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INTEGRATING MOBILE LEARNING AND ICT IN ART EDUCATION: EXPLORING THE IMPACT OF AUGMENTED REALITY AND MOBILE DEVICES ON CREATIVE PEDAGOGY

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ABSTRACT

This research focuses at the integration of mobile learning and information and communication technology (ICT) in art education, with a focus on how these resources might improve teaching methods and encourage creativity. With the advent of mobile devices and digital tools, education has become more accessible and flexible. With the advent of mobile devices and digital tools, education has become more adaptable and available, particularly with mobile learning (m-learning), which allows students to engage with content wherever they are. The goal of the study is to evaluate how augmented reality and mobile apps affect art instruction and to pinpoint the obstacles that teachers have while implementing these tools. Eight pertinent articles from Scopus and WoS were examined using the PRISMA framework for a systematic literature review. The analysis focused on topics such as augmented reality, ICT in pedagogy, and mobile devices in art education. Research indicates that augmented reality (AR) stimulates creativity, information and communication technology (ICT) aids improve student motivation and performance, and mobile devices support individual and group learning. Nonetheless, there are obstacles including insufficient training for teachers and limited resource availability. The results emphasize how better pedagogical frameworks and assistance are required to enable teachers to fully utilize new technologies in art instruction.

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INTRODUCTION

Rapid technological advancements have completely changed the educational landscape, opening up new avenues for teaching and learning. With digital tools being incorporated into educational practices more and more, the idea of mobile learning—also known as m-learning—has become a major area of focus. M-learning makes use of learners' accessibility and flexibility by utilizing mobile devices to facilitate learning anytime, anywhere. This trend toward mobile learning is further reinforced by the addition of technological innovations such as collaborative platforms, online resources, and interactive applications, all of which enhance the educational experience (Kushwaha & Ahmad, 2024).

LITERATURE REVIEW

Traditional teaching techniques have been completely transformed by the incorporation of Information and Communication Technology (ICT) into pedagogy. ICT promotes dynamic, captivating learning environments that accommodate a range of learning styles in addition to supporting the delivery of knowledge. According to research, ICT can improve student motivation, engagement, and achievement when used properly (Simões et al., 2022, Pandita & Kiran, 2023, Demir & Akpinar, 2018). But the creation of suitable pedagogical frameworks that direct teachers in making the most use of these resources is a prerequisite for the successful integration of technology in education.

Mobile learning, defined as learning conducted via mobile devices, enables flexibility and accessibility, making education more individualized and learner-centered (Al-rahmi et al., 2021; Kumar & Chand, 2019; Kumar Basak et al., 2018). The incorporation of AR in mobile learning settings has the potential to alter established pedagogical practices. However, the success of mobile learning is dependent upon the pedagogical practices applied. Research underlines the necessity for educators to adopt constructivist techniques that enhance active learning and cooperation (Kukulska-hulme, 2020).

Research has shown that m-learning not only improves student engagement and motivation but also allows for personalized learning experiences that cater to individual needs. Furthermore, m-learning's integration of technologies such as AR enriches art education by providing immersive experiences, allowing students to visualize and manipulate artistic materials in ways that were previously limited to conventional tools As a result, mobile learning is becoming a critical component in art education, driving innovation and creativity in teaching and learning (Analisa et al., 2021; Kumar & Chand, 2019).

Despite the potential benefits of technology in education, difficulties persist. Educators sometimes confront hurdles such as inadequate training, restricted access to resources, and varied levels of technical competency among students. These issues can hamper the effective application of mobile learning and ICT initiatives in art education teaching and learning, leading to discrepancies in educational outcomes (Haleem et al., 2022). Therefore, it is vital to examine the interplay between technology, pedagogy, and learner engagement to find best practices and fix the existing gaps in the educational system (Parveen & Ramzan, 2024).

This comprehensive literature review aims to examine the current level of technology integration in the teaching and learning of arts education, covering mobile learning integration and ICT pedagogy, highlighting the potential and challenges faced by educators. By synthesizing previous research, this study seeks to provide insights that will advise educators and policymakers on how to successfully utilize the latest technology to enhance the learning experience in arts education.

METHODOLOGY

Using the PRISMA Framework, the Systematic Literature Review process comprises a thorough examination through three key phases that are broken down into subsections: Identification, Screening, and Eligibility. Data

Abstraction and Analysis explains the PRISMA Framework-based evaluation at the conclusion of the data formation.

Identification

Three crucial steps are involved in the systematic review technique that is used to choose a set of relevant research for this investigation. The first step involves identifying keywords and investigating related, similar terms by using lexicons, thesauri, encyclopaedias, and previous academic studies. Once all relevant keywords had been identified, search strings were created to query both the Scopus and WoS databases, as Table 1 shows. In the first stage of the systematic review effort, this study successfully collected 17 scholarly publications from the two databases.

Table 1

Database	Search String
Scopus	("android apps" OR "mobile applications" OR "educational apps" OR "smartphone apps" OR "mobile learning tools") AND ("art education" OR "arts education" OR "visual arts education" OR "creative arts education" OR "arts pedagogy" OR "artistic education")
WoS	("android apps" OR "mobile applications" OR "educational apps" OR "smartphone apps" OR "mobile learning tools") AND ("art education" OR "arts education" OR "visual arts education" OR "creative arts education" OR "arts pedagogy" OR "artistic education")

Screening

In the first screening stage, 1 article were eliminated due to the removal of superfluous papers. As a result, 11 publications were evaluated during the second screening step using a set of inclusion and exclusion criteria that academics had developed. The nature of the literature was the main criterion used, with research papers being the primary source of useful insights. Selecting reviews, systematic reviews, novels, meta-analysis, and meta-syntheses that did not align with the latest research was another aspect of this. Notably, this selection process focused on the preceding 12 years, from 2012 to 2024, and was limited to works published in the English language. Six articles were disqualified according to these particular criteria.

Eligibility

In the third phase, referred to as eligibility assessment, a number of 10 articles were compiled. The titles and essential content of these articles underwent a comprehensive evaluation to confirm that they met the inclusion criteria and aligned with the current research objectives. Hence, 2 articles were excluded from the assessment for not meeting features such as not related to android apps and not aligned with research objective. Finally, there are 8 articles accessible for examination refer to Table 2:

Table 2 : The search criteria for selection

Criterion	**Inclusion**	**Exclusion**
Language	English	Non-English
Timeline	2012-2024	< 2012
Literature type	Journal (Article), Conference Proceedings, Book chapters, Book Series,	Review
Publication Stage	Final	In Press

Data Abstraction and Analysis

An integrative analysis strategy was used in this study to combine many research methodologies, including mixed, qualitative, and quantitative methods. Finding appropriate subjects and subtopics involving Android apps used in art education in a teaching and learning environment was the main goal. In order to gather data, eight papers had to be carefully reviewed in order to extract relevant material for the study's topics. Through cooperation among the writers, two major subjects—"Android apps" and "Art Educational"—came to light and were expanded upon, along with related themes and concepts. Table 3 provides a description of every article categorized by theme. Throughout the data analysis process, an accurate record was regularly maintained to document analyses, findings, questions, and other relevant information.

All eight articles, categorized into the three themes: **AR in Creativity**, **ICT in Pedagogy**, and **Mobile Devices in Art Education**.

Table 3: List of Article that categorized by themes

1. AR in Creativity

Authors	Title	Year	Source	Methodology	Key Findings
Tan, J., Gao, B., Lu, X.	An AR System for Artistic Creativity Education	2018	Proceedings Of the ACM Symposium...	Experimental, AR System Tested with Students	AR Fosters Artistic Creativity Through Immersive and Interactive Tools.
Bebar, K., Amon, BT., Solina, F.	An Augmented Reality Application for Depicting Space...	2022	Elektrotehniški Vestnik	Case Study with Art Students	AR Enhances Teaching of Perspective Drawing in Art Education.

2. ICT in Pedagogy

Authors	Title	Year	Source	Methodology	Key Findings
Silva, N., Martins, C.	An Ict-Based Approach To Improve The Pedagogy...	2016	Inted2016	Mixed Methods: Surveys, Interviews, Observations	ICT Tools Improve Pedagogy in Music Education Through Enhanced Interactivity and Motivation.
Silva, N., Martins, C.	The Usage Of Mobile Applications For Specialized Artistic Education...	2016	Iceri2016: 9th International Conference...	Quantitative Analysis with Apps Testing Among Music Students	Apps In Music Education Improved Performance and Motivation Among Students.

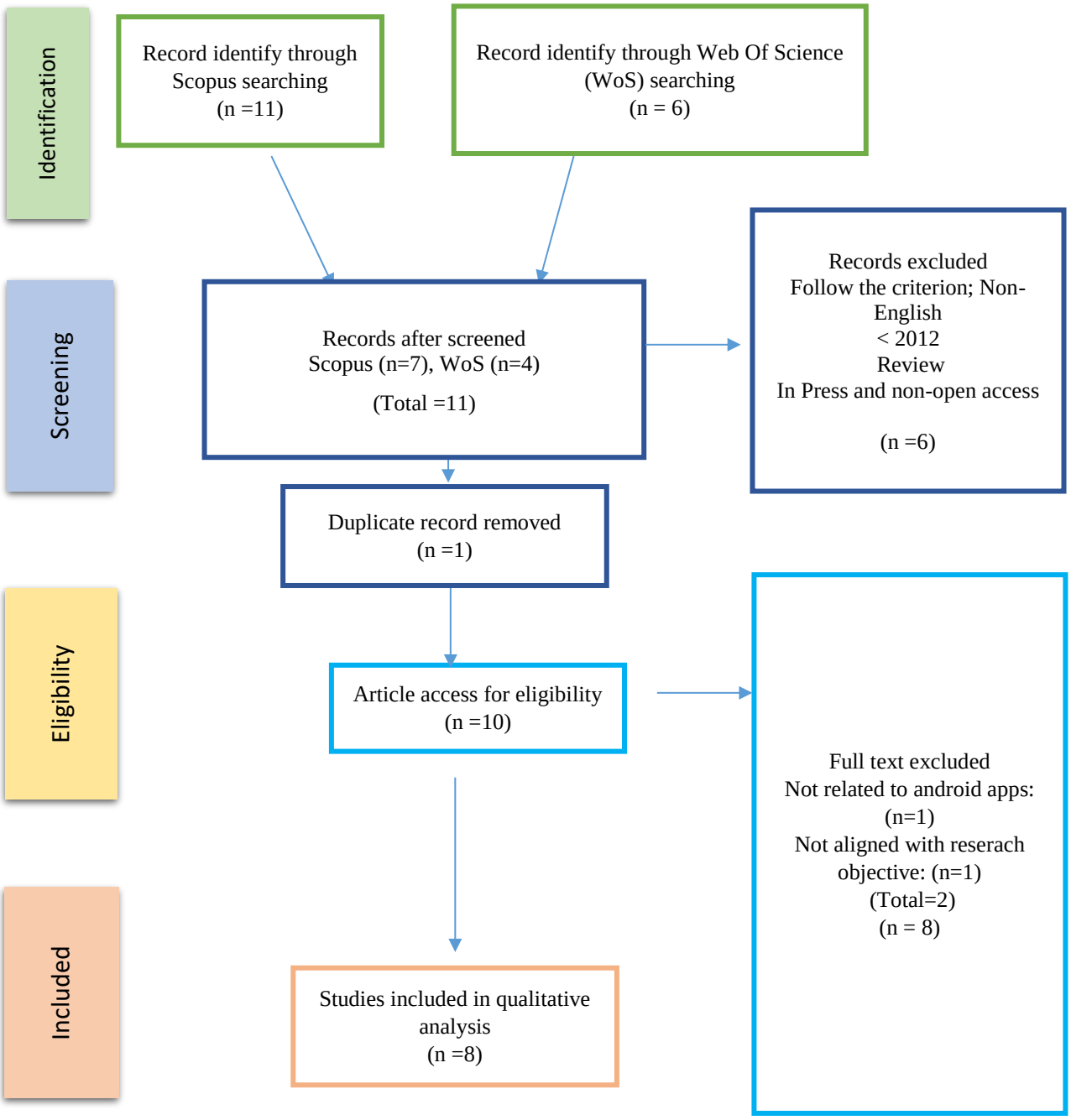
Sobánová, P., Jiroutová, J., Lazová, J.	New Ways In Education Through Art: Research Into Mobile Applications In Museums...	2017	Art & Design Education in Times of Change	Case Study	Mobile Apps Used in Museums Improve Art Education by Linking Digital Content with Museum Collections.

3. Mobile Devices in Art Education

Authors	**Title**	**Year**	**Source**	**Methodology**	**Key Findings**
Forget, B.	Girls and their smartphones: Emergent learning...	2019	Mobile Media in and Outside of the Art...	Ethnographic study: Interviews and observations	Smartphones foster learning behaviours, especially among girls, supporting creativity and engagement.
Neelu, S.	Our liberal arts majors get IT (Information Technology)	2015	Journal for the Liberal Arts and Sciences	Experimental with mobile app development course	Students concentrating in liberal arts gain more technological skills and are better equipped for the workforce through mobile app development.
Bae-Dimitriadis, M., Ivashkevich, O.	Teaching Civic Participation with Digital Media in Art Education	2023	Teaching Civic Participation with Digital Media...	Mixed methods: Digital media projects in classrooms	Students are empowered by digital media to use artistic expression to participate with civic problems.

The authors resolved any discrepancies that arose while developing topics to maintain conceptual consistency. To verify domain validity and assess the importance, clarity, and relevance of each sub-theme, specialists in Educational Technology and Art Education reviewed the study. The analysis was continuously improved by incorporating expert feedback and recommendations throughout the review process, which strengthened the study's overall validity and reliability.

Figure 1 describes the process used to implement the PRISMA Framework:Adapt from Moher et al., (2009)



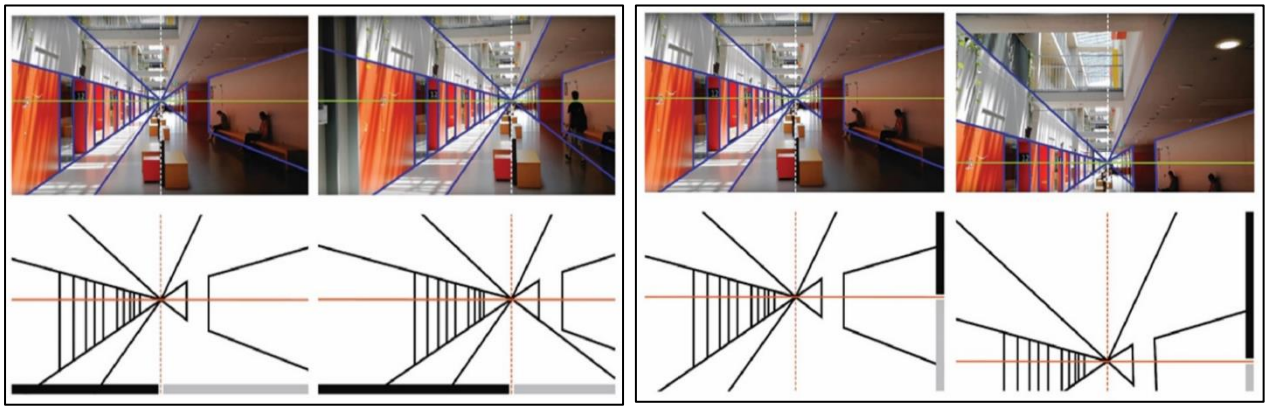
RESEARCH FINDINGS AND DISCUSSIONS

Augmented Reality (AR) in Creativity

Incorporating Augmented Reality (AR) into art education offers two key advantages: boosting creativity and delivering engaging, hands-on learning experiences. AR technology allows students to interact with and visualize artistic content in ways traditional methods cannot match. A study by Tan, Gao & Lu, (2018) explored AR's role in fostering creativity in art education. Their AR mobile app enhances students' artistic process through real-time interactive features that encourage experimentation. The research emphasizes that conventional art teaching often fails to provide the immersive environment and immediate feedback offered by AR, positioning it as a crucial tool in modern art pedagogy.

Bebar, Amon & Solina, (2022) found that augmented reality (AR) can assist educators in addressing difficulties when teaching linear perspective and spatial representation. Their research focused on an AR app designed to aid students' comprehension of spatial concepts in painting, which are often challenging to convey through conventional teaching methods. The researchers concluded that AR enhances students' spatial awareness and promotes creative thinking by offering an intuitive platform for visualizing and interacting with abstract ideas. These studies highlight AR's capacity to connect physical and digital realms, introducing novel ways for students to engage in creative processes. By leveraging AR, teachers can create vibrant learning spaces that nurture creativity and help students cultivate the spatial and observational skills crucial for artistic expression.

Figure 2: Shows the mobile app demonstrates changes in perspective by adjusting the perspective lines, vanishing point, and horizon as the phone is moved from the center to the right and upward (Source: Bebar et al., 2022)



ICT in Pedagogy

In this field of pedagogy, information and communication technology (ICT) has increased in significance, especially in specialized areas like art instruction. By using ICT technologies, teachers can tailor learning experiences and engage students in new and creative ways.

In a study on the use of ICT in music education, Silva & Martins, (2016) concentrated on the ways that mobile applications might improve auditory training and boost student enthusiasm. The findings highlighted the value of integrating ICT into the teaching and learning process by showing that the use of multimedia technologies enhanced student performance in areas including musical perception and proprioception. The study also demonstrated how ICT could promote ongoing learning even during school breaks by extending learning outside of the classroom through the use of online platforms.

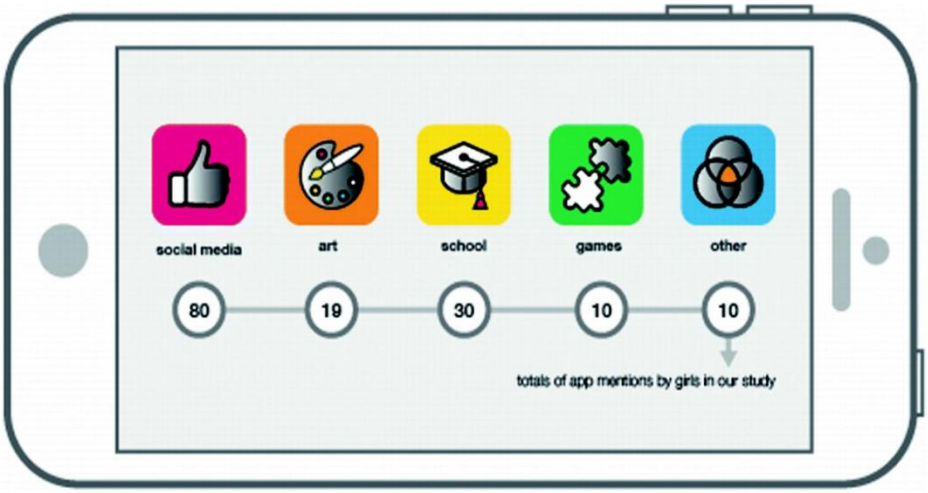
Furthermore, Sobánová et al., (2017) investigated how mobile technology is used in galleries and museums and evaluated how these resources might enhance learning opportunities. According to their research, mobile applications can effectively link museum exhibits with learning goals, increasing students' access to and engagement with art. This study bolsters the idea that by offering students individualized and interactive learning experiences, ICT technologies can improve pedagogy. These studies show how ICT can transform art education by providing students with tools that are tailored to meet their specific learning requirements. With the use of ICT, teachers may create learning environments that are more dynamic, adaptable, and engaging—enabling students to investigate artistic ideas in fresh and significant ways.

Mobile Devices in Art Education

While smartphones and tablets provide students new ways of engaging with creative processes both within and outside of the classroom, the role of mobile devices in art education is growing. For students to create, share, and collaborate on artistic projects, mobile devices offer an adaptable and convenient platform.

Forget, (2019) investigated at how mobile apps on mobile phones support emergent learning habits, especially among female students. According to the study, mobile devices encourage creativity in students by giving them access to resources that let them interact more casually and independently with artistic processes.

Figure 3: Expanding Learning via Devices That Enable (Forget, 2019)



Neelu, (2015) also demonstrated how technology can close the gap between conventional art education and contemporary technical capabilities by focusing on the integration of mobile app development within the liberal arts curriculum. According to the study, students who took mobile app development courses improved their creative problem-solving abilities in addition to becoming more technologically proficient. These studies indicate that mobile devices are platforms for creation as well as tools for consumption. They provide students the freedom to connect with artistic content on their own terms and enable them to develop their creative potential in more dynamic and engaging ways.

An important result from Bae-Dimitriadis & Ivashkevich, (2023) study is that digital media projects in art education provide students with powerful tools to understand and interact with civic problems. Through artistic expression, children are able to critically engage social and political problems, acquiring a deeper sense of civic responsibility and action. This integration of digital media helps students connect personal creativity with bigger societal concerns, enabling meaningful involvement in civic life.

CONCLUSION AND RECOMMENDATION

The integration of mobile learning, ICT, and Augmented Reality (AR) has significantly reshaped art education by making teaching and learning more adaptable, interactive, and personalized. Mobile devices and digital tools not only boost student engagement but also extend learning beyond the classroom, allowing students to create, share, and explore artistic concepts at their own pace. AR, in particular, enhances creativity by offering immersive, real-time feedback that helps students grasp complex ideas like spatial representation and linear perspective, which are often challenging with traditional methods. However, despite these advantages, several barriers need to be addressed for successful implementation. Inadequate teacher training on using these technologies, limited resources in schools, and unequal access to devices among students hinder widespread adoption. To unlock the full potential of ICT and mobile learning in art education, educators must receive comprehensive training, resources need to be easily accessible, and instruction should be tailored to meet the diverse

needs of students, ensuring an inclusive, technology-driven learning environment that fosters creativity and critical thinking.

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