

Ethical Considerations for the Application of Virtual Reality in Education and Training

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ABSTRACT

Virtual Reality (VR) refers to a visual experience that creates a fully immersive sensation surrounded by three-dimensional (3D) stereoscopic images of a virtually artificial or pre-recorded environment. Differing aspects of VR usage in different domains (e.g., aviation, healthcare, military, education etc.) have emerged in the past several decades. However, ethical issues in the use of VR along with its physical and psychological harm calls for a critical evaluation of the technology before it can be utilized for everyday use. The goal of this paper is to inspect the ethical implications involving both personal as well as the societal impact of deploying VR in education and training contexts. In addition, a few recommendations for ensuring the ethical use of VR in the future is presented.

Keywords: Virtual reality, Ethics, Education and training, Philosophy, Psychology

INTRODUCTION

Modern Virtual Reality (VR) lacks a unified definition; however, it largely refers to a visual experience that creates a fully immersive sensation surrounded with three-dimensional (3D) stereoscopic images of a virtually artificial or pre-recorded environment. Most contemporary VR systems adopt a Head-Mounted Display (HMD) setup, as it creates a highly immersive experience merging the affordances of stereoscopic display and 3D objects. VR has been gaining popularity in gaming, entertainment and education due to the increased availability of the technology and its lower cost (Madary & Metzinger, 2016). The usefulness of VR in different domains is increasingly being realized through empirical research, therefore, the continued effort to make the medium more suitable for widespread adoption continues.

The concept of using VR as a medium for instruction can be dated back to the 1950s which set its course for popular adoption in 1977 with the introduction of microcomputers (Pantelidis, 2010). However, the purpose of using VR in the education domain needs to be justified from a pedagogical point of view, as described by Pantelidis (2010). He theorized the affordance of this technology as suitable for constructivist, self-regulated and experiential learning through a first-person perspective in an immersive environment

(Pantelidis, 2010). VR in education and training is a convenient alternative for simulation where learning in the real environment poses risks to the learners or if the difference in cost is significant between an actual and a virtual environment. Moreover, specific learning situations may require 3D graphical representation of objects which users can manipulate in order to maximize learning outputs that are only possible in VR (Pantelidis, 1996). The ability to depict strong visual representation of learning materials in VR makes it a motivating factor for the learners where they can learn at their own pace (Pantelidis, 2010). VR can also be used to interact with virtual objects with multiple users in a virtual space which forms the basis of social interaction in learning. The adaptive nature of learning in VR also allows the learning content to be tailored for individual learner's characteristics which opens door to new possibilities in learner-centric education and training. A recent scientific review by Renganayagalu et al. (2021) examined the usefulness of VR in training cognitive, procedural and psychomotor skills after analyzing literature from the past 30 years. They reported VR training instances from different domains ranging from industrial training, firefighting, safety and emergency preparedness, healthcare, aviation, and aerospace as well as defense training. Moreover, specialized training areas such as sports, teacher training and even calligraphy were also reported to have used some form of VR in their training continuum (Renganayagalu et al., 2021).

Any new technological advancement has foreseen and unforeseen consequences to the user and to society at large, and thus the implications can potentially affect differing people or groups in vastly different ways. The adverse effects of widespread application of VR are not well understood either. Pantelidis (1996, 2010) also recommended against using VR for education and training where there is a risk of physical or emotional damage. Therefore, it is time that the potential negative consequences of VR are explored from differing dimensions before widespread implementation of this technology.

The goal of this paper is to explore the ethical implications of deploying VR in education and training. In addition, the discussion will include the limitations of using VR from a psychological point of view. Finally, a philosophical view is presented through which the use of VR, notwithstanding the mentioned issues, could be justified.

ETHICAL ISSUES IN USING VR

The novel affordances provided by VR, such as immersivity, presence, realism, or interactivity, can potentially cause harm to its users. Ethical concerns related to the usage of VR for individuals and society are described by Madary & Metzinger (2016). These concerns are discussed below with respect to education and training usage of VR technology:

First, the unknown risks related to long-term immersion is a major impediment in adopting VR as a generalized solution across an entire population. Current research addressing the link between immersion time and its impact on the users reports addiction along with different mental illness issues. The addictive nature of immersive VR has been reported for its use in tourism and

in gaming (Chou & Ting, 2003; Merckx & Nawijn, 2021). Manipulations of users' sense of agency, depersonalization disorder and loss of authentic social interaction may result from long-term exposure to VR (Madary & Metzinger, 2016). The sensation of agency differentiates VR from other forms of media with regard to moral status (Brey, 2020). Long-term immersion and its link with a false sense of agency is a form of violation of personal autonomy (Madary & Metzinger, 2016). Therefore, the potential negative consequences due to long-term immersion in VR may prevent its mass adoption as a learning tool.

Secondly, the loss of authenticity of the real environment and physical neglect of the social artefacts around us may be an unfortunate outcome of VR immersion. Consequently, our behaviour in VR could influence our real-world activities; for example, disrespecting virtual avatars in VR could lead us to treat real people with less respect in real world (Brey, 1999). The users may perceive virtual environments and associated interactions as more engaging than real-world counterparts though the authenticity of real-world social experiences may not be possible in VR. This phenomenon is conflicting with the required educational affordance of VR where accurate representation of real-world objects in virtual space is warranted for increased learning outcomes as discussed before (Pantelidis, 1996). However, such accurate representation of the real world in VR calls for further scrutiny from an ethical perspective focusing on what can or cannot be replicated in a virtual environment, since this technology can produce "virtually real experiences" combining higher perception of fidelity with "context realism" (Ramirez & LaBarge, 2018).

The management of risky content and associated behaviours is another major concern in virtual environments. The risk of exposure to violent contents and the isolation potential of VR environments pose questions for its suitability in educational contexts. As the experience in VR is more immersive, these potential risks hold more adverse behavioural consequences (Brey, 2020). Virtual avatars within VR environments provides the users a certain degree of freedom in their possibly anonymous actions. Since there is no guideline on how to control these actions, consisting of interpersonal violence such as virtual paedophilia and even virtual rape involving avatars, the associated psychological impact on the real users is a worrying concern (Madary & Metzinger, 2016). Moreover, the goal of VR technology is to facilitate human interaction in virtual space, but the heavy use of this technology providing the scope of animosity could potentially indulge people to act in a derogatory manner which they would not manifest otherwise in a real environment (Madary & Metzinger, 2016). Therefore, the first-person perspective in VR could also become an ethical concern (Brey, 2020), even though it is an important aspect of learning (Renganayagalu et al., 2021).

Privacy issues involve novel conflicts with the intention to use VR for education. Head and motion tracking in VR acts as an advantage to train spatial skills (Renganayagalu et al., 2021). However, tracking users neural and motor responses in virtual environments could be potentially used in

“neuromarketing”. For example, users’ eye movements, retinal characteristics and in extreme cases their motor intentions depicted through avatars could be emergent privacy breaches in VR (Madary & Metzinger, 2016).

Another contemporary issue with using VR is the higher risk of cybersickness and its aftereffects (Kemeny et al., 2020). Nausea, eyestrain, vomiting, disorientation, and vertigo are some of the symptoms of cybersickness whereas the aftereffects include disturbed locomotion, changes in postural control, perceptual-motor disturbances, flashbacks, drowsiness, fatigue etc. (Schulteis & Rothbaum, 2002). Moreover, different learners may perceive the usefulness of VR differently where some students may perform better than others. Poorly performing learners may lose their interest in VR and in the worst case may choose to discontinue the learning task altogether. This psychological dilemma with using is delineated by Schulteis & Rothbaum (2002) where they focused on different pre-existing self-traits of learners that might affect their performance in VR. Therefore, the question arises how ethical it is to use a technology that bears the risk of physical as well as psychological harm to its users.

PHILOSOPHICAL GROUND TO USE VR IN EDUCATION AND TRAINING

While VR has the potential to become an efficient learning tool, the issues presented above makes it a challenging approach forward for this technology. The VR technology available today is not yet optimized focusing all issues related to physical, psychological, or ethical dimensions associated with it. Therefore, it would be beneficial to scrutinize the technology through an ethical lens before its full-scale deployment into general education and training practices.

Despite having both physical and psychological risk potential in VR use, the research and development of this technology are still ongoing and evolving as the technology advances. Brey (1999) tried to justify the reason behind the continuous use of VR despite the likely moral conflicts using the two most influential theories of ethics: consequentialism and Kantian duty ethics. Consequentialism implies that the use of VR is ethically sound as long as it brings about the greatest good compared to the bad ones for the subjects that are affected by the technology (Brey, 1999). On the other hand, Kantian duty ethics implies that VR should never be used irrespective of how good the consequences are. However, Brey (1999) argues that issues related to Kantian duty ethics should be resolved through social dialogue which implies that VR should be used once the capability of this technology is accepted by society.

FUTURE DIRECTIONS

Since the usage of highly immersive VR will be increasing in the domains of education and training along with gaming and entertainment, the increasing authenticity of social interaction, as well as undesirable behaviours would become challenging to manage in a virtual space (Brey, 2020). Biased representation or misrepresentation of reality is also a matter of concern in virtual

environments. Critical simulations in medical training, 3D models of architectural designs, historic paintings, documentaries and different racial elements in education are especially susceptible to representation issues in VR (Brey, 1999). Therefore, restricting users from performing unethical actions in VR as well as ensuring an accurate representation of the real-world would be a necessity in VR environment design. The moral obligation of content developers who may be engaged in designing virtual environments and artefacts should steer them away from exercises that may harm others (Alpern, 1991).

Spiegel (2018) presented mental health, personal autonomy and personal privacy as public goods and consequently presented his argument about the need of legal regulations related to the use of VR. Informed consent should be explicitly obtained from the users of VR after making them aware of the possible repercussions that may arise from using virtual environments as learning media (Madary & Metzinger, 2016). Vulnerable user groups (e.g., children and people with latent mental illness etc.) could be excluded from using the VR solutions until the safety and ethical issues are properly addressed. Therefore, regulatory precautions are critical in safeguarding the physical and psychological well-being of VR users.

CONCLUSION

In this paper, both sides of using VR as a learning tool has been discussed. First, how VR can be a useful tool for efficient learning and then how its affordances could bring about some ethical concerns. Then a philosophical reasoning has been presented to justify the use of VR notwithstanding the ethical concerns.

Differing issues comprising privacy, psychological and physical harm were included in the discussion here concerning VR usage in education and training. However, these studies mostly sample adult users who are immersed for brief periods. Widespread adoption of VR in education and training will require it to be safe for users of all ages, especially for young adults and for a varying period. The long-term psychological, neurological, and physical effects of using VR including those on eye and vision in these under-developed group of people requires longitudinal studies to demonstrate the suitability of VR for education and training.

It is therefore clear that although VR has the potential to be used as an effective training medium, the lack of generalized solutions is not established. This notion should be taken into consideration during the design, development and implementation of education and training programs that is interested in utilizing VR as a tool. Future research and development including participants from a wide range of age groups, as well as employing diverse set of social and psychological variables in empirical investigations would help ameliorate ethical awareness of using VR.

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