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NAVIGATING DIGITAL TRANSITION IN EDUCATION

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Abstract. Digitalization has rapidly increased across all industries, but education has been particularly badly impacted. Digital tools and platforms are becoming increasingly integrated into both traditional and virtual classrooms. As part of the ongoing trend toward digitalization in education, this paper looks at how technology is influencing administrative, instructional, and learning practices at various educational institutions. The study investigates the different technological advancements and tools that are being incorporated into educational systems. These include data analytics, online collaboration tools, virtual classrooms, and artificial intelligence in education. All of these have been instrumental in changing the way people learn. The study explores the effects of digitalization on education with a particular emphasis on how technologies such as artificial intelligence, virtual reality and blockchain are transforming teaching, learning and administrative processes. The study distinguishes between well-planned digital education and emergency remote teaching, and it emphasizes the quick transition to online learning, especially during the COVID- 19 pandemic. Despite the flexibility, engagement and inclusive learning settings that digital technologies provide, issues including curriculum design, faculty development, and digital divide still exist. In order to successfully incorporate technology into education, the study highlights the necessity of sustainable techniques. From an initial selection of 194 sources obtained from Google Scholar, Science Direct (Elsevier) PubMed, and the IEEE Xplore digital library, 26 papers were analysed.

Keywords: digital transition, artificial intelligence, online learning.

1. Introduction

The study examines how these changes impact various demographic groups and evaluates the effects of digitalization at various educational levels, from elementary schools to universities. In addition to radically altering the teaching and learning experience, technological advancements like blockchain, virtual reality, and artificial intelligence (AI) are also promoting transparency, efficiency, and accountability in the administrative procedures of educational institutions [1][2]. Higher education's digital revolution is progressing quickly as more institutions embrace virtual classrooms, online learning platforms, and collaborative technologies [3]. Big data analytics, artificial intelligence, and online platforms are spearheading the educational revolution [4].

Beyond education [5][6][7][8], AI is transforming sectors such as medicine (e.g., diagnostics and personalized treatment) [9][10][11][12], military industry and security[13][14], robotics (e.g., autonomous navigation and manipulation) [15][16], agriculture (e.g., precision farming), and many others, reinforcing its central role in global digital transformation. Due to urgent situations like the COVID- 19 pandemic, which

forced many colleges to swiftly switch to online models in order to continue offering instruction, distance learning became increasingly popular at traditional universities [17]. Many universities prioritized maintaining operations over innovation or long-term sustainability as a response to this crisis, educational institutions frequently implemented temporary “stop- gap” strategies to unsure the continuity of education. The COVID- 19 pandemic has led to a sharp rise in the usage of digital learning, emphasizing the difference between well- planned online learning and emergency remote learning [18]. The relationship between digital technology and education is fraught with challenges and paradoxes. The appeal of digital technology and the assurance of technologically driven educational advancement are highlighted in techno – positive discourses in politics and society [19]. There is still a significant gap between the romanticized discourse around technology in education and the complex realities of its real- world implementation. As the use of digital resources and integration continues to grow, educational leadership must develop and assess strategies for effective guiding of educational technology [20]. However, this transition also has disadvantages, particularly in the fields of digital curriculum design and faculty development [21]. The socioeconomic impact of digital transformation is crucial because unequal access to technology creates a digital divide that limits the full benefits of learning and obstructs equitable educational opportunities [22].

The aim of this study is to examine how digitalization, particularly the integration of artificial intelligence (AI) and online learning technologies, has influenced and transformed educational institutions between 2022 and 2025. During this period, schools, universities, and training organizations have faced unprecedented shifts driven by rapid technological development, the normalization of hybrid and virtual learning environments, and the increasing adoption of intelligent tools to support both teaching and administration. This scoping review seeks to map and synthesize the emerging trends that have defined this transformation, including the expansion of adaptive learning systems, data-driven decision-making, automation of administrative processes, and innovative digital pedagogies. Additionally, the study aims to identify the new opportunities created by these advancements such as enhanced accessibility, more personalized learning pathways, and improved efficiency in academic workflows.

2. **Methodology**

This study uses the methodology of a scoping review. A scoping review is a sort of research synthesis that highlights new advances and practices in a particular subject, maps important ideas and definitions, identifies and evaluates the types of evidence that are available, and identifies gaps in the body of the existing research [23] [24] [25][26]. Scoping reviews concentrate on mapping the existing evidence without assessing the methodological quality or danger of bias, in contrast to systematic reviews, which evaluate the calibre and rigor of the included research. Therefore, evaluating the studies' quality is not a prerequisite for conducting a scoping review [24][26]. When it is unclear what more focused questions may be posed and successfully addressed by a thorough systematic review, scoping reviews are especially helpful for research examining more general issues [24][27][28]. This research is following The Preferred Reporting Items for

Systematic Reviews and Meta-Analyses - Extension for Scoping Reviews (PRISMA-ScR) [26].

Eligibility Criteria

We reviewed English language journal articles and conference proceedings that discussed both digital transformation in education driven by the Covid-19 pandemic and the evolution of higher education through online learning and artificial intelligence (AI). Due to its dominance in international scholarly publications, English was chosen [29]. Publications from June 2022 to January 2025 were included in the corpus because this time frame saw significant developments in the use of digital technologies in the classroom. In particular, the COVID- 19 pandemic's acceleration of digitalization was a major factor in the global transformation of educational processes. Digital tools, virtual classrooms, and online learning platforms became widely used as a result of the pandemic and were crucial for continuing education during social distance and lockdowns.

Data Sources and research terms

Every document used in this review came from a highly respected and well-known resource, such as Google Scholar, IEEE Xplore Digital Library, and Science Direct (Elsevier). As these databases offer access to a broad range of academic topics and specialties, they were especially selected due to their multidisciplinary nature. To retrieve the data from the English search syntax, we used the following search query: "navigation" + " digital transition" + " education". We were able to broaden our search parameters beyond the title, keywords, and abstract by choosing the "all fields" option. With these strings, the search approach continues as follows:

(ALL (:"digital*"AND "transition*" AND "education*") AND LANGUAGE (english) AND PUBYEAR > 2022 AND PUBYEAR < 2026.

Study Selection

The process of study selection was conducted following the PRISMAScR methodology depicted in Figure 1. Duplicated titles between the three data sources were removed (n = 2), leaving 192 articles to consider. Authors read the titles of all 192 articles to remove clearly irrelevant articles. Following the initial screening of titles and abstracts, and when there was insufficient clarity regarding the inclusion of a given source, the reviewer proceeded with the manual search of keywords and synonyms derived from the research question [28], reducing the total number to 43. Authors read the abstracts independently and removed those clearly irrelevant (n = 149), leaving 43 articles for full text review.

After the full text review of the papers, 26 papers were included for the scoping review. Then they were identified in the references that had met the inclusion criteria, such as: Digital Transformation, E-learning, EdTech, Online Education, Remote learning with technology integration, Digital Literacy, Blended Learning, Virtual Classrooms, Digital tools, Adoption of educational technology and innovative schooling practices, Digital pedagogy, Learning Management Systems (LMS), Data-driven education, Student

Engagement, and Teacher training. Additionally, the search technique was in line with the studies goals, guaranteeing that the phrases most relevant to the review were included. The search included terms such as online learning, artificial intelligence, and higher education. In addition to digitalization and COVID-19, all of these were essential to the study's theme. These words were chosen with care to reflect the pertinent advancement and patterns that surfaced in the literature on the relationship between artificial intelligence, education, and the worldwide transition to online learning.

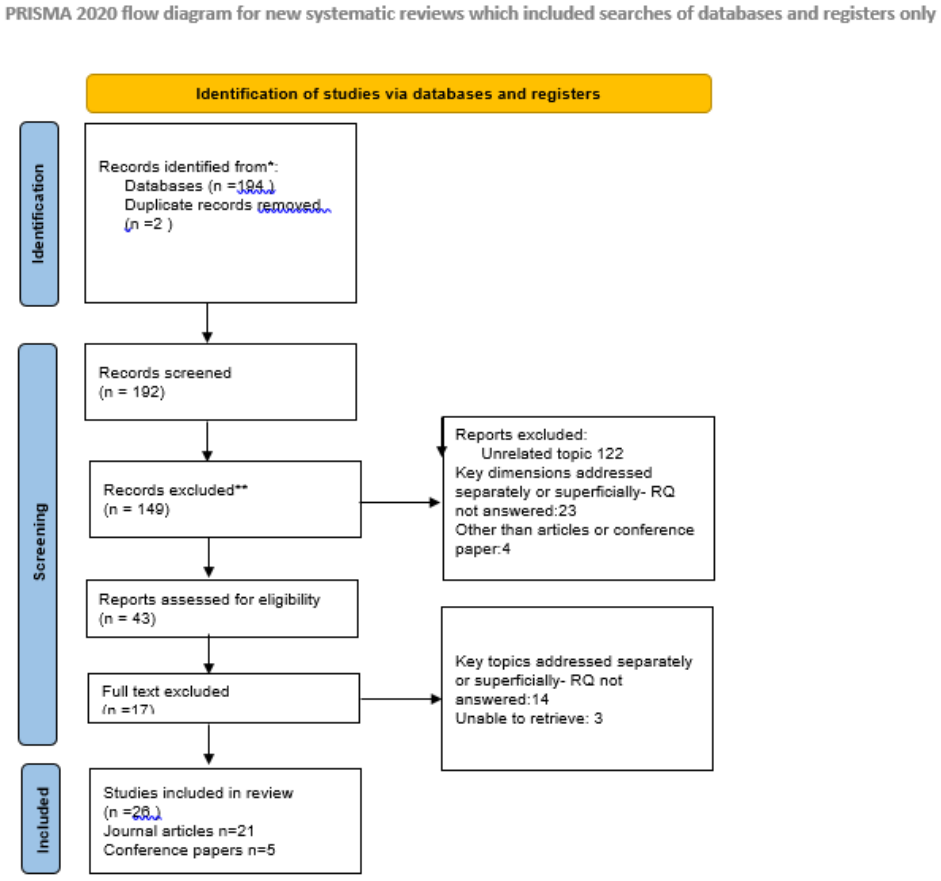

Figure 1. *PRISMA-ScR methodology applied*

Annual distribution of studies related to this topic in education from 2022 to 2025 indicates a growing research interest in the integration of Artificial Intelligence (AI) technologies within educational settings. The number of publications steadily increased from 2022 to 2024, reflecting growing academic interest in the integration of AI technologies into educational contexts. The decline in 2025 may indicate a shift toward more specialized or applied research as the field begins to mature (Figure 2).

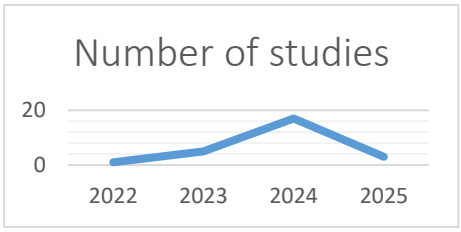

Figure 2. *Number of studies*

The visualization generated using VOSviewer, Figure 3, displays bibliographic coupling among documents focusing on the intersection of artificial intelligence and education. Documents are clustered based on shared references indicating thematic similarity and intellectual alignment. It should also be noted that these publications are taken from the Dimension AI platform with the title "Navigating digital transition in education".

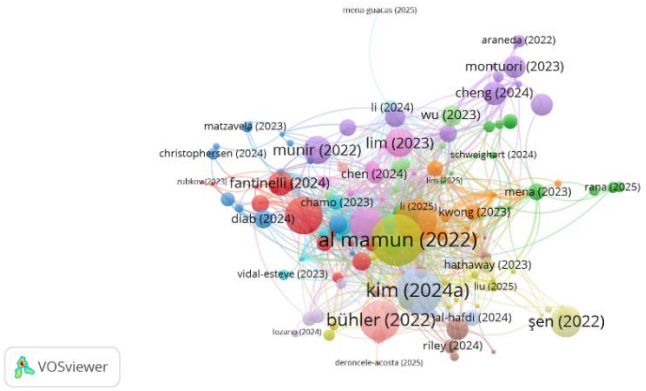

Figure 3. *Bibliographic coupling visualization using VOSviewer*

Selected articles

The selected articles address the navigating digital transition in education outlined in the research question in the following ways: Digital transition in higher education (5), Artificial intelligence (12), and teaching and learning (9) (Table 1).

Reference	Domains	Thematic focus
[31]	1,3	Navigating the New Normal: Adapting Online and Distance Learning in the Post-Pandemic Era
[32]	1,3	Navigating challenges in school digital transformation: insights from school leaders in the Republic of Cyprus
[33][34]	1	Navigating Sustainable Educational Practices in Higher Education: A Systematic Literature Review

[35]	1,2,3	Integrating AI-based and conventional cybersecurity measures into online higher education settings: Challenges, opportunities, and prospects
[36]	2,3	Artificial Intelligence Enhanced Digital Learning for the Sustainability of Education Management System
[37]	1,2,3	Artificial intelligence in steering the digital transformation of collaborative technical education
[38]	1,2	Artificial Intelligence Technologies in College English Translation Teaching
[39]	2,3	The interconnection between digital literacy, artificial intelligence, and the use of E-learning applications in enhancing the sustainability of Regional Languages: Evidence from Indonesia
[40]	1,3	Student engagement in online learning in Latin American higher education during the COVID-19 pandemic: A systematic review
[41]	1,3	Current Technologies, Present Challenges and Emerging Solutions for Digital Transformation of the Engineering Education
[42]	3	The Role and Impact of Digital Transformation in the Development of Professional Teachers' Methodological Culture
[43]	3	The Impact of the Digital Transformation of Education on Literacy
[44]	1,3	The Transformation of Digital Culture and Learning Habits in Higher Education, Digital Methods and Tools
[45]	3	Holistic exploration of reading comprehension skills, technology and socioeconomic factors in Spanish teenagers
[46][47]	2,3	A Systematic Review and Comprehensive Analysis of AI-Enabled Re-Skilling and Upskilling in Education: Transformative Strategies for the Future
[34]	1,3	Navigating transitions: Vietnamese students' experiences and challenges in the first year of higher education
[47]	2,3	From chatting to self-educating: Can AI tools boost student learning outcomes?
[48]	2,3	Artificial Intelligence teaching and learning in K-12 from 2019 to 2022: A systematic literature review
[49]	2	Industry 5.0 in Smart Education: Concepts, Applications, Challenges, Opportunities, and Future Directions
[50]	2,3	Designing an artificial intelligence tool to understand student engagement based on teacher's behaviours and movements in video conferencing
[29]	2	A systematic review of AI education in K-12 classrooms from 2018 to 2023: Topics, strategies, and learning outcomes

Analysis procedure

Both deductive and an inductive approach were used in the analysis process. While the inductive technique was largely motivated by the data itself, the deductive approach concentrated on the data that aligned with the predetermined analytical strategy [30]. The process of navigating the digital transition transformation in education is continuous and involves curriculum redesign, teacher empowerment, technology integration, access equality, and long-term planning. Although technology breaks issues that call for thoughtful and calculated responses to guarantee that it benefits all stakeholders, it also offers opportunity for innovation in teaching and learning, and it describes the procedure for incorporating digital tools and technologies into educational practices and systems.

Training programs and ongoing professional development are essential for boosting their abilities and self-assurance in order to improve assessment procedures, boost student engagement, customize learning experience, and direct educators how to integrate digital tools into their lesson plans. The shift to digital technology presents a significant chance to update courses, making them more interesting, individualized and flexible to meet the demands of modern students. By encouraging the use of multimedia materials such as movie simulations and interactive tools, this shift makes learning more dynamic and immersive while accommodating a variety of learning preferences.

3. Results

This section presents the findings from the analysis of the selected sources, with separate subsections addressing each of the four domains outlined in the review question.

Digital transition in higher education

The collection of these studies explores various aspects of education in the digital area. The first study investigates the challenges of digital transformation in Cypriot schools, identifying barriers such as inadequate infrastructure, lack of professional development, and insufficient digital literacy [32]. The second review examines the shift to online learning during the COVID-19 pandemic, focusing on innovative strategies, the importance of technology integration, and the need for ongoing teacher development. The third study reviews student engagement in online learning in Latin American higher education, highlighting key factors such as behavioural, cognitive, and emotional engagement and offering recommendations for improving online education [40]. Lastly, the fourth study delves into the impact of technology on literacy skills in Spanish teenagers, revealing that family oversight and moderate use of technology are crucial for enhancing reading comprehension while addressing socioeconomic inequalities in education [45]. Each study provides valuable insights to inform educational practices, policy decisions, and professional development in the digital age.[31]

Artificial intelligence

These papers examine the transformative role of artificial intelligence in education across various contexts. One study explores how AI enabled learning strategies are reshaping education, focusing on personalized learning and skills development, with a

case study on AI driven marketing in Jordanian SMEs (Small and Medium-sized Enterprises). Another research investigates the role of AI tools such as ChatGPT in enhancing student learning outcomes in Moroccan higher education, revealing key factors such as perceived usefulness and student satisfaction. The integration of AI in addressing cybersecurity challenges in online higher education is also discussed, with findings emphasizing the need for responsible AI development to ensure security and privacy. In translator education, AI technologies are shown to significantly enhance the development of key competencies for future translators in China. These studies collectively underscore the pivotal role of AI in reshaping the educational practices, improving learning environments, and addressing the challenges of the digital area [46][47][35] [38][39][36][49][50][29][35].

Teaching and learning

Digital transformation in education is a continuous process affecting all levels from primary school to university, driven by advancements in information and communication technologies. This transformation is reshaping teaching and learning integrating new tools and platforms while addressing the challenges of digitalization, which became especially prominent during the COVID-19 pandemic. The shift has made education more accessible and flexible, allowing for personalized learning experiences through tools like virtual reality, AI-I based tutors, and gamified systems. However, this shift also raises questions about the impact on literacy and the effectiveness of online learning compared to traditional face to face education. The need for continuous professional development of educators is also highlighted, especially as digital tools and methodologies evolve. These transformations require educators to adapt to new teaching approaches that go beyond simply enhancing traditional methods, fostering a more dynamic and interactive learning environment that can withstand future crisis [41][44][43][42] [34][33][44][48].

Limitations

Despite providing a broad overview of current developments, this scoping review has several inherent limitations. The wide scope and diversity of the included literature restrict the depth of analysis and make it difficult to draw definitive conclusions. Furthermore, the descriptive nature of scoping reviews limits the ability to evaluate the effectiveness or impact of specific approaches or interventions.

Future research directions

Future research should conduct more empirical investigations of the impact of digital technologies on learning outcomes and teaching practices. Comparative studies across educational levels and analyses of institutional policies would add further insight. Research on AI-driven personalization and strategies to reduce the digital divide is also recommended.

4. **Conclusion**

The purpose of this study is to provide a comprehensive overview of current research on digitalization in education, with particular emphasis on the strategic integration of digital technologies in higher education institutions and the challenges associated with their implementation. This scoping review looked at the data from 26 scientific journals and conference papers. The evaluation concentrated on important topics such as adopting digital tools and platforms, teaching and learning, and artificial intelligence. Numerous studies are examining the effects of the digital transition that is changing higher education. Our research looks at incorporating digital learning resources emphasizing the difficulties and solutions for modifying instructional tactics in online settings [18][10][21][23]. Another study examines the digital transformation of an online institution and provides guidance on how to manage online learning models and employ digital resources [23][30]. Furthermore, one research examines how teachers' pedagogical approaches are impacted by digital transformation, highlighting the necessity of teacher preparation programs to adjust to new digital resources [34]. Lastly, a suggested framework for managing learning in digital environments provides institutions with a direction on how to plan, evaluate, and assist learning processes in hybrid and online contexts. When taken as a whole, these studies highlight how crucial professional development, adaptive instructional methods, and strategic planning for managing digital transition are. The statistics of another section, which addresses the digital divide and its effects on literacy outcomes, investigates how socioeconomic status and technological access effects Spanish teens' reading comprehension abilities [45]. With an emphasis on digital technologies, student involvement and sustainable online education, researcher looks at how educational institutions are adjusting to long term online and hybrid learning models in the post-pandemic period [29][31]. To satisfy the expectations of the modern industry, this study examines the technology currently utilized in engineering education acceptance barriers and new developments, including virtual laboratories and adaptive learning platforms [32][33][37]. AI tools are rapidly transforming education by offering innovative ways to enhance student learning outcomes [25]. A comprehensive review of AI enabled re-skilling and up-skilling strategies reveals transformative methods for students with essential skills for the future workforce [23][24]. Online higher education integrating AI with traditional cybersecurity measures presents both challenges and opportunities in safeguarding digital learning environments [26]. Moreover, AI is pivotal in driving the digital transformation of collaborative technical education, facilitating dynamic real time learning and collaboration between students and instructors [37].

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