



Impact of the Digitalization Level on the Assessment of Virtual Reality in Higher Education


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ABSTRACT

This paper conducts quantitative research on the assessment made by university professors of the didactic use of virtual reality technologies according to the level of technological development and digitization of their country. For this purpose, a survey was used, the responses to which were statistically analyzed, and the level of digitalization was differentiated through the country's global innovation index. The results show that the valuations of virtual reality as a teaching tool are high, but the competence for its use of university professors is intermediate. On the other hand, it was found that the higher the country's level of digital development, the more pronounced the gender gap in this study. Similarly, the higher the country's level of digital development, the smaller the age gap.

KEYWORDS

Digital Development, Digital Learning Environments, Digital Resources, Extended Reality, Higher Education, Innovation, Online Learning, Reality-Virtuality

INTRODUCTION

The outbreak of the COVID-19 pandemic in 2020 forced governments and administrations around the world to adopt restrictions on physical contact and mobility that particularly affected the education sector and, specifically, higher education (Sabu, 2020). Thus, a significant proportion of university students had to give up participation in face-to-face training activities and their professors had to look for methodological strategies and resources suited to a non-face-to-face teaching scenario (Vital-López, 2022).

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In this situation, professors had to suddenly strengthen the presence of digital learning environments and technologies that would allow students to develop the appropriate competences and keep alive the motivation and involvement of students with learning activities (Tejedor et al., 2020). In this sense, virtual reality (VR) technologies are among the tools that have proven to provide the best results (Nesenbergs, 2021). Indeed, these technologies allow immersion in simulated but realistic environments that help to visualize possibly complex three-dimensional objects –such as those presented, for example, in medical (Barteit et al., 2021), art, or architecture classrooms (Özgen et al., 2021)– and interact with them, thus virtually simulating laboratory activities –which is of great interest in science and engineering education (Vergara, Fernández-Arias et al., 2021).

VR technologies have proven to be well adapted to the academic requirements of different areas of knowledge and to the demands of non-face-to-face education (Lamb et al., 2019). However, they pose important limitations, such as technological infrastructure needs (Luo et al., 2021; Marks & Thomas, 2022), digital competence and faculty training (Cabero-Almenara et al., 2021), or the adaptation of professors to this type of environment (Antón-Sancho, Vergara, & Fernández-Arias, 2022). These limitations give rise to numerous gaps in the use and perception of VR technologies for various reasons, including cultural, gender or age (Vergara, Antón-Sancho et al., 2021). Due to the growing trend for the virtualization of educational environments and, in general, for the educational metaverse (Antón-Sancho & Sánchez-Calvo, 2022; Vergara-Rodríguez et al., 2022), the literature reflects the current interest in exploring the opinions of professors and students about the didactic use of these technologies –identifying the factors influencing these opinions –, because this can provide keys to improve faculty training in this regard (Vergara, Fernández-Arias et al., 2021; Vergara, Fernández-Arias et al., 2022).

Given the interest of this line of work, this study focuses on the perceptions about the didactic use of VR technologies of university professors, analyzing for this purpose a sample of 1234 professors from the Latin American and Caribbean region. Specifically, the influence of the level of technological and digital development of the country on the perceptions expressed is analyzed quantitatively. This level of development has been measured through the Global Innovation Index (WIPO, 2021). Specifically, conclusions are drawn about the behavior of gender and age gaps in perceptions of VR as a function of the level of digital development and some recommendations and lines of research are suggested based on the results.

LITERATURE REVIEW

VR Technologies in Higher Education

VR consists of a set of computational technologies that allow the user to immerse in a three-dimensional virtual environment in a realistic way and interact with it (Ospina-Bohórquez et al., 2022). Consequently, there are some characteristics that specifically define VR technologies and differentiate them from other computerized technologies (Slater, 2009; Sundar et al., 2010): (i) immersive character –i.e., the ability to generate the stimuli of the simulated environment–; (ii) 3D design –i.e., the sensation of three-dimensionality of that environment–; (iii) ability to generate sensory experiences; (iv) realism; and (v) interactivity –i.e., allowing the user to interact with the simulated environment–. Because of the above characteristics, VR has been abundantly applied to very different areas of knowledge in which three-dimensional representation and the ability to interact with those representations is crucial, including construction industry (Safikhani et al., 2022); arts (Kim & Lee, 2022); architecture (Gao & Li, 2022); history (Allal-Chérif, 2022); or medicine (Bruno et al., 2022).

The application of VR technologies in higher education, hereinafter referred to as the didactic use of VR, not only requires the professor to have sufficient technical knowledge and adequate access to the necessary equipment, but also the development of a series of specific digital competencies, of a techno-pedagogical nature, aimed at the professor being able to integrate the

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