



THE LANDSCAPE OF LEARNING STYLES IN ONLINE LEARNING: A BIBLIOMETRIC REVIEW

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Abstract-

E-learning has evolved over the past years in the educational landscape. Several studies have defined that learning styles can significantly improve the academic performance if aligned with digital learning content. Research studies on learning style in digital environments provided mixed results. The results showed that online content if designed according to the needs of the learners can increase performance and engagement. Although, there are challenges too along with benefits. The challenges include the identification of learning styles and development of online courses often require proper training and resources. In the present bibliometric study, a gap has been identified on e-learning style research showing a need for more studies to design e-learning content. By addressing this research gap, learning strategies aligned with learning content could be developed for better learning outcomes.

Keywords- e-learning, students, learning styles, online education, personalized learning

Introduction-

In the fast changing field of education, the introduction of digital technology has fundamentally changed the approaches and ways of learning. (Farhan et al., 2023; Kumar & Priyanka, 2023; Zhao, 2023). The shift from traditional classroom settings to online learning environments presents unique challenges and opportunities for both educators and learners (Dhawan, 2020; Maphalala & Ajani, 2023).

Recognising students' varied learning styles is an important component of this transition. Understanding and addressing various learning styles in an online setting is essential for improving educational achievements and ensuring that all students have the opportunity to succeed. (Sousa et al., 2023; Liao, 2023; Dinh, 2023).

After the pandemic, the classroom learning shifted to online learning. Therefore, it become important for educational institutions to adopt online learning platforms for teaching learning process (Lemay et al., 2021; Khalil et al., 2020). Teachers and learners use technology in their own way for teaching learning. In short, it helps to know how teaching approaches could be made effective for online learners (Sönmez & Korucuk, 2023; Alemayehu & Chen, 2021).

The research studies gave mixed results showing that e-learning styles improve learning and engagement while some studies ignore this perspective (Gacusan et al., 2023; Sayed et al., 2022; Jadhav, 2020). For example, visual learners may benefit from multimedia



presentations and infographics, while auditory learners might find podcasts and video lectures more effectively. Moreover, the digital nature of online learning offers unique opportunities for personalization and interactivity that are not possible in traditional settings ((Al-Zahrani & Alasmari, 2023; Lin et al., 2022).

In conclusion, the exploration of learning styles in online environments is a critical area of research that holds significant implications for the future of education. As digital technology continues to advance, educators must strive to create flexible, responsive, and inclusive learning experiences that accommodate the diverse needs of learners ((Hafezy, 2023; Grierson et al., 2022; Batac et al., 2021).

Rationale of the study-

E-learning has dramatically changed the landscape of education, making it essential to understand and study this field comprehensively. Despite the vast research, there are still gaps which need to be addressed. The gaps include less focus on learner needs, and integration of new technologies in education. There is need to address these gaps for the development of effective online learning approaches. It would help educators and researchers to stay informed about innovative practices and their incorporation in education.

Research Questions-

1. What keywords are commonly used to describe various e-learning styles?
2. What are the current research trends in online learning styles?
3. What are the research gaps in the study of e-learning styles?

Research Methodology-

To find the most rigorous studies from an initial large dataset, a number of consecutive rounds of filtering and refining are involved in the process. The technique, which describes the process for selecting articles, is broken down into stages that are shown by the PRISMA flow diagram. The PRISMA flow diagram is used to illustrate each stage in the methodology, which outlines the approach to article selection. Bibliometric analysis is a method that is rigorous, systematic, and innovative, and it is used to analyse research trends and publications over the years (Erfanmanesh & Abrizah, 2018; Oliveira et al., 2019).

Search strategy-

To systematically review the literature on learning styles in online environments, we employed a detailed search and filtering process.

A search string was used to capture all relevant studies. The search string used was: ("Learning Styles" OR "Learning modality" OR "Learning Approaches" OR "Cognitive style" OR "Learning method" OR "Learning strategy") AND ("Online Education" OR "Digital Education" OR "Virtual Learning") AND ("Factors Affecting" OR "Influences" OR "Determinants") NOT ("BOOK" OR "BOOK REVIEW" OR "BOOK CHAPTER")



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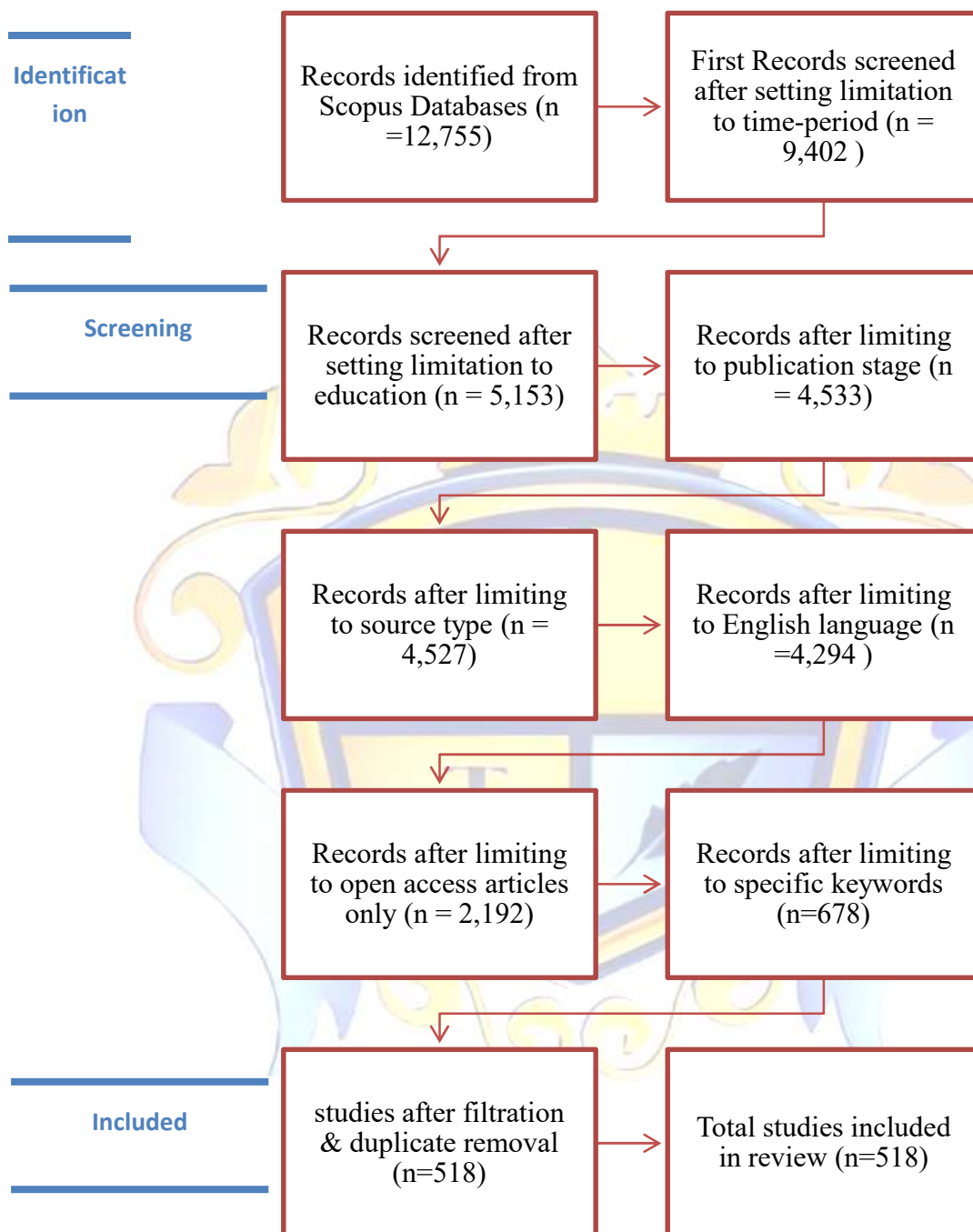
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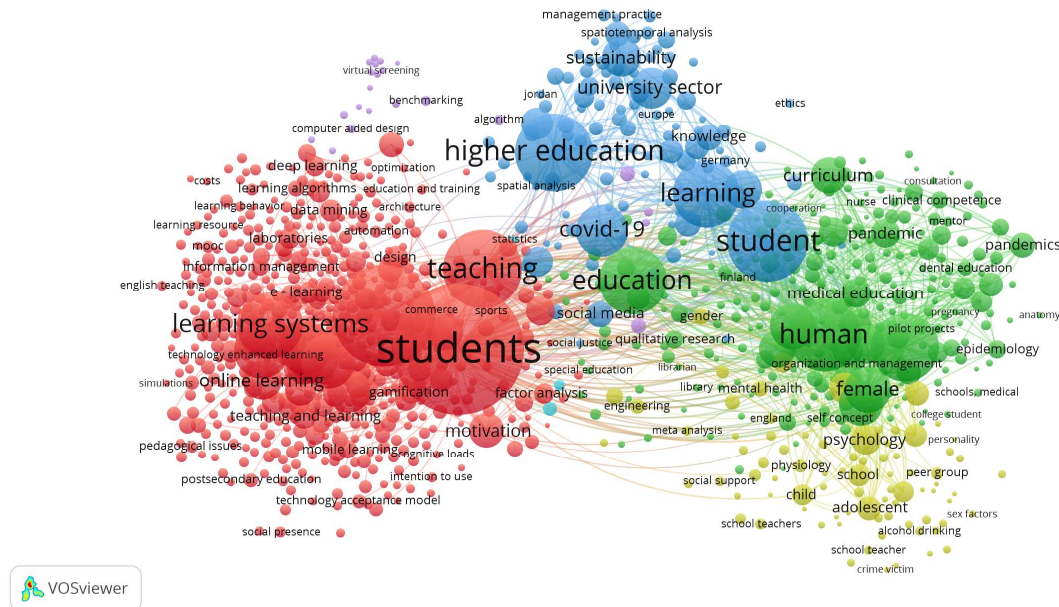
Criteria Type	Inclusion Criteria	Exclusion Criteria
Time Period	Articles published between 2014-2023	Articles published before 2014
Subject Area	Articles related to Social Sciences, including Education subject only	Articles not related to Social Sciences or Education
Document Type	Journal articles, including final articles and articles in press	Proceedings, case studies, book chapters, and other non-article formats
Source Type	Articles published in journals	Articles not published in journals
Keywords	Articles containing keywords: "e-learning," "student engagement," "distance learning," "online education," "learning styles," "learning approach," and "personalised learning"	Articles not containing the specified keywords
Language	Articles published in English	Articles published in languages other than English
Access Type	Open access articles	Non-open access articles
Citation Count	Articles with 1 or more citations	Articles with less than 1 citations



PRISMA Flow Diagram



a) Dominant terms-



The final part of the bibliometric analysed the most frequently represented words in abstracts to identify most used terms and research trends (Han & Ellis, 2019; Leung et al., 2017). Empty words like conjunctions, connectors, articles and propositions were omitted. This bibliometric analysis study on learning styles from 2014-2023 showed significant trends to understand the focus in education field. Key terms related to learning styles were used as synonyms were identified. These key terms were 'learning approaches,' 'learning styles,' 'learning strategies,' and 'learning modalities'. The 'Learning' term was found with highest occurrence. Around 824 articles appeared in the abstracts with this term. After this term, the term 'online' appeared 460 times. It reflected the study contexts. The learning style synonym studies were 196 in total. This showed the importance of learning styles in literature. Then 'learning styles' term appeared 57 times, 'learning modalities' for 57 times, 'learning methods' for 33 times, 'learning approaches' 33 times and 'learning strategies' 28 times.

b) Research Trends-

This bibliometric analysis showed a trend towards integration of different terms representing different learning style aspects. This shows the multifaceted nature of learning style concept in digital education. High frequency of these terms suggested that



researchers are studying different approaches and methods to accommodate various learning preferences in digital environments. The VOS-viewer diagram provides an overview of synonym keywords of learning styles. This highlighted the interconnection and focus areas in research area. Central keyword used was 'students'. This shows the focus how students engage with online learning platforms. While the terms 'learning systems' and 'online learning' were used prominently. This indicated the technology framework importance supporting online environments.

The term 'e-learning' is used widely showing the nature of education today. Another keywords like 'teaching and learning' and 'pedagogical issues' explored the instructional methods and educational strategies. As well as the VOS-viewer diagram showed tools and methods like 'gamification'. This involves the incorporation of gaming elements to enhance engagement and motivation of students. While 'mobile learning' refers to learning flexibility using mobiles. Keywords like 'deep learning' showed the machine learning application to understand learning styles. Further, 'blended learning' word represents the integration of traditional learning with online learning. This provides a complete educational experience. Whereas the focus on 'technology enhanced learning' and 'learning behaviour' tells about how learners interact with online content. In short, multifaceted approach to study learning styles is shown by the diagram.

This mapping of keywords is important for researchers to understand online learning environments. These keywords help to cater different learning needs. This shows the personalized approaches of learning in digital education. These diverse terminologies highlights the need for a deep understanding how learners engage with e-learning. The data shows that keeping the idea of learning styles central, there is wide scope to integrate strategies, approaches and modalities to understand how e-learning could be optimized for learners. in short, this analysis study shows that learning styles and its synonyms are central to the online education discourse. The expansion of online learning and learning styles in education reflects a movement towards educational personalization to meet diverse learning needs and improve outcomes of education.

c) Research gap –

The provided bibliometric analysis highlights significant trends and research areas in e-learning but identifies a crucial research gap concerning e-learning styles. Although, there has been a wide research on online learning with emphasis on technology and pedagogy, but there is still a lack of research on e-learning styles in education. Most of the studies generally revolved around learning methodologies, digital tools and instructional strategies. But there is still a need for more focused research to integrate learning styles in online learning platforms. Studying this gap is important as it will help to cater and understand different learning styles to create an inclusive learning environment. it would also help to know how online learning tools can be used to meet the diverse learning needs of learners. This would probably enhance engagement,



effectiveness and performance. The research studies shows that personalized education is important and there has been advancements in adaptive learning systems. Therefore, future studied need to focus on investigating how online learning platforms could be designed to accommodate diverse learning styles, thus improving the educational outcomes.

Conclusion-

This bibliometric study shows that there are still significant gaps in the field of online learning. This study focused on the e-learning style areas that are still unexplored. There is less research on incorporation of learning styles in learning platforms. Therefore, this gap needs to be filled. This way, effective and inclusive learning styles could be created. Balance should be there between synchronous and asynchronous learning. Learning should be accessible to all. This would help to address the gap between traditional and digital learning. Personalized learning could be developed by developing the LMS & integration of technology in content.

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