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Research Trends of Augmented Reality-Related Studies in Education and Training – A Bibliometric Analysis

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ABSTRACT

Augmented reality (AR) is increasingly recognised for its ability to improve educational and training experiences by fostering learner engagement and performance. It has attracted academic interest since 2002. Presently, there is no comprehensive review of AR-related research in education and training. To address this gap, the current study utilised an VOS Viewer and Bibliometrix R-package software to analyse scientific AR literature in education and training. The analysis was focussed on the publication trend since 2002 and trending topics. Data was extracted from the Scopus database, resulting in 213 articles. Findings revealed AR in education and training as an active study area with a growing body of literature in recent years. This bibliometric review aims to guide future research directions by offering an overview of the present landscape of AR in education and training settings.

Keywords: Augmented reality, bibliometric analysis, education, training, VOS viewer

INTRODUCTION

Technological progress has reshaped everyday life, supporting the development of human skills, expanding knowledge access, and enhancing capabilities. An augmented reality (AR) is one example of a technology that is gaining traction in education and training (Mendoza-Ramírez et al., 2023). Studies in educational contexts highlight that AR applications can enhance a range of learner abilities, including cognitive development, innovation, self-direction, analytical reasoning, and independent thinking (Garzón et al., 2019). Other studies have shown that learners value the immersive and interactive experiences

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enabled by the AR tools, which contribute to better understanding and retention (Vrellis et al., 2020) as they facilitate their understanding and knowledge retention (Sun et al., 2022).

PROBLEM STATEMENT

Although the AR is beneficial in enhancing skills acquisition and learning motivation (Turan et al., 2018), it is not without challenges. Among the challenges associated with learning through augmented realities are technical difficulties, and issues with technology acceptance as well as usability (Ajit et al., 2020).Moreover, although the literature on AR applications in education and training has shown an increase in recent years, academic reviews that address its implications in these two settings are limited with Hincapie et al. (2021) and Min and Yu (2023) being the exceptions. In line with the growing interest in the AR in education and training, the current study employed bibliometric techniques that utilise various quantitative tools to analyse extensive literature data sets related to this topic (Donthu et al., 2021). Such analysis is significant to understand the trends and development patterns of research related to the AR in these two settings.

Our study utilised the Scopus database as the data source. Only studies related to the AR education and training settings were considered for the study, while those outside this scope were excluded. Analysis was conducted using the VOS Viewer and Bibliometrix R-package tools to visualise and interpret data.

RESEARCH QUESTIONS

RQ1. What are the research development patterns until 2024 in the AR-related research in education and training?

RQ2. What are the trending topics in the AR-related research in education and training?

A total of 213 articles were analysed in the examined period. Figure 1 shows the research development patterns from 2002 until 2024. There were very few papers published on the AR research from 2002 until 2017. In 2018, publications started to increase, showing an annual publication count exceeding ten per year. Interestingly, the past three years showed a surge in the number of publications, with 2023 being the most productive, yielding 41 articles. Given this current trend, it can be anticipated that there will be a growth in the number of publications in the coming years.

In our study, the minimum word frequency was set at 5, with an annual word count of 3. Figure 2 presents the AR trending topics related to education and training that are based on keyword usage by authors. It can be seen that the recent AR research in these settings has been associated with medical students, medical education, reviews, systematic reviews, humans, and mixed reality. The term “AR” began to receive significant attention in 2021, often appearing in conjunction with terms like “virtual reality”, “humans”, and “e-learning”.

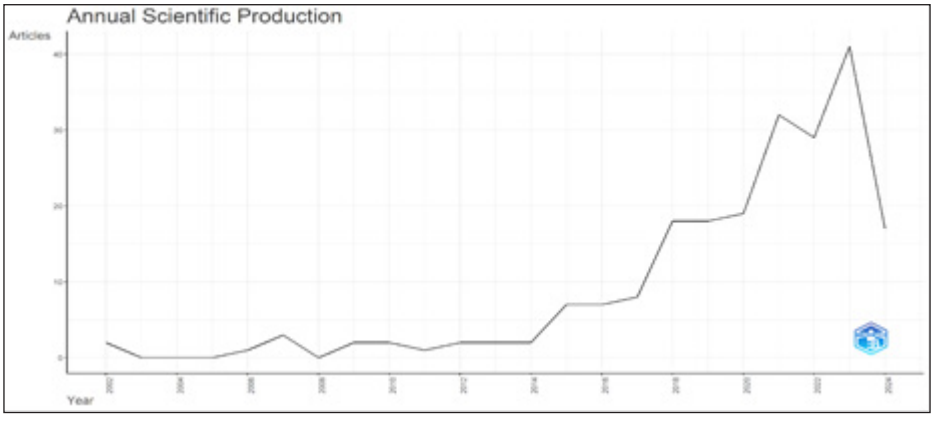

Figure 1. Total number of papers from 2002 to 2024

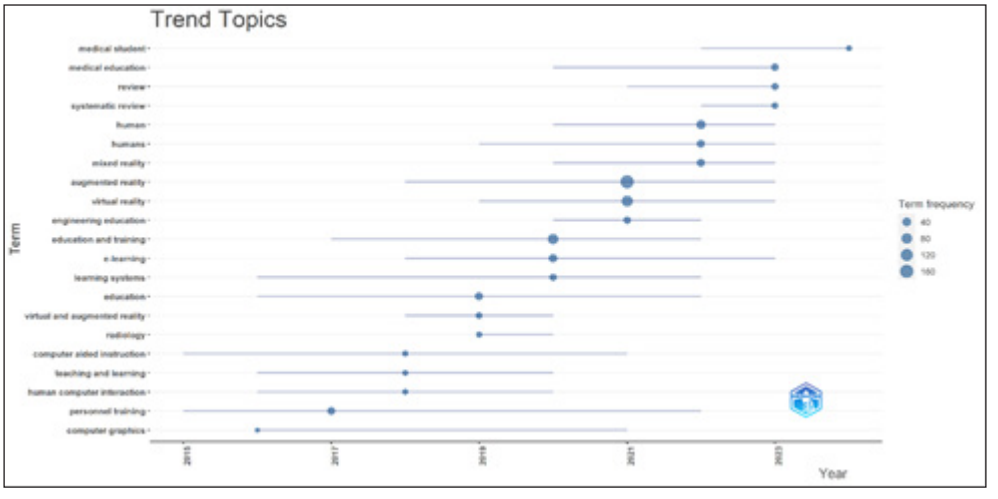

Figure 2. Trending topics with the use of keywords (*Source*: Bibliometric R-Package, Biblioshiny)

CONCLUSION

The current study addresses the state of the AR research in education and training by analysing research trends up to September 30, 2024. Key findings indicate that research started to increase since 2002 although the concept of the AR was introduced in 1968. Furthermore, this study stands out as the first bibliometric investigation specifically focussed on the AR-related research within the domains of education and training. The implication of this study underlines the relevance of the AR to enhance education and training. Future research may utilise other databases to provide a better overview of the trends in this area.

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