 2:59:59 pm CET	I consider that a mix of content is more interesting than solely one medium.
2022/03/09 3:00:18 pm CET	In the ways that the traditional methods may not work for people, the vr/ar might. Plus it's a new, entertaining technique of learning.
2022/03/09 3:03:38 pm CET	Physical and Digital interactions are stimulating and keep users on their toes. Writing down what you learnt in an VR experience will further engrain it in your memory, with the notes as reference for future learning.
2022/03/09 3:04:54 pm CET	I enjoy learning by doing things. It helps me memorize better.
2022/03/09 3:14:01 pm CET	
2022/03/09 3:17:29 pm CET	I find benefit in many methods of learning, always happy to try new ideas especially if it helps bed in a new skill.
2022/03/09 3:22:06 pm CET	Ar/Vr seems perfect for learning generally but I feel the benefits of 'natural' learning are perhaps non-tangible e.g. being in and around subject experts outside the
2022/03/09 3:48:50 pm CET	For academic "exam-like" subjects, I think traditional methods are still more efficient, but they can be so boring it's hard to stay engaged, which is where I imagine immersive learning would come in. I think a balance would work well. Although, I think hands-on skills like sports or simulators would benefit much better from this!
2022/03/09 3:54:42 pm CET	I believe it could be entertaining to use in education for very short periods of time
2022/03/09 3:55:35 pm CET	Solely one learning method is a bit boring and VR headsets could make it more interactive
2022/03/09 3:56:52 pm CET	We need to be flexible. The best way to ensure flexibility is to combine and balance proven methods with innovations. Until those innovative methods become proven ones and then repeat :)
2022/03/09 4:24:29 pm CET	
2022/03/09 4:26:29 pm CET	
2022/03/09 5:18:23 pm CET	Learning provides basic understanding to be applied to VR/AR
2022/03/09 5:22:30 pm CET	I could see a future where it could be extremely useful to augment teaching with interactive experiments and challenges. I personally learn best by doing something so in an education setting AR and VR could be very complimentary to helping you understand where you are making mistakes and increase your accuracy for physical tasks. I feel that it would work well if the educator had access to demonstrations that would otherwise be impossible. I think the technology would be wasted on teaching you to do real world tasks like cooking as there are so many more senses involved in learning how to do that. But certainly in a subject like Science it would be exciting to explore the universe or zoom down to a micro scale and explore atoms. For the right subject matter it could be very beneficial.
2022/03/09 5:23:41 pm CET	i know which methods work well for me but also would be keen to try new methods
2022/03/10 2:58:13 am CET	
2022/03/15 5:30:38 pm CET	Everything becomes much more interesting and easier to understand when it comes to life in front of you. I think it could transform early-age education by making it more interactive and therefore enjoyable for kids. It could blur the line between learning and playing.
2022/03/15 9:53:14 pm CET	It's more practical and research has shown it works
2022/03/22 3:04:52 pm CET	Don't no
2022/03/22 5:55:36 pm CET	
2022/03/22 6:25:22 pm CET	VR/AR could bring interactivity that traditional methods do not provide.
2022/03/23 4:38:01 pm CET	
2022/03/23 9:47:25 pm CET	
2022/03/24 6:50:38 am CET	I think it gives a sense of reality which is easier to relate too
2022/03/25 7:13:41 am CET	
2022/03/25 11:51:27 am CET	
2022/03/25 12:24:06 pm CET	AR and VR will provide a unique learning experience
2022/03/25 12:36:07 pm CET	
2022/03/25 12:55:46 pm CET	
2022/03/25 12:56:38 pm CET	
2022/03/25 1:41:58 pm CET	Way more engaging than watching a video or reading a script.
2022/03/25 1:43:58 pm CET	
2022/03/25 1:44:51 pm CET	Will allow for a more visual learning while still utilising current methods.
2022/03/25 1:57:24 pm CET	I feel using both would benefit me
2022/03/25 3:05:15 pm CET	Feel traditional learning methods do work for some subjects.
2022/03/25 3:16:33 pm CET	I am not yet confident with The technology but I feel it has massive potential
2022/03/25 5:59:03 pm CET	
2022/03/25 7:53:50 pm CET	
2022/03/25 8:41:29 pm CET	Prefer seeing things physically in front of me
2022/03/25 11:42:18 pm CET	In case i dont engage with one or the other, i still have a choice
2022/03/25 11:46:43 pm CET	I think AR/VR would be very useful for certain aspects of learning. In person is usually preferable. VR/AR can be more interesting and impactful than reading books, normal online training and Zoom meetings. It can be especially effective for hands-on things like practical science, BTEC subjects, art. But it would be too much if all learning was VR/AR. And I think it might affect eyesight!
2022/03/26 1:06:31 am CET	
2022/03/26 1:06:36 am CET	
2022/03/26 9:15:49 am CET	

Appendix 4: Questionnaire B questions

1. Do you give consent for your responses to be included in this study?
 - Yes
 - No
2. How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?
 - Never heard of them
 - Heard of, but don't know what they are
 - Have a basic understanding
 - Knowledgeable on the subject
3. Which age group/ education level do you currently teach?
4. How would you describe the methods you use to teach?
5. Do you think that your pupils engage with these methods?
 - Yes
 - No
 - Sometimes
6. Do you find that pupils engage more when technology is involved?
 - Yes
 - No
7. Would you find the increased use of AR and VR teaching resources beneficial?
 - Yes
 - No
8. Do you think that AR and VR technology could ever replace traditional teaching methods?
 - Yes
 - No
 - To some extent

Appendix 5: Questionnaire B responses

Timestamp	Do you give consent for your responses to be included in this study?
2022/03/09 9:26:41 pm CET	Yes
2022/03/25 1:56:18 pm CET	Yes
2022/03/25 5:02:38 pm CET	Yes
2022/04/09 11:51:46 am CET	Yes
2022/04/09 5:48:10 pm CET	Yes

Timestamp	How familiar are you with VR (Virtual Reality) and AR (Augmented Reality)?
2022/03/09 9:26:41 pm CET	Heard of, but don't know what they are
2022/03/25 1:56:18 pm CET	Knowledgable on the subject
2022/03/25 5:02:38 pm CET	Have a basic understanding
2022/04/09 11:51:46 am CET	Have a basic understanding
2022/04/09 5:48:10 pm CET	Knowledgable on the subject

Timestamp	Which age group/ education level do you currently teach?
2022/03/09 9:26:41 pm CET	KS2 - junior school
2022/03/25 1:56:18 pm CET	Will be teaching years 7-11
2022/03/25 5:02:38 pm CET	Primary School
2022/04/09 11:51:46 am CET	Primary - Year 5/6
2022/04/09 5:48:10 pm CET	Year 2

Timestamp	How would you describe the methods you use to teach?
2022/03/09 9:26:41 pm CET	Variety of different steategies and methods used to suit needs of all learners
2022/03/25 1:56:18 pm CET	Mostly verbal and imteractive
2022/03/25 5:02:38 pm CET	Interactive whiteboard/Google classroom
2022/04/09 11:51:46 am CET	Blended learning - a mix of learning using technology and traditional teacher led classroom learning.
2022/04/09 5:48:10 pm CET	Practical

Timestamp	Do you think that your pupils engage with these methods?
2022/03/09 9:26:41 pm CET	Yes
2022/03/25 1:56:18 pm CET	Yes
2022/03/25 5:02:38 pm CET	Sometimes
2022/04/09 11:51:46 am CET	Sometimes
2022/04/09 5:48:10 pm CET	Yes

Timestamp	Do you find that pupils engage more when technology is involved?
2022/03/09 9:26:41 pm CET	Yes
2022/03/25 1:56:18 pm CET	Yes
2022/03/25 5:02:38 pm CET	Yes
2022/04/09 11:51:46 am CET	Yes
2022/04/09 5:48:10 pm CET	No

Timestamp	Would you find the increased use of AR and VR teaching resources beneficial?
2022/03/09 9:26:41 pm CET	Yes
2022/03/25 1:56:18 pm CET	Yes
2022/03/25 5:02:38 pm CET	Yes
2022/04/09 11:51:46 am CET	Yes
2022/04/09 5:48:10 pm CET	No

Timestamp	Do you think that AR and VR technology could ever replace traditional teaching methods?
2022/03/09 9:26:41 pm CET	No
2022/03/25 1:56:18 pm CET	To some extent
2022/03/25 5:02:38 pm CET	To some extent
2022/04/09 11:51:46 am CET	To some extent
2022/04/09 5:48:10 pm CET	No

Appendix 6: Research Ethics Form 1

Winchester University: Ethics Form 1

**RESEARCH ETHICS FORM 1****WHAT LEVEL OF REVIEW DO I NEED?****GUIDELINES**

This form is for staff and students. It will help you identify the level of review needed for your project. Before completing it, you need to:

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions.

The questions and checklist in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

Winchester University: Ethics Form 1

SECTION 1**DETERMINING WHETHER YOU REQUIRE ETHICS REVIEW**

YOUR RESEARCH
Project title: To what extent is the growth of immersive design beneficial in educational settings?
Your name: Maia McGhee

1.	Is the proposed activity classified as Research or Audit /Service Evaluation or similar?	
	<input checked="" type="checkbox"/> Research	<input type="checkbox"/> Audit or Service Evaluation
	<p>Use the Policy to help you answer this question. If the proposed activity meets the definition of research (see the policy), CONTINUE.</p> <p>If the activity is an audit or a service evaluation, STOP. You do not need to seek ethics approval, but you do need to formally register your project with UREC, along with a project outline. To do this complete Form 2.</p> <p>If you are unclear what type of activity you are undertaking, please refer to the Policy for additional types.</p>	
2.	Does the research involve living human participants, human samples or data derived from individuals who may be identifiable through that data?	
	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	<p>Use the Policy to help you answer this question.</p> <p>If you answer NO, SKIP to QUESTION 6 and CONTINUE.</p> <p>If you answer YES, CONTINUE.</p>	
3.	Is the research being conducted for a medicinal purpose?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>Use the Policy to help you answer this question. See Appendix 2 - FAQs and definitions.</p> <p>If you answer YES, and think your research comes under the definition of 'for a medicinal purpose,' it will need to be scrutinised by the Committee. Please email the Committee Chair (ethics1@winchester.ac.uk) for further guidance on what to do.</p> <p>If you answer NO, CONTINUE.</p>	
4.	Does your research require external ethics approval or review?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>For example, from the NHS or another overseeing body. Use the Policy to help you answer this question.</p> <p>If you answer NO, CONTINUE.</p> <p>If you answer YES, you need to formally register your project with UREC, along with the relevant external ethics approval. To do this complete Form 2.</p>	
5.	Is the project underway and, the researcher or PI, has moved institution to Winchester?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	If you answer YES , please read the following:	

Winchester University: Ethics Form 1

	<p>If the research began when the PI was employed at another institution but has subsequently moved to Winchester, and the project has previously been subjected to ethics scrutiny at that institution, then it need not go through ethics review again. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval.</p> <p>HOWEVER, if there have been significant changes to the original research design which have ethical implications or recruitment of a cohort of participants will be undertaken through Winchester, then the project will require ethics review and you should apply for approval, CONTINUE.</p> <p>If you answer NO, CONTINUE.</p>	
6.	Is the research collaborative?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>If you answer YES:</p> <ul style="list-style-type: none"> where the Principal Investigator (PI) of the research is located at another institution, it is their responsibility to seek ethics approval, including partner research sites. The outcome of ethics review by that institution should be communicated to UREC for formal recording. To do this complete Form 2 and include evidence of the previous ethics approval. where the PI is located at Winchester, then the project will undergo scrutiny as per Winchester's Ethics Policy, CONTINUE. <p>If you answer NO, CONTINUE.</p>	
7.	Is the research being conducted in another country?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>If you answer YES, please read the following:</p> <p>Where a project is conducted in another country, the researcher should consider if it is possible to obtain ethics review by a local research ethics committee or other relevant body. The outcome of such a review by that institution should be communicated to UREC for formal recording, along with a project outline. To do this complete Form 2.</p> <p>If this is not possible, the project should be reviewed by the University of Winchester, either at Faculty level or Committee depending on the nature of the proposed work, so CONTINUE.</p>	
8.	Does the research involve the use of documentary material, papers, literary works or archive documents in the public domain?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>Use the Policy to help you answer this question.</p> <p>If you answer NO because the works are in a private archive or closed collection, do the following: complete Form 2, including details of the nature of the private /closed collection and provide evidence of the permission to use this material for research purposes.</p> <p>If you answer YES, you need to formally register your project with UREC, along with a project description. To do this complete Form 2.</p>	
9.	Does the research involve the animals?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p>If you answer NO, CONTINUE.</p> <p>If you answer YES, you need to formally register your project with UREC, along with a copy of the relevant licence (if required). To do this complete Form 5.</p>	

Winchester University: Ethics Form 1

10.	Does the research involve environmental interventions?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	<p><i>If you answer NO, CONTINUE.</i></p> <p><i>If you answer YES, you need to formally register your project with UREC, along with a copy of the relevant licence (if appropriate). To do this complete Form 2</i></p>	
11.	Does the data you will collect contain <i>any</i> information that could be linked back to participants or that might identify them (e.g. name, address, photo, voice, email)?	
	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	<p><i>If you answer NO, you need to formally register your project with UREC. To do this complete Form 2.</i></p> <p><i>If you answer YES, CONTINUE.</i></p>	

☞ Reaching the end of these questions, **either** you will have been directed to complete a specific additional form **or** you should continue to section 2.

If you are still unsure whether you need ethics review or not, please re-read The Policy and email your query to ethics@winchester.ac.uk with details of your project.

SECTION 2**DETERMINING THE LEVEL OF ETHICS REVIEW REQUIRED**

Please mark with an <input checked="" type="checkbox"/> as appropriate	YES	NO
<p>Does the research involve individuals who are vulnerable?</p> <p><i>For example: vulnerable children, over-researched groups, people with learning difficulties, people with mental health problems, young offenders, people in care facilities, including prisons. For a note on research with children, see Appendix 2 of the Policy.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Does the research involve individuals in unequal relationships e.g. your own students?</p> <p><i>Please note:</i></p> <ol style="list-style-type: none"> 1. <i>students recruited via SONA are not considered 'your own students.' If you intend to recruit widely across the University or your Faculty (e.g. through snowball sampling or a mail shot) you do not need to consider such students as your own, even if some participants may be students you are directly involved with. Only tick "yes" if you are targeting your own students specifically.</i> 2. <i>if you are an undergraduate or postgraduate student carrying out research with children in either a school or early years setting, these DO NOT come under the category of your 'own students.'</i> 	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Will it be necessary for participants to take part in the study without their knowledge and consent at the time?</p> <p><i>For example: covert observation of people in non-public places, use of deception. See Appendix 2 of the Policy.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Will the study involve discussion of sensitive or personal topics?</p> <p><i>For example: (but not limited to) participants' relationships, emotions, sexual behaviour, experience of violence, mental health, gender, race / ethnicity status or experience, political or religious affiliations. Please refer to the Policy.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Is there a risk that the highly sensitive nature of the research topic might lead to disclosures from the participant concerning their own involvement in illegal activities or other activities that represent a threat to themselves or others which may need onward reporting?</p> <p><i>For example: sexual activity, drug use, illegal activities or professional misconduct.</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Might the research involve the sharing data or confidential information beyond the initial consent given?</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Might participant anonymity be compromised at any time during or after the study?</p> <p><i>For example: will the research involve respondents using the internet, social media, or other visual /vocal methods where respondents may be identified?</i></p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<p>Is the study likely to induce severe physical harm or psychological distress?</p>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Winchester University: Ethics Form 1

Does your research involve tissue samples covered by the Human Tissue Act (2004)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Is there a possibility that the safety of the researcher may be in question? <i>For example: research in high risk locations or with high risk groups.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Does the research involve creating, downloading, storing or transmitting material that may be considered to be unlawful, indecent, offensive, defamatory, threatening, discriminatory or extremist? <i>If you answer YES to this question, you must also contact the Director of IT Services, who must provide approval for the use of such data.</i>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Answering **NO** to **all** these questions means your project is eligible for Faculty level ethics review. You now need to complete Form 3.

Answering **YES** to **any** of these questions means your project will require Committee ethics review. You now need to complete Form 4.

Appendix 7: Research Ethics Form 3

Winchester University: Ethics Form 3

**RESEARCH ETHICS FORM 3****FACULTY REVIEW****GUIDELINES**

This form is for staff and students. It will help you set out the ethical aspects of your project that need to be reviewed. Before completing it, you need to:

1. Read *The University Research Ethics Policy*.
2. If you are a student, discuss the ethical aspects of your project with your supervisor.

It is your responsibility to follow the University's Policy on the ethical conduct of research and to follow any relevant academic guidelines or professional codes of practice pertaining to your study when answering these questions. This includes providing appropriate information sheets and consent forms and ensuring confidentiality in the storage and use of data.

The questions in this proforma are intended to guide your reflection on the ethical implications of your research. Explanatory notes and further details can be found in the Policy document.

If any aspect of your project changes during the course of the research, you must notify the Chair of UREC.

Winchester University: Ethics Form 3

SECTION 2

YOUR DETAILS	
1.1.	Your name: Maia McGhee
1.2.	Your department: Digital Media Design
1.3.	Your Faculty: Business, Law and Digital Technologies
1.4.	Your status:
	<input checked="" type="checkbox"/> Undergraduate Student <input type="checkbox"/> Staff (Professional Services)
	<input type="checkbox"/> Taught Master <input type="checkbox"/> Staff (Academic)
	<input type="checkbox"/> Research Degree Student <input type="checkbox"/> Other (please specify below)
1.5.	Your university email address: m.mcgree.19@unimail.winchester.ac.uk
1.6.	Your telephone number: 07525753631
	<u>For students only:</u>
1.7.	Your degree programme: Digital Media Design
1.8.	Your supervisor's name: Marina Brkljac, Rhys Lockley
1.9.	Your supervisor's department: Digital Media
1.10.	Your supervisor's email: marina.brkljac@winchester.ac.uk, rhys.lockley@winchester.ac.uk

SECTION 3

YOUR RESEARCH		
2.1.	Project title: To what extent is the growth of immersive design beneficial in educational settings?	
2.2.	Start date: March 2022	
2.3.	Expected completion date: April 2022	
2.4.	Expected location of data collection: (e.g. school, workplace, public place, University premises etc.) Online	
2.5.	Has funding been sought for this research?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
2.6.	If so, where have you applied for funding?	
2.7.	Has the funding been granted?	
	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> Pending
2.8.	Is the research collaborative? (e.g. co-investigators from another institution, at or with another organisation or colleagues in another department)	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	If yes, which?	
2.9.	Is Disclosure and Barring Service clearance required for your study? It is your responsibility to contact the Disclosure and Barring Service (DBS) to confirm whether or not clearance is needed prior to commencing recruitment or data collection. More information here	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
2.10.	Will your research be informed by guidelines from a professional association or specific, agreed standards of practice?	
	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	If yes, which?	

SECTION 4**PROJECT DESCRIPTION**

Please provide a brief description of your project in non-technical language (between 500-1000 words). This should include details of the research rationale, aim(s), research question(s), context (linking to some relevant literature), and methods (including details of participants, data collection (including examples /descriptions of any audio or visual stimuli to be presented to participants), data analysis) to be used. You should state any ethical issues that you have identified and how these will be dealt with. This overview should contain sufficient information to acquaint the reader with the principal features of the proposal. A copy of the full proposal may be requested if further information is deemed necessary.

Please use this section to list documentation that may be relevant to your application and append it to the submission (e.g. consent forms, information sheets, questionnaires etc.).

The aim of this study is to evaluate the effectiveness of immersive design in educational settings. This includes applications of AR and VR technology in schools and workplace training. The immersive design industry is growing rapidly and is increasingly being incorporated into everyday applications, including the education sector. This study will therefore help to identify how beneficial this trend is. I have already conducted secondary research, to gain an understanding of how VR and AR is currently being used for education. In particular, this includes how it is used in schools, medical and workplace training. I will be making use of the triangulation model, by comparing primary and secondary sources, to support my argument. By comparing the findings from academic studies with the opinions and experiences of individuals, it will help me to achieve a deeper understanding of the research topic. For example, by conducting interviews or questionnaires, it may reveal insights which had not been considered in the secondary sources (e.g. different uses of AR and VR technology).

I have chosen to conduct a survey as part of my primary research. I will be distributing the survey online, in order to quickly and easily reach a large amount of participants. The more participants I am able to reach, the more representative the data will be. Furthermore, distributing online will allow individuals to participate in their own time. This can lead to a higher response rate and more in-depth answers, where there is less immediate time pressure. Using a questionnaire will allow for a combination of qualitative and quantitative data to be collected, the use of open ended and multiple-choice questions.

I will be targeting my research at individuals who work in the education sector or are currently in education (e.g. university students). I will not be researching anyone under the age of 18, due to potential ethical and gatekeeping issues, however I will attempt to reach school teachers. I will also be targeting individuals who regularly have to complete workplace training, such as those in medical professions. The reasoning for these selected groups is to understand their current understandings of immersive design and whether they have used it before. I will categorise the results from the surveys, based on participants occupation/ education status.

The questionnaires will be created using Google forms. This will allow the respondents to remain anonymous. Using Google forms also means the questionnaires can be easily distributed online.

SECTION 5**REFINING THE LEVEL OF ETHICS REVIEW REQUIRED**

<i>Please mark with an <input checked="" type="checkbox"/> as appropriate</i>		YES	NO
1	Does the research involve members of the public in a research capacity as co-researchers? (I.e. as in participant research where involvement extends beyond data collection)	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Is there a risk of over-disclosure that may put the participants at risk or cause them any anxiety?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Will tissue samples (including blood) be obtained from participants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	Will the study require the co-operation of a gatekeeper for initial access to participants? (E.g. to students at school, to members of self-help group.)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Is the right to withdraw from the study withheld at any time, or not made explicit?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
6	Is there any reason participants may feel obliged to participate in the study against their will?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
8	Will the research involve administrative or secure data that requires permission from the appropriate authorities before use?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
10	Will financial inducements (other than reasonable expenses and compensation for time) be offered to participants?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
11	Are there payments to researchers /participants that may have an impact on the objectivity of the research?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
12	Is there any cause for uncertainty as to whether the research will fully comply with the requirements of the General Data Protection Regulation (GDPR) (2018)?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
13	Does any part of the project breach any codes of practice for ethics in place within the organisation in which the research is taking place?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
14	Are drugs, placebos or other substances (e.g. food substances, vitamins) to be administered to the study participants? Please note: for fast track review, it is expected that the study will not involve invasive, intrusive or potentially harmful procedures of any kind.	<input type="checkbox"/>	<input checked="" type="checkbox"/>
15	Is pain or more than mild discomfort likely to result from the study?	<input type="checkbox"/>	<input checked="" type="checkbox"/>
16	Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life? (E.g. involve prolonged or repetitive testing.)	<input type="checkbox"/>	<input checked="" type="checkbox"/>

If you answer **YES** to **any** of these questions, please use the next section to indicate which question you have said yes to, describe the ethical issue in the context of your study and how you will address it. If you have answered **NO** to all questions, complete section 6.

SECTION 6**ADDITIONAL INFORMATION AND AMENDMENTS**

Use this space to address ethical issues highlighted by the checklist in section 4, or to amend an original submission.

The study will require a gatekeeper to gain access to participants in some instances. I will conduct two surveys, one aimed at the general public, and one aimed at school teachers. The general public can be easily accessed via social media; however a gatekeeper will be needed to specifically reach the teachers.

SECTION 7

DECLARATION	
<p>I have read and understood the University of Winchester Research Ethics Policy and confirm that adequate safeguards in relation to the ethical issues raised by this research can and will be put in place. I am aware of and understand University procedures regarding Health and Safety. I understand that the ethical aspects of this project may be monitored by the University Research Ethics Committee.</p> <p>I understand my responsibilities as a researcher as described in the University of Winchester Research Ethics Policy.</p> <p>I declare that the answers above accurately describe the research as presently designed and that a new application will be submitted should the research design change in a way which would alter any responses given in Form 1 or here.</p>	
<input checked="" type="checkbox"/> I confirm that if a Risk Assessment is required I will complete it and have it co-signed by my Supervisor or Head of Department before data collection takes place.	
<input checked="" type="checkbox"/> I confirm that, if DBS clearance is required for my project, then I will seek it before the start of my project.	
<input checked="" type="checkbox"/> I confirm that my research does not include risks that might cause it to be excluded from coverage by the University's insurers.	
<input checked="" type="checkbox"/> I confirm that I have appropriate insurance for this research.	
Researcher's signature: Maia McGhee	
Date: 09/02/22	
<p>In addition, for students (undergraduates, masters, postgraduate, research):</p> <p>The student has the skills to carry out the proposed research. I undertake to monitor the student's adherence to the relevant research guidelines and codes of practice.</p>	
Supervisor's signature: Marina Brkljac	
Date: 07.03.2022	
R.Lockley	
06/03/22	

Please submit this form along with Form 1 to your Faculty Head of RKE or nominee (staff /PGR) or your supervisor (taught postgraduate students).

Please remember to append any forms or documents that may be relevant to your application (e.g. consent form, information sheet, questionnaire(s) etc.). Your form cannot be considered unless it is submitted with the required supporting documentation. Omitting to do so will delay the ethics review process.