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Investigating hesitancy in the use of Virtual Reality for education

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Executive Summary

This research examined the hesitancy towards Virtual Reality (VR) technology in the academic sphere, with a specific focus on its application in education. The primary objective was to investigate the attitudes of educators towards the integration of VR techniques in learning settings in order to inform future guidance and resources for educators to effectively engage with this technology in their educational practices. This project was undertaken as part of the Queen Mary Academy's Learner Intern Programme. This programme undertakes scholarship and development projects in partnership with our diverse learner population to better support innovative education at Queen Mary while also providing learners opportunities to further develop a wide range of employability skills.

This study employed a mixed-methods approach to investigate educators' attitudes toward the utilization of VR in teaching in higher education. A survey was sent to education staff (academic and/or professional services staff) in six schools/institutes at Queen Mary across three faculties chosen due to their emergent use of VR in learning. Following the survey, participants who expressed hesitancy toward VR technology were invited to participate in semi-structured interviews. An iterative, grounded thematic analysis approach was applied throughout this research project. Emerging themes from the survey phase informed the development and refinement of interview questions. Subsequently, interview data underwent a grounded thematic analysis to identify recurrent patterns and insights.

Even amongst those who are enthusiastic about educational technology, participants specified that VR remains somewhat inaccessible in terms of opportunities to experience and explore the technology. Participants expressed reluctance to using VR due to the perceived high-level of resource required to successfully integrate VR into their teaching, both in terms of hardware purchases but also time for their own training and the creation of VR teaching tools. Educators also appeared to be weighing that high cost versus the risk of the technology not working when it needs to most.

The following are recommendations that could form the basis for a framework that would help foster a culture of exploration of VR in educational settings. These recommendations aim to develop a space that encourages learning innovation more generally where all stakeholders in education at Queen Mary are genuinely valued and considered. Primarily these recommendations are aimed at central teams including the Queen Mary Academy, the Technology Enhanced Learning Team and Information Technology Services more generally, but local teams of educators and supporting staff also have an important role to play in the development and delivery of these recommendations.

1. Experiment to establish how and why VR should be used in various settings
2. Share knowledge and experiences
3. Consider various models for scaling
4. Develop trust amongst technology user

Contents

Introduction

This research examined the hesitancy towards Virtual Reality (VR) technology in the academic sphere, with a specific focus on its application in education. The primary objective was to investigate the attitudes of educators towards the integration of VR techniques in learning settings in order to inform future guidance and resources for educators to effectively engage with this technology in their educational practices. This research aligns with Queen Mary University of London's core values and supports its 2030 strategy, which aims to become the most inclusive university of its kind. This vision is realized through the delivery of an outstanding, inclusive, world-class education and student experience, co-created with our diverse student body, and enhanced by our world-leading research and the latest technological developments.

This project was undertaken as part of the Queen Mary Academy's Learner Intern Programme. This programme undertakes scholarship and development projects in partnership with our diverse learner population to better support innovative education at Queen Mary while also providing learners opportunities to further develop a wide range of employability skills.

Background

VR is an emerging technology used in education across various disciplinary fields. In his study on transforming medical education by using VR, Pottle (2019) defines VR as 'the use of software to create an immersive simulated environment.' Considering recent trends towards the digitalization of education spaces, especially in Higher Education Institutions (HEIs), it is vital to consider complexities that may arise with introducing newer education techniques.

The need for alternative teaching methods has seen a sharp rise, especially after the COVID-19 pandemic, as evidenced in Lythreatis et al.'s systematic review of the digital divide. The digital divide here refers to "the gap between people who have adequate access to information communication technology (ICT) and people who have poor or no access to ICT" (Soomro et al., 2020, as cited in Lythreatis et al., 2021). In the context of VR, the digital divide features predominantly in the level of skill required to set up and operate an immersive VR headset. Digital literacy proves to be a source of hesitancy when it comes to adopting newer processes in the classroom. The results of this study concluded that although socioeconomic standing is the factor that most strongly affects the digital divide, age and digital training are also significant factors. Hence, in order to reduce the effect of the digital divide among the working population, it is important for them to receive the necessary training, context, and resources required to embrace newer forms of technology and reduce any hesitancy towards using the same.

The most significant benefit of using VR is its ability to provide a simulated environment with fewer resources and time demanded from faculty. In medical education, for example, In medical education, interactive VR is most commonly used to simulate clinical settings such as hospital wards, parts of the anatomy, and interactions with patients or caregivers. Interactive VR replicates human interactions in the real world as closely as possible so that participants can receive immediate feedback, think critically, improve clinical recommendations, and gain insight into their performance before engaging with patients in a real clinical context. (Pottle, 2018). In this example, the benefits include: the space required for a VR setup is relatively more minor compared to in-person clinical settings; multiple students can undergo the simulation simultaneously; and more qualified educators can go through their interactions in the simulation to share incident-specific feedback. Furthermore, through VR, learners struggling with a particular scenario can repeat their experience and learn at their own pace.

Baniasadi et al. (2020), in their study on the Challenges and Practical Considerations in Applying Virtual Reality in Medical Education and Treatment, have identified potential challenges that arise when implementing VR techniques in learning in higher education. Some of the general difficulties elaborated in this study are: a reduced chance to engage in face-to-face interaction; the increased cost of purchasing VR units; training educators on the correct ways to implement VR in the classroom; and changing preconceived notions about using VR. The study also highlights some specific challenges, such as designing the interface to be as engaging as an in-person interaction, ensuring safety standards are met while accessing the software, making it accessible for those with disabilities, and making the virtual environment immersive enough to be an adequate substitute for a real-life setting. In some cases, VR may also be viewed as a 'game' rather than a tool for education, owing to its primary use in gaming systems. Arguments have also been raised about over-complicating simple procedures that can be taught better by using screen-based learning. Thus, several practical considerations need to be taken into account to ensure that the VR setup is beneficial and as authentic as possible.

Methods

This study employed a mixed-methods approach to investigate educators' attitudes toward the utilization of VR in teaching in higher education. The entire project was reviewed and received ethics approval from the Queen Mary Ethics of Research Committee.The research design encompassed two primary phases:

- **Survey Phase**: In the initial phase, participants were invited to complete a survey designed to identify prevailing themes related to educators' attitudes and perceptions regarding the use of VR in teaching; that survey is included here at Appendix A. This survey aimed to gather preliminary insights and establish a foundational understanding for subsequent in-depth exploration. There were nine survey questions in total which highlight three major insights into the study:
    - Experience with VR: aimed to gather information about participants' level of familiarity or prior experiences with VR
    - Barriers to Using VR: designed to understand the obstacles or challenges that educators may face when it comes to using VR systems
    - Level of comfort with VR systems: gauge participants' comfort and confidence levels in using Virtual Reality (VR) technology, particularly in an educational or classroom setting and receiving peer-peer assessment and feedback.

- **Interview Phase**: Following the survey, participants who expressed hesitancy toward VR technology were invited to participate in interviews. These interviews were semi-structured and designed to delve deeper into the underlying reasons and motivations the hesitancy expressed in the survey. The interview questions were informed by the emerging themes from the survey, enabling a more comprehensive exploration of participants' perspectives; those questions are included here at Appendix B.

The survey was sent to education staff (academic and/or professional services staff) in the following schools/institutes at Queen Mary across three faculties:

- Institute of Dentistry (IoD)
- Institute of Health Sciences Education (IHSE)
- School of Education and Drama (SED)
- School of Geography (Geo)
- School of Electronic Engineering and Computer Sciences (EECS)
- School of Physical and Chemical Sciences (SPCS)

These schools were chosen due to their emergent use of VR in teaching and to equally represent all three faculties at Queen Mary.

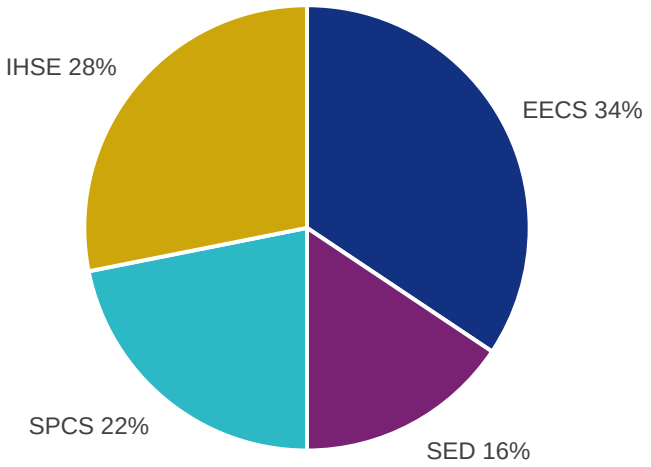
An iterative, grounded thematic analysis approach was consistently applied throughout this research project. Emerging themes from the survey phase informed the development and refinement of interview questions. Subsequently, interview data underwent a grounded thematic analysis to identify recurrent patterns and insights. The integration of both surveys and interviews provided a holistic understanding of educators' viewpoints and experiences concerning the use of VR in academic settings. This combined use of quantitative and qualitative data not only enhances the authenticity of the findings but also enables a more profound exploration of the research question.

Results

Survey data

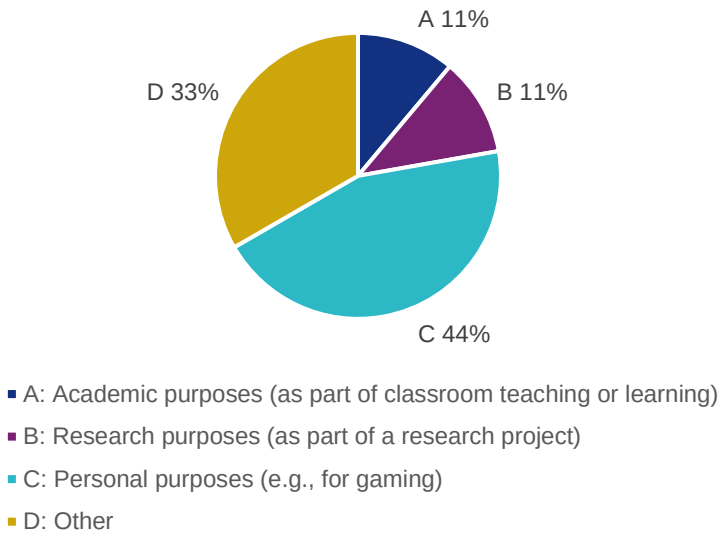
The survey was conducted from April to June 2023 and a total of 32 participants took part in the survey; the survey response window was expanded once to accommodate the availability of educators from different disciplines. Among the participants, there were 17 males, 11 females, and 4 individuals who did not specify their gender. Participants ranged in age from 25 to 64 years. The distribution of the participants across the six faculties listed can be found in Figure 1.

Figure 1 - Survey school distribution



The survey results revealed that only 28% of the participants had direct exposure to VR technology, whereas 78% had not engaged with it personally. Among those who had experienced VR, their experience was primarily for use outside of academia. The breakdown of their responses is in Figure 2.

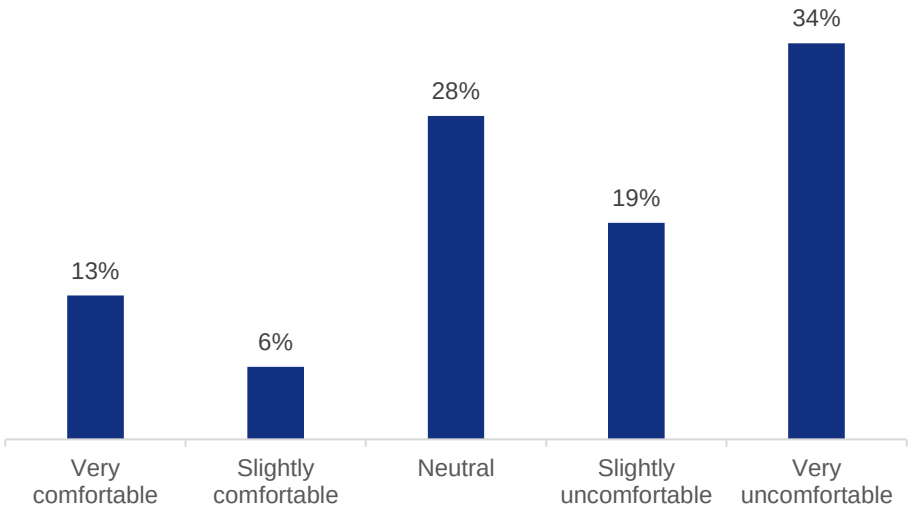
Figure 2 - What have you used VR systems for?



The majority of survey participants who lacked experience with VR (61%) cited the unavailability or limited access to VR technology as a primary barrier. That includes a subgroup who are enthusiastic about the use of VR but have not had sufficient access. The remaining participants who lacked experience with VR attributed it to their belief that it was not beneficial for their specific needs or applications.

With regards to levels of comfort with VR, survey participants feelings skewed towards discomfort with the idea of using VR in the classroom (Figure 3).

Figure 3 - Comfort level with using VR in the classroom



Participants were asked to expand upon their concern in a subsequent open text question Their concerns regarding VR use in the classroom reflect their lack of experience with VR expressed in previous questions.

"Because I have never used one or seen one in action. Given appropriate training and/or exposure, my responses would likely be different. Further, because of the nature of the subjects I teach I am not entirely sure if VR would be beneficial, however I am open to reviewing this."

"I am not familiar with VR and I still need to do some research into how I can introduce this into my teaching."

Their responses also highlighted concerns about the accessibility of VR especially with regards to potential physical discomfort experienced when using VR.

"Having extensively used VR in a personal context, I can see that, at least with current technology, there can be issues. VR can be unpleasant for some users, in particular when used over extended periods of time, and in worst case scenarios can lead to motion sickness, dizziness and discomfort that can persist for a significant period of time (on the timescale of a typical lesson)"

Finally, some respondents expressed concern about the ability to use complicated technology like VR in teaching spaces given their previous experiences with other forms of technology.

Even basic lecture recording doesn't work, AV fails, networks crash, learning environments stop being available mid lessons tests and even exams, software updates mid test in unavoidable ways, eduroam fails to work, no proper AV in rooms where we need them and more... We struggle to have enough machines and they didn't even come with earphones when it was vital."

"I teach large classes (over 100 students) and am uncomfortable about equipment issues when we cannot currently even reliably record classes. Trying to get headsets distributed to 100 students, and for them all to get them working would be a potential nightmare. I am not at all confident that our networks would cope with the traffic level to give a satisfactory experience. At the moment, VR material would be an expensive toy with little clear benefit in connection with the learning outcomes for my courses.

Interview data

Invitations to participate in an interview were sent to all survey participants who expressed that they were either slightly or very uncomfortable with the use of VR in the classroom. Five participants agreed to take part in an interview: four teaching staff members and one non-teaching staff member with administrative duties related to teaching. The interview questions were shaped by the responses to the surveys. Two themes emerged from the analysis of the interview transcripts:

- Benefits and limitations
- Need for resources and training

Even though these interview participants had expressed discomfort with VR during the survey, they were clear that they were open to using technology generally in their educational practices and spoke of other teaching methods they had employed. Furthermore, they acknowledged the potential of VR to make lesson more engaging and interactive. Participants further discussed the benefits of VR in enhancing students' understanding of complex subjects, highlighting the benefits of VR in making lessons more engaging and interactive. They also saw it as an additional tool for education and acknowledged its potential benefits.

"…I think, have a huge impact on students learning and engagement."

"… it's gonna bring lessons to life… it's going to let you see people's reactions… we'll be able to interact… bringing thought experiments to life, bringing a courtroom to life, bringing negotiations to life."

However not all interview participants saw the applicability their discipline and the subject needs of their learners. Furthermore, participants were clear that they perceived the challenges to using VR as still too numerous to use VR on a larger scale.

"… I find it hard to first of all imagine what I would be using VR technologies for, but secondly, even if I could imagine a scenario where VR would be a great technology for some specific purpose, I don't think I would have them myself."

Among these were the financial challenges of providing VR equipment to a large number of students and their potential lack of access to necessary equipment. Many also noted the time investment required for integrating VR into teaching and the limitations regarding accessibility. Participants highlighted the necessity for resources, including VR headsets, software, and relevant materials, to support VR implementation.

" It's quite a lot of work. And it can involve a lot of work, and it's not always easy to get access to the headsets."

"… getting access to the headsets…finding the right, finding the right access to the software and finding that… the time and resources to be to develop the software."

"…developing the virtual worlds involved a lot of work… the time and resources to be to develop the software."

Participants also emphasized the necessity for training, particularly for educators and also highlighted the distinction between VR technology and traditional software tools, suggesting that training is crucial for proper utilization.

"…initially there'll be a great deal of work to be done in, planning lectures and knowing how to make use of time productively…"

"…From the point of the educators… they've really do need some training…on every single aspect of it because they're the ones who are in the spotlight…"

Discussion and Recommendations

Though the survey and interview participant sample was small, it was clear that even amongst those who are enthusiastic about educational technology, VR remains somewhat inaccessible in terms of opportunities to experience and explore the technology. Not surprisingly, this corresponds to a lack of comfort around how such technology could be used in educational settings; even those with experience of VR tend to have gained that experience outside of their roles as educators. Further discussions with those who expressed the most discomfort with VR revealed that they identify this reluctance to be specific to this particular form of technology. That reluctance was strongly related to the perceived resource required to successfully integrate VR into their

teaching, both in terms of hardware purchases but also time for their own training and the creation of VR teaching tools.

Relatedly, educators appear to be weighing that high cost versus the risk of the technology not working when it needs to most. They note prior experiences with technological failures of what they describe as “basics”, presumably important but less resource-intensive (from their perspective) educational technologies. They seem to be arguing that if they technology does not functional on a foundational level, what good reason is there to incur the loss of resource that would accompany a VR failure while teaching.

The following are recommendations that could form the basis for a framework that would help foster a culture of exploration of VR in educational settings. These recommendations aim to develop a space that encourages learning innovation more generally where all stakeholders in education at Queen Mary are genuinely valued and considered. Primarily these recommendations are aimed at central teams including the Queen Mary Academy, the Technology Enhanced Learning Team and Information Technology Services more generally, but local teams of educators and supporting staff also have an important role to play in the development and delivery of these recommendations.

1. **Experiment to establish how and why VR should be used in various settings**. VR may not be the best mode of teaching in all disciplines, but all educators should consider whether there are opportunities to use VR to enhance accessibility of certain experiences, especially those involving travel that may exclude learners due to financial or mobility concerns. VR should be also considered as a potentially useful tool when exploring innovative pedagogical strategies (such as peer teaching, role-playing and simulations, gamification, case-based learning) as opposed to being through of as a strategy unto itself.
2. **Share knowledge and experiences**. Following on from the previous recommendation, where there is overlap in co-curricular areas of learning resources developed for VR may be more easily modified and used across the institution. Areas of learning that are co-curricular, like employability skill training, may be suitable for VR when more specific content areas are not. Central teams can play an important role in tracking use of VR across Queen Mary to better connect those working in this area. This includes supporting teams who own hardware to create opportunities for other teams to use their equipment for experimental and trials of their own.
3. **Consider various models for scaling.** The scenario in which VR becomes a centrally embedded pedagogical tool might mean that every student must have a headset. This would be challenging and costly scenario to implement due to the cost and the likelihood of hardware quickly being rendered obsolete. More modest scaling models may include hardware that can be borrowed either centrally or on a school/programme-level. This level of scale may be more palatable and therefore encourage experimentation.
4. **Develop trust amongst technology user**. Any form of technological education technology innovation will be hampered if the users, but at the educator and learner level, do not trust the infrastructure in which they are embed. Central teams need to work closely with educators to ensure that relationships are rebuilt in such a way that encourages input from all parties and enables users to feel supported enough to move beyond every use into more experimental modes of use.

Limitations and Conclusions

The primary limitation of this study is the small size of the samples. While there was breadth in terms of disciplines, only schools known to have some connection to existing VR projects were invited to take part. Nonetheless, findings presented here provide valuable insights into the ways in which educators are engaging (or not) with VR and hint at barriers that may prevent not only its implementation but also the implementation of

educational technologies. Given the importance of continually supporting innovation in our educational practices, these findings point to some preliminary recommendations that may further innovation in leaving at Queen Mary.

References

Baniasadi, T., Ayyoubzadeh, S. M., & Mohammadzadeh, N. (2020). Challenges and practical considerations in applying virtual reality in medical education and treatment. *Oman Medical Journal*, *35*(3). https://doi.org/10.5001/omj.2020.43

Kopp, M., Gröblinger, O., & Adams, S. (2019). Five common assumptions that prevent digital transformation at Higher Education Institutions. *INTED2019 Proceedings*, 1448–1457. https://doi.org/10.21125/inted.2019.0445

Lythreatis, S., Singh, S. K., & El-Kassar, A.-N. (2021). The Digital Divide: A Review and Future Research Agenda. *Technological Forecasting and Social Change*, *175*. https://doi.org/10.1016/j.techfore.2021.121359

Pottle, J. (2019). Virtual reality and the transformation of medical education. *Future Healthcare Journal*, *6*(3), 181–185. https://doi.org/10.7861/fhj.2019-0036

Ruggeri, K., Kácha, O., Menezes, I. G., Kos, M., Franklin, M., Parma, L., Langdon, P., Matthews, B., & Miles, J. (2018). In with the new? Generational differences shape population technology adoption patterns in the age of self-driving vehicles. *Journal of Engineering and Technology Management*, *50*, 39–44. https://doi.org/10.1016/j.jengtecman.2018.09.001

Appendices

Appendix 1: Survey questions

1. What is your age?
    - 18-24 years old.
    - 25-34 years old.
    - 35-44 years old.
    - 45-54 years old.
    - 55-64 years old.
2. What is your job title?
3. What school do you belong to?
    - Institute of Dentistry
    - Institute of Health Sciences Education
    - School of Education and Drama
    - School of Geography
    - School of Electronic Engineering and Computer Sciences
    - School of Physical and Chemical Sciences
    - Other
4. What is your gender identity?
    - Cisgender Male
    - Cisgender Female
    - Nonbinary
    - Prefer not to say
    - Other
5. Have you ever used immersive Virtual Reality (VR) systems?
    - Yes
    - No
    - Maybe
6. If yes, what have you used VR systems for?
    - Academic purposes (as part of classroom teaching or learning)
    - Research purposes (as part of a research project)
    - Personal purposes (e.g., for gaming)
7. If no, why have you not been able to use VR?
    - I do not think VR is beneficial to me
    - Although I am enthusiastic about VR, I have not had a chance to use it
    - I do not know how to use VR
    - Other
8. Would you feel more comfortable with using VR if you were given appropriate training and management skills for the same?
    - Yes

- No
- Maybe

9. Please rank your comfort level with using VR as part of the classroom (5-point Likert scale)
10. If you are comfortable with being contacted by the researchers for an in-depth interview, please leave your full name and email address below.

Appendix 2: Semi-structured interview questions

1. Could you tell me about any experiences you have had while using VR?
2. If VR used previously – Could you share some more details about your experience with using VR?
3. Could you tell me what you know about VR? (If no experience using VR)
4. What resources would you require to incorporate VR into your study methods?
5. Do you think using VR in the classroom has any limitations? If not, why not?
6. Do you think using VR in the classroom would be beneficial for you? If yes, how? If not, why not?
7. Have you experimented with mixed methods education techniques before?

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