INTEGRATING AUGMENTED REALITY AND DIGITAL CITIZENSHIP IN CIVIC EDUCATION: A SYSTEMATIC LITERATURE REVIEW

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ABSTRACT

The swift advancement of digital technology necessitates a cohesive strategy to enhance digital citizenship within citizenship education via pertinent and contextual learning methodologies. Previous studies generally analyzed the two as separate factors; this study, however, rigorously investigates the level of integration between them in citizenship education. The study used a systematic literature review to analyze scientific articles published between 2018 and 2025, indexed in Scopus and Web of Science, using the keywords digital citizenship, augmented reality, citizenship education, learning, and technology, in accordance with PRISMA guidelines, assisted by Google Scholar and Publish or Perish. The findings indicate that digital citizenship through augmented reality serves as an immersive educational technology that enhances engagement and visualization in learning. The explicit integration of these two concepts remains constrained. This paper presents a conceptual framework that designates augmented reality as a pedagogical intermediary for applying digital citizenship principles in experiential citizenship education, and advocates for more empirical validation in genuine educational settings.

ABSTRAK

Perkembangan teknologi digital yang pesat menuntut strategi yang terpadu untuk meningkatkan kewarganegaraan digital dalam pendidikan kewarganegaraan melalui metode pembelajaran yang relevan dan kontekstual. Studi terdahulu umumnya menganalisis keduanya sebagai faktor yang terpisah, Namun, studi ini secara ketat menyelidiki tingkat integrasi antara keduanya dalam pendidikan kewarganegaraan. Penelitian menggunakan tinjauan literatur sistematis untuk menganalisis artikel ilmiah yang diterbitkan antara tahun 2018 dan 2025, yang terindeks di Scopus dan Web of Science, menggunakan kata kunci kewarganegaraan digital, *augmented reality*, pendidikan kewarganegaraan, pembelajaran, dan teknologi, sesuai dengan pedoman PRISMA, dibantu oleh Google Scholar dan Publish or Perish. Temuan menunjukkan bahwa kewarganegaraan digital melalui *augmented reality* berfungsi sebagai teknologi pendidikan imersif yang meningkatkan keterlibatan dan visualisasi dalam pembelajaran. Integrasi eksplisit antara kedua konsep ini masih terbatas. Artikel ini mengusulkan kerangka konseptual yang menetapkan augmented reality sebagai perantara pedagogis untuk menerapkan prinsip-prinsip kewarganegaraan digital dalam pendidikan kewarganegaraan berbasis pengalaman, dan mendesak validasi empiris lebih lanjut dalam lingkungan pendidikan yang nyata.

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INTRODUCTION

Digital technology has advanced rapidly in the era of globalization and significantly changed all aspects of social interaction, communication, and civic participation, especially for younger generations (Öztürk, 2021). Digital technology can be used to learn, be creative, and engage civically, but it also poses serious challenges, such as misinformation (UNICEF, 2016), cyberbullying, unethical behaviour, and the loss of social virtues (Jones & Mitchell, 2016). The requirements require that students possess the knowledge, skills, and ethical consciousness to navigate digital landscapes responsibly. Digital citizenship entails judicious and appropriate engagement with the internet, computers, and other digital devices (Isin & Ruppert, 2020). This concept includes the principles of self-respect and respect for others, adherence to legal standards, ensuring accessibility, practicing digital etiquette, engaging in teaching and learning for both oneself and others, facilitating online communication, conducting e-commerce securely, and enhancing personal and communal security (Fernández-Prados et al., 2021).

On the other hand, in responding to these challenges, digital citizenship has emerged as a crucial conceptual framework in shaping perspectives on ethical, responsible, and participatory behavior in the digital environment. Norms, values, and practices for the appropriate use of digital technologies are also part of digital citizenship, including digital literacy, online safety, ethical communication, respect for intellectual property, and civic engagement (Isman & Gungoren, 2014; Manzuoli et al., 2019). In education, digital citizenship is viewed by many as a vital aspect of civic education that equips students to be informed, responsible, and engaged citizens in democratic societies (Parker, 2003; Westheimer & Kahne, 2004).

This study draws on both digital learning theory and citizenship theory, which conceptualize citizenship as active involvement and civic responsibility and ethics in society (Westheimer & Kahne, 2004; Isin & Turner, 2002). From this perspective, civic education aims to cultivate participatory, justice-oriented citizens who can navigate and operate effectively in difficult sociopolitical environments. Digital learning theory posits that learning is constructed through active involvement in and with a given environment, which includes meaningful interactions (Lave & Wenger, 1991). In this context, technology-facilitated learning environments significantly strengthen participatory and reflective learning processes. As an immersive learning technology, augmented reality closely aligns with the principles of experiential and situated learning because it enables learners to interact with digital information embedded in real-world objects.

Within the framework of digital citizenship, digital ethics (netiquette) and education about oneself and others are part of respecting oneself and others. Like other forms of ethics, digital ethics refers to the expected behaviour that individuals and other technology users should demonstrate. Therefore, students are encouraged to understand how their use of technology affects others and to use technology responsibly, including being mindful of their online interactions, respecting privacy, and considering the impact of their digital footprint (Mattson, 2017). In addition, they need to assess the potential impact of their digital communications on other parties. Teaching yourself and others how to find the right digital tool for your task, navigate online resources critically by assessing their truthfulness, efficiently communicate in any format you choose, consider risks of buying/selling online and make sure personal data is protected when necessary with strong passwords (Alshawi, 2023).

Prior research has reconstructed the phenomenon of digital citizenship and its dimensions, such as ethics, engagement, critical participation, and media and technology literacy (Wulandari et al., 2023). Ribble et al. (2004) offered a framework for digital citizenship comprising nine behavioral dimensions: etiquette, communication, education, access, commerce, rights, safety, and security. In the same vein, 21st-century research in civic education has also moved beyond the four walls of the classroom and incorporated digital literacy, global citizenship, social justice, and integrated technology (Corbisiero-Drakos et al., 2021; Pike, 2008; Quigley, 1995)

Within middle-range theory, the theory of digital citizenship articulates the intersection of democratic values and democratic processes within the digital realm. Digital citizenship consists of the ethics of digital communication, digital literacy, the protection of online minors, and the advocacy of civic engagement (Jones & Mitchell, 2016; M. S. Ribble et al., 2004). Within middle-range theory, the theory of digital citizenship articulates the intersection of democratic values and democratic processes within the digital realm. Digital citizenship consists of the ethics of digital communication, digital literacy, the protection of online minors, and the advocacy of civic engagement (Choi, 2016; E. Isin & Ruppert, 2020). Alongside this position, the theory of digital literacy views the ability of individuals to think critically to acquire, evaluate and produce information in digital form, as fundamental to active participation in civic life in the digital realm (Buckingham, 2015; Ng, 2012)

Involving digital citizenship within civic education is an unequivocal necessity within today's society, particularly for the youth. The era of globalization brought about noteworthy social transformations, most remarkably the speed at which new technologies are developed (Öztürk, 2021). Technologies can both benefit society by improving productivity and encouraging creative solutions. At the same time, technologies can contribute to a decrease in the moral standards of society, particularly youth (Jones & Mitchell, 2016). The negative effects described here are problems that the education system must address by building the digital citizenship competencies of youth and fostering the development of critical thinking (Adhari et al., 2024). This is a possibility made available by the inclusion of character education which consists of moral knowing, modeling, feeling, and action (Nucci et al., 2014).

In the 21st century, civic education has become increasingly relevant in the past couple decades as part of the new consolidated information age (Corbisiero-Drakos et al., 2021). With the growth of social complexity and networking, the need to comprehend the layers of society is imperative (Westheimer & Kahne, 2004). Importantly, civic education intends to promote active citizenship (Parker, 2003).

According to Quigley (1995), civic education is no longer about what happens in the classroom. Pike (2008), states that in the 21st century, civic education is a vital part of an integrated whole. In today's world, civic education is diversifying and includes digital education, media education, global citizenship, and social justice (What, 2019). Research literature reviewed from books and national and international research journals showed a clear need for strengthening the education of character in schools, families, and communities to prepare young people as responsible digital citizens. Character education can help reduce the adverse effects of the digital world by strengthening the positive side of it.

Recent years have seen considerable growth in academic analysis of digital citizenship as a result of heightened digital technologies in civic, social and educational domains. Earlier research has defined digital citizenship in various ways, including through the prism of digital literacy (Ng, 2012), online civic participation (Kahne et al., 2016), and the ethics of digital behavior (Jones & Mitchell, 2016), and democratic engagement within digital spaces (Isin &

Ruppert, 2020). The findings of this study indicate that digital citizenship is a concept that goes far beyond technical skills, as it also encompasses civic responsibility, ethical and reflective engagement, and active participation in community life.

From an applied theory perspective, the integration of educational technology with augmented reality (AR)-based learning theory provides an explanatory framework for the mechanisms of digital citizenship competency formation through instructional design. Constructivist learning theory assumes that immersive and interactive technologies facilitate active knowledge construction and contextual learning (Jonassen & Rohrer-Murphy, 1999). Based on empirical findings, augmented reality has been proven to increase student engagement, conceptual understanding, and learning motivation (Akçayır & Akçayır, 2017; Avila-Garzon et al., 2021; Wu et al., 2013). Conversely, the application of augmented reality in the context of education also raises ethical and civic issues related to privacy, digital behavior, and responsibility in the use of technology. These conditions emphasize the urgency of integrating the principles of digital citizenship into the implementation of augmented reality-based civic education (Kljun et al., 2020).

Concurrently, augmented reality (AR) has come forth in promise as an educational technology that can significantly improve learning through immersion and interaction. An increasing number of empirical studies posit that AR positively enhances students' motivation, engagement, and learning, as well as their understanding of concepts across multiple disciplines (Akçayır & Akçayır, 2017; Avila-Garzon et al., 2021; Wu et al., 2013). AR has improved contextualized learning and deep understanding of social studies and civic-related learning and has aided in the learning and understanding of abstract and complex concepts (Sırakaya & Sırakaya, 2022).

The potential of augmented reality (AR) in the context of digital citizenship pertains to the influence of AR technologies on the behaviors and obligations of users as digital citizens (Kljun et al., 2020). Digital citizenship is the acceptable behavior, practices, and ethics of individuals in the digital world. On the other hand, augmented reality is the technology that blends the real world and digital content in an interactive and engaging way (Billinghurst & Dünser, 2012). The intersection between digital citizenship and augmented reality is that students using Augmented Reality (AR) technology are expected to behave in an ethical, safe, and responsible manner (Ohler, 2010).

In this context, it is important to consider how students as augmented reality users should maintain their privacy when using this technology, as well as how they can utilize augmented reality technology in the educational environment positively and productively so that their class becomes citizens who utilize technology instead of being utilized by technology (Billinghurst & Dünser, 2012). Thus, an understanding of digital citizenship is crucial in the face of technological developments such as augmented reality so that students can use the technology responsibly and make positive contributions in the digital environment (Choi, 2016).

In addition, the majority of contemporary literature reviews still examine digital citizenship and augmented reality partially. For example, systematic literature reviews on AR in education generally do not integrate their findings into the perspective of citizenship education or digital citizenship theory. Conversely, reviews of digital citizenship research literature also tend not to make AR and other learning technologies a major part of their analysis. These findings indicate a valuable gap in research that connects augmented reality, citizenship education, and digital citizenship into an integrated theoretical and pedagogical framework.

Although there is a theoretical foundation that integrates democratic citizenship, digital citizenship, and educational technology, existing empirical research and literature reviews still tend to position the three as separate domains. The majority of studies on digital citizenship focus on conceptual frameworks, behavioral dimensions, and moral aspects in various digital spaces, while studies on the use of augmented reality in education emphasize pedagogical approaches and technological characteristics. Thus, there is still very little research that examines in depth how the concept of digital citizenship is defined, developed, and integrated in the context of citizenship education through augmented reality-based learning, especially through a comprehensive review of existing research.

Previous studies have not adequately coordinated and mapped the theoretical relationships, main research focuses, and latest developments in digital citizenship, citizenship education, and augmented reality. In particular, the lack of research examining the role of augmented reality as a pedagogy in the formation of digital citizenship competencies highlights the urgency of conducting a systematic literature review (SLR) for the first time that specifically integrates these three fields. This integration is important to clarify existing research developments, identify areas that have not been widely studied, and provide a basis for developing a research agenda for the future. Thus, bridging this gap is the main novelty of this study.

The increasing number of publications in the field of digital citizenship and augmented reality (AR) in education shows a growing academic interest in both fields. However, we have yet to adequately address the crucial issue of integrating digital citizenship competencies conceptually and pedagogically in AR-based citizenship education. The majority of research still positions digital citizenship as merely a normative realm of digital behavior, while studies on AR in education predominantly highlight its function as an instructional technology to enhance learning engagement and visualization. On the other hand, there is still very limited research that explains the dimensions of digital citizenship, such as ethics, participation, literacy, and responsibility, in the framework of immersive learning design in citizenship education. This fragmentation of studies not only makes the discourse on responsible digital citizenship less operational but also widens the gap between theoretical constructs and the practice of technology integration in citizenship education. Therefore, this gap needs to be addressed immediately so that digital citizenship in education does not merely become a discourse that follows trends but develops into meaningful pedagogical practices.

The available literature review shows that there is still a limited understanding of the potential of augmented reality (AR) as a pedagogical approach to developing digital citizenship skills in citizenship education. In addition, the existing literature has not clearly answered how theories, concepts, and thematic issues related to digital citizenship, citizenship education, and augmented reality are interconnected within a coherent framework. Therefore, it is important to address these issues so that the argument for integrating contemporary technology with educational objectives based on citizenship values becomes stronger and more academically sound.

Based on these gaps, this study applies a systematic literature review (SLR) to comprehensively examine the relationship between digital citizenship, citizenship education, and augmented reality. This study seeks to analyze the theoretical framework, pinpoint research deficiencies, and address educational challenges associated with the instruction of digital citizenship via augmented reality (AR) within the realm of citizenship education. To attain these objectives, this study is structured around the subsequent research questions:

RQ1: How are digital citizenship theories and concepts constructed in civic education literature?

RQ2: What dimensions and competencies of digital citizenship are most prominent in civic education research?

RQ3: How is augmented reality utilized and developed in civic education to support the formation of digital citizenship?

RQ4: What research gaps and directions for further study emerge from the examination of digital citizenship, civic education, and augmented reality?

METHOD

1. Research Design

This study uses a systematic literature review (SLR) as a methodological approach. According to Snyder (2019) and Paul et al. (2021), SLR is a systematic, transparent, and replicable method for identifying, evaluating, and synthesizing relevant scientific literature in a particular field of research. This approach is considered appropriate because it allows for comprehensive mapping of theoretical and empirical developments. In addition, SLR also serves to examine research trends, identify state-of-the-art (SOTA) developments, and find research gaps that require further attention

2. Data Sources and Search Strategy

Scholarly articles from the past five years were prioritized to ensure that the most recent studies, which demonstrate the growing relevance and methodological advancements, are published in the fields of digital citizenship, augmented reality, and technology-supported learning, especially in the context of citizenship education. As the use of digital technology in education becomes increasingly dominant, this approach is considered capable of providing an appropriate pedagogical basis for this research, particularly by enhancing student engagement and fostering critical thinking skills necessary for effective citizenship education.

The literature search was done in a systematic way by using relevant keywords and structured search strategies to find peer-reviewed research papers. The keywords used include digital citizenship, augmented reality, civic education, learning, and technology. The selection of these keywords was based on their relevance to the study's conceptual framework and the context of technology-based learning environments. Furthermore, these keywords were combined with Boolean operators and searched in various electronic library sources, such as Google Scholar and Publish or Perish, to identify and evaluate as many relevant journal articles, books, and conference proceedings as possible.

3. Inclusion and Exclusion Criteria

To maintain the quality and relevance of the literature reviewed, the author established strict inclusion and exclusion criteria. A study was included if: (1) it provided a definition of digital citizenship and/or augmented reality in the context of education; (2) it is published in a peer-reviewed journal or published by a reputable academic publisher; and (3) it contains a conceptual framework, model, empirical findings, or evaluation instruments related to digital citizenship, citizenship education, or technology-based learning.

A study is excluded if: (1) it falls beyond the domain of education; (2) it fails to examine digital citizenship or augmented reality comprehensively; (3) it constitutes an

opinion piece, editorial, or non-scholarly work; and (4) it does not grant access to the complete text. The application of these criteria ensures that the selected studies conform to methodological standards and are relevant to the research's thematic focus.

To achieve consistency, objectivity, and methodological reliability, exclusion and inclusion criteria were established a priori before the initial study flow, as shown in Table 1 below:

Table 1. Criteria, Exclusion, and Inclusion

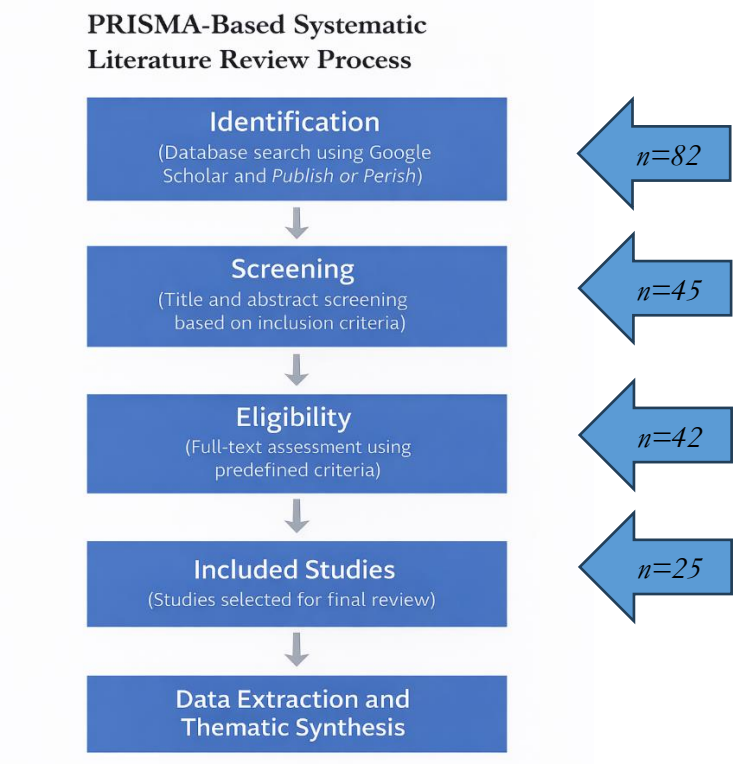
Criteria	Exclusion	Inclusion
Publication Period	Studies published before 2018	Studies published between 2018 and 2025
Educational Context	Studies outside educational or learning contexts	Conducted in formal or non-formal educational settings (schools, universities, teacher education)
Publication Source	Non-peer-reviewed or predatory publications	Peer-reviewed journals, reputable academic publishers, and indexed conference proceedings
Technology Aspect	Studies unrelated to technology-enhanced learning	Studies integrating Augmented Reality or digital technology in learning contexts
Research Focus	Does not address digital citizenship or civic-related education	Explicitly discusses Digital Citizenship, Civic Education, or Citizenship Knowledge
Language	Articles published in languages other than English	Articles published in English
Accessibility	Full text inaccessible	Full-text articles available
Methodological Quality	Unclear methods or insufficient methodological detail	Clear research objectives, methodology, and findings
Study Type	Opinion pieces, editorials, non-academic blogs	Empirical studies, conceptual models, frameworks, or validated instruments

Source: Page et al. (2021)

4. Literature Screening Process

The systematic literature review followed the PRISMA methodology, as adapted by Kitchenham et al. (2009) and Moher et al. (2009) for qualitative systematic reviews. As per the PRISMA guidelines, each stage of the screening process documented the number of records retrieved, screened, excluded, and included. The initial set of search parameters produced 82 records. Title and abstract screening left 45 records. Following a full-text evaluation that included identification, screening, eligibility assessment, and final inclusion of relevant studies, 25 studies were included in the qualitative synthesis. Figure 1 details the screening process.

Figure 1. Stages of the Systematic Literature Review Process



Source: Kitchenham et al. (2009); Moher et al. (2009)

The literature search was temporally bound from 2018 to 2025 to establish parameters for the most applicable literature on the most robust methodologies. The impact of this is proportional to the recent breakthroughs in areas such as digital citizenship, augmented reality, technology-enhanced learning, and civic education. This notion is particularly applicable given the recent incorporation of digital technologies into the education system. In the current study, the authors conducted a systematic, transparent literature screening across several stages to assess the relevance and empirical and methodological quality of the cited studies. The screening was conducted in accordance with the prescribed systematic literature review (SLR) guidelines and best practices (Page et al., 2021; Snyder, 2019).

5. Quality Assessment

To evaluate the reliability and credibility of the results from the review, individual evaluations were conducted on each of the studies included in the review, modifying the examples of criteria from previous SLRs (Kitchenham et al., 2009; Petticrew & Roberts, 2006) on the clarity of specific research objectives, the methodological rigor, the relevance to the research questions, the clarity of data collection and analysis, and the contribution of the study to theory or practice.

The quality assessment criteria were adapted from the established guidelines for systematic reviews in the education and social science domains, particularly those of Kitchenham et al. (2009) and Petticrew and Roberts (2006). These criteria serve as parameters for evaluating quality, referring to a number of frameworks commonly used to review qualitative and mixed-methods studies. Each framework is assessed on a three-level quality scale: high, moderate, and low. Research studies that do not meet the minimum quality threshold, especially those that do not explain their methods or relate to the theory,

will be excluded from the synthesis process. Regarding the quality assessment, the reports revealed that the studies included in the review met the minimum quality criteria, making them appropriate for advanced thematic analysis. This process enhances the reliability and validity of the research findings and the quality and validity of the synthesized evidence.

RESULTS AND DISCUSSION

With the increasing development of digital technologies, the various facets of life, including education, economy, society, and politics, have experienced significant transformation. Such changes demand that individuals be equipped with digital literacy and the ability to utilize information and communication technologies judiciously, responsibly, and safely.

As a result, digital citizenship education has become a fundamental aspect of education in the 21st century. Therefore, in today's context, digital citizenship education is a critical component of 21st-century education (M. Ribble & Bailey, 2011). There is a significant lag in both the curriculum and teaching practices regarding the understanding and implementation of digital citizenship education. Hence, it is essential to analyze the key aspects of digital citizenship education. The findings will provide a basis for formulating strategies for teaching digital citizenship.

Based on the PRISMA screening results, 25 studies were included in the qualitative synthesis. All studies met the inclusion criteria, covered the period from 2018 to 2025, and were published in sources indexed in Scopus and Web of Science. The first search turned up 82 records. These records were then screened based on title, abstract, relevance to the research focus, and full-text quality evaluation to determine the final selection. After removing duplicates and screening based on title and abstract, 45 studies remained.

Additionally, after reviewing the full texts, 25 studies were found adequate for inclusion in the synthesis. Among these studies, 14 examined digital citizenship while 11 examined augmented reality in education. The majority of studies neglected the intersection of these two constructs in citizenship education, indicating a gap in the literature on integrating digital citizenship and augmented reality to improve education in this field. Table 2 shows the full list of articles that were included in this systematic literature review (SLR):

Table 2. Results of SLR Research Article Included

Author (s) (year)	Type of Study	Research Design	Publisher
Alshawi (2023)	Quantitative	Cross-sectional quantitative study	Humanities & Social Sciences Communications
Pangrazio & Sefton-green (2021)	Literature Review	SLR	Journal of New Approaches in Educational Research
Avila-Garzon et al. (2021)	Literature Review	Bibliometric Analysis	Contemporary Educational Technology
Chang et al. (2023)	Literature Review	SLR	Virtual Reality, Springer
Corbisiero-Drakos et al. (2021)	Quantitative	Cluster Randomized Control Trial (RCT) design	International Journal of Education & The Arts
Fernández-Prados et al. (2021)	Literature Review	SLR	Informatics, MDPI

Garzón et al. (2019)	Literature Review	Systematic Review and Meta-Analysis	Virtual Reality, Springer
Hunter et. al. (2021)	Literature Review	SLR	Interaction Design and Architecture(s) Journal
Sırakaya & Sırakaya (2022)	Literature Review	SSCI database and deemed suitable	Interactive Learning Environments, Routledge
Kim & Choi (2018)	Mixed Method	S.A.F.W Model through EFA and CFA verification	Educational Technology & Society, International Forum of Educational Technology & Society
Kljun et al. (2020)	Book	Chapterbook	Springer Series on Cultural Computing
Manzuoli et al. (2019)	Literature Review	SLR	TOJET: The Turkish Online Journal of Educational Technology
Öztürk (2021)	Literature Review	SLR	Journal of Educational Technology & Online Learning
Wahab (2020)	Literature Review	SLR	Advances in Social Science, Education, and Humanities Research
Radianti et al. (2020)	Literature Review	SLR	Computers & Education, Elsevier Ltd
Rumiati et al. (2024)	Qualitative	Descriptive-analytical method	Journal of Humanities and Social Studies
Subhashini et al. (2020)	Quantitative	Quasi-Experimental,	Journal of Information Technology and Digital World
Usmia & Samsuri (2023)	Qualitative	Literature study methods	Atlantis Press SARL
E. Wulandari et al. (2021)	Qualitative	Case Study	Universal Journal of Educational Research
Zheng et al. (2019)	Quantitative	One-group pretest-posttest control group design	ACM International Conference Proceeding Series
Garzón (2021)	Literature Review	SLR	Multimodal Technologies and Interaction, MDPI
Çetin & Turkan (2022)	Quantitative	One-group pretest and posttest experimental design	Education and Information Technologies, Springer
Adhari et al. (2024)	Literature Review	SLR	International Joint Seminar on Education, Social Science and Applied Science, KnE Social Sciences
Masalimova et al. (2023)	Literature Review	Bibliometric Analysis	Online Journal of Communication and Media Technologies
Mystakidis et al. (2022)	Literature Review	Systematic mapping review	Education and Information Technologies, Springer

The 25 articles that were screened and included in the "included" category were analyzed to answer literature questions in order to strengthen the concept of literature research (Kabatiah et al., 2024; Rachman et al., 2024).

1. Trends and Distribution of the Reviewed Literature

From 2018 to 2025, trends in publications and studies show greater consistency in research on digital citizenship, augmented reality, civic education, and the integration of technology into learning. This also shows concerning gaps in the studies: there is development in the scholarly quest regarding the fundamentals of digital citizenship and the use of the latest technologies in relation to the curricula, and in this case, the development is in the digital learning systems and technology used in civic education (Choi, 2016; Garzón et al., 2019).

The systematic literature review shows an overwhelming growth in digital citizenship and augmented reality (AR) research over the past 10 years, particularly in the educational context. However, the focus of these studies varies widely. Most investigations focus on digital citizenship and augmented reality as a teaching technology, rather than on the synthesis of augmented reality and citizenship education. Digital citizenship is often viewed through several aspects, including techniques, ethics, digital literacy, participation, rights and responsibilities, and critique and resistance (Pangrazio & Sefton-green, 2021). Most studies focus on the responsible use of technology, online safety, and information evaluation, and few extend this understanding of digital citizenship to civic engagement and democratic participation on online platforms.

This review centred around the following research questions: (1) Regarding digital citizenship in education contexts and augmented reality as teaching technology, almost all the studies I examined focus on one or the other. Surprisingly, so few studies consider both civic and citizenship education. This pattern indicates that scholarship on digital citizenship and augmented reality has developed mostly in parallel, a trend noted in previous systematic reviews of digital technologies in education (Radianti et al., 2020; Radu, 2014).

Mulyani et al. (Mulyani et al., 2024) illustrate the implementation issues and the obstacles hindering Global Citizenship Education (GCED) in the 21st century using a systematic literature review. The results show GCED as a crucial element in developing learners' awareness and sense of responsibility, as well as the skills and competencies needed to tackle global issues such as inequality, multiculturalism, and sustainability. GCED, however, is still challenged by inflexible curricula, teacher unpreparedness, cultural issues, and a lack of support from the concerned institutions. The building of teacher capacity and the support of multiple digital initiatives, in order to improve the practice of GCED in formal education. The study positions GCED as a reformative educational model that should be tailored to the fourth industrial revolution (Wahab, 2020).

The majority of publications on this topic come from the fields of educational technology, social science education, and digital literacy education. In comparison, journal publications in citizenship education remain few, suggesting that the use of innovative teaching technologies, such as augmented reality, is still in its infancy. The literature is primarily focused on the competencies and curriculum of digital citizenship, while empirical studies tend to address the intersection of digital literacy, digital ethics, digital participation, and the responsibilities of being a digital citizen. In contrast, the literature on augmented reality learning regarding cognitive engagement, visualisation, motivation, and learning outcomes remains scant. Furthermore, the field lacks comprehensive studies, as evidenced by the poor representation of the intersection of digital citizenship, augmented reality, and

citizenship education. This part emphasises the importance of education for citizenship as a key educational process that empowers and equips individuals with the competencies required for the digital era. The various aspects of digital citizenship are multidisciplinary and span several fields, including technology, ethics, and social studies, which are essential for understanding its implications in the context of citizenship education.

This section highlights the role of citizenship education as a primary vehicle for developing knowledgeable citizens prepared to meet the demands of competency in the digital age. The dimensions of digital citizenship have received widespread attention across various disciplines. Some literature reviews on augmented reality and digital citizenship have shown how this framework positions the educational focus of learning. The educational aspects of digital citizenship include online behaviour, information literacy, respect for others' copyrights, management of one's digital footprint, critical thinking, online civic engagement, media literacy, and advocacy for digital rights. The reviews of the studies show that the evolution of digital citizenship and augmented reality research has developed in parallel. The distribution of these studies confirms that the development of digital citizenship and augmented reality research has largely occurred in parallel, rather than developing within a coherent, integrative framework within civic education.

2. Dimensions of Digital Citizenship Recognized in the Literature

The literature review indicates that digital citizenship is a multidimensional construct encompassing the ethical, cognitive, social, and participatory dimensions of technology use. Although there are differences in terminology and classification across the literature, some dimensions recur, such as the ethical, cognitive, social, and participatory dimensions, which are essential for understanding digital citizenship. Thus, the literature reviewed reiterates that digital citizenship is a multidimensional construct and encompasses the ethical, cognitive, social, and participatory dimensions. One of the most frequently cited frameworks is Ribble's model of digital citizenship, which outlines nine core elements grouped into themes of respect, education, and protection in digital environments (M. Ribble & Bailey, 2011; M. S. Ribble et al., 2004).

Being a digital citizen involves three dimensions of internet use: a shared imaginary of the movement, communicating its ideas to the world outside, and engaging in intense collaboration (Isin & Ruppert, 2020). As schools prepare students for the 21st century, the most important teaching and learning strategy is technology integration, which is why schools have prioritised digital citizenship. Digital citizenship comprises nine general areas of behavior: etiquette, communication, education, access, commerce, responsibility, rights, safety, and security (Ribble et al., 2004). While others refer to dimensions of digital citizenship (creative, communicative, participatory, axiological). (Manzuoli et al., 2019; Sanabria & Cepeda, 2016).

Furthermore, many dimensions of digital citizenship are discussed in the Digital Citizenship Education Handbook, namely access and inclusion, learning and creativity, media and information literacy, ethics and empathy, health and well-being, e-presence and communications, active participation, rights and responsibilities, and privacy and security, and also consumer awareness (What, 2019). This dimension is reinforced by Öztürk (2021), who argues that becoming a digital citizen requires four categories: ethics, media and information literacy, participation/involvement, and critical resistance (Choi, 2016).

In addition to Ribble's framework, multiple other studies offer alternative classifications that incorporate ethics, media and information literacy, online participation, and critical engagement with digital technologies. Choi (2016), for instance, defines digital

citizenship as the integration of digital ethics, media literacy, civic engagement, and critical protest, thereby foregrounding the active, participatory nature of engagement with the digital world. In the same vein, Kim & Choi (2018) describe the competency-based aspects of digital citizenship as including a sense of digital responsibility, as well as the capacity for critical thought and active participation.

These individuals possess values and norms regarding the appropriate and effective use of technology, digital literacy, and an understanding of the associated rights and responsibilities (Wulandari et al., 2021). This differs from Simsek & Simsek (2013), who posit that the integrated digital model comprises two dimensions: the pedagogical or environmental dimensions and the associated skills and competencies that the literate individual is expected to possess.

Digital citizenship encompasses multiple dimensions that illustrate the diverse aspects of responsible technology use. Literature research has identified many of these dimensions (Ribble & Fodeman, 2011):

a) Digital Access: This dimension of the framework underscores the technological and internet access rights of all citizens. Access to digital technologies limits societal participation in numerous ways. An example of digital access is the provision of digital learning infrastructure in schools.
b) Digital Commerce: This dimension of the framework emphasises the responsible buying and selling of goods and services online. It also covers consumer rights, online protections, and the dangers associated with e-commerce.
c) Digital Communication: This element of the framework emphasises the ability to use digital tools effectively and appropriately for communication. This includes using different communication styles, observing netiquette, and understanding the possible repercussions of online communication.
d) Digital Etiquette: This dimension concerns the standards of behaviour expected in the online space and requires an understanding of why and how to use digital platforms respectfully, as well as how to prevent cyberbullying.
e) Digital Literacy: This dimension focuses on the purposeful and thoughtful use of different technological devices. It includes understanding information, media, and Internet resources, as well as evaluating them. Students' digital literacy positively affects their creativity, as well as creativity in the online classroom or learning environment.
f) Digital Law: This section covers laws governing the use of technology, including copyright, intellectual property, and internet crimes.
g) Digital Rights and Responsibilities: This dimension concerns the freedoms and rights citizens possess in the digital environment, along with the responsibilities that accompany them, such as the obligation to use technology responsibly. Digital rights and responsibilities are a fundamental component in the cultivation and enforcement of rules in the school environment and learning by systems.
h) Digital Health and Wellness: This dimension concerns the psychological and physical health of individuals in the digital environment. In this regard, issues such as internet addiction, cyberbullying, the balance between on- and off-screen activities, and the resultant health effects in terms of eye problems and mental health are important.
i) Digital Security: This dimension focuses on protecting yourself and others from online threats, including developing safe online practices such as strong password

management, protecting personal information at all times, and avoiding phishing attacks.

The interdependence of these dimensions allows for a comprehensive understanding of digital citizenship in the educational context. Education and training that accommodates these dimensions largely determine an individual's preparation for effective and responsible digital citizenship. Core dimensions frequently identified include digital access and inclusion, digital and media literacy, ethics and responsibility, digital participation, rights and responsibilities, health and well-being, and individual privacy and security. These dimensions emphasize that digital citizenship goes beyond merely mastering technical skills and knowledge, encompassing values, critical awareness, and civic activism in the digital space, which can be developed through citizenship education.

In particular, a key trend in the digital citizenship literature is the emphasis on the concept's significance within the education sector, positioning schools and universities as key institutions in promoting responsible digital citizenship. However, a considerable gap remains in the learning practice concerning the application of the aforementioned components, especially concerning newer teaching technologies that may enable experimental and contextualized learning.

3. Dimensions of Augmented Reality in the Context of Education

The simultaneous progress of studies on digital citizenship and augmented reality reveals a divergence within technology-oriented citizenship education. This reveals a lack of a cohesive pedagogical model and framework that integrate the design of immersive learning with the standard digital competencies necessary for augmented reality in technology-oriented citizenship education.

In general terms, augmented reality is an interactive teaching tool that enhances visualization, engagement, and learning in certain situations. Some investigations have shown that augmented reality applications are effective at minimising cognitive load, enhancing learner motivation, and improving learning outcomes. However, most studies have focused on the instructional use of AR in science, engineering, and education, with little attention to civic and citizenship education (Garzón, 2021).

In the field of education, augmented reality (AR) has been the focus of research as a technology that supports learning and education (Billinghurst & Dünser, 2012). This is because AR offers new forms of interactivity with content, improved visualisations of scientific phenomena, and lower cognitive load (Avila-Garzon et al., 2021). Previous research has focused on several AR innovations to facilitate learning/teaching effectiveness for both students and employees, such as interactive simulations and virtual classrooms that enhance engagement and comprehension. Moreover, research continues on AR's applicability and use in real-world settings (Lee, 2012).

The existing body of research identifies AR as a learning aid. The primary focus of most studies is AR's ability to support learning by helping users visualise, learn in context, and engage in activities that foster understanding of difficult ideas (Akçayır & Akçayır, 2017; Garzón et al., 2019). Reports also indicate that AR educational technologies foster learner engagement and enhance their understanding and experiences. AR-enabled learning environments support the visualisation of challenging and abstract ideas and foster active learning, thereby improving knowledge retention and reducing cognitive load during learning activities. Several studies conclude that students achieve improved academic performance.

Augmented reality (AR) integrates digital content and virtual models into the user's visual field, enabling a contextualized, interactive, and embodied perception of information that enhances comprehension of intricate concepts and environments (Hunter et al., 2021). Instead of delivering information in an abstract or detached manner, augmented reality integrates digital elements directly into the physical environment, enabling users to interact with content within their immediate surroundings. This immersive feature enhances learning, communication, and cooperation, rendering them more intuitive and significant. Moreover, augmented reality offers a distinctive platform for individuals to engage with, investigate, and experience others' concepts more vividly. Thus, augmented reality (AR) enhances the visualization of thoughts and concepts while promoting shared comprehension by rendering personal ideas more accessible and experientially available to others (Subhashini et al., 2020).

Several studies have shown that AR can help reduce cognitive load and increase information retention by using contextual and visual cues that aid understanding of difficult or abstract concepts (Cheng & Tsai, 2013; Radu, 2014). Primary studies on augmented reality (AR) technology focus on the effectiveness of the teaching method, students' motivation, and learning outcomes, mostly in the context of STEM and vocational education (Mystakidis et al., 2022). In contrast, the use of augmented reality in civic education is almost nonexistent. When augmented reality is used in civic education, it is primarily an additional tool for visualising certain aspects rather than an instrument for developing civic, ethical, and participatory competencies (Masalimova et al., 2023).

In addition to cognitive outcomes, some research suggests that AR can encourage collaborative and experiential learning. These characteristics, together with the flexibility of AR, are consistent with the constructivist learning model, but its use in citizenship education has been described as inadequate (Radianti et al., 2020). This evidence indicates that the use of AR for developing digital citizenship skills remains under-researched and under-explained, and requires further attention in empirical research. While Siregar & Rachman (2024) acknowledge the role of digital technologies in civic values education, the lack of AR tools indicates that the potential for more immersive, experiential learning about digital citizenship has not yet been realised. The educational potential of augmented reality (AR) lies in its ability to create 3D visualisations and simulations and to provide interactive learning experiences (Subhashini et al., 2020). With augmented reality, seamless integration of the physical and digital environments is possible, enabling improved educational experiences (Avila-Garzon et al., 2021).

The rapid advancement of augmented reality (AR) technology has broadened its prospects in educational settings, particularly in immersive environments, visualizations, and simulations (Avila-Garzon et al., 2021; Billinghurst & Dünser, 2012). Research has shown that AR technology has the potential to (1) increase student engagement in the educational process, (2) improve understanding of educational concepts, and (3) increase the desire to learn (Subhashini et al., 2020; Wu et al., 2013). On the contrary, AR integration in education raises ethical and civic issues, such as data privacy, digital responsibility, and the lack of technology awareness and the optimal use of digital resources in educational settings (Kljun et al., 2020; Ohler, 2010).

Research has shown that augmented reality can define educational approaches that lead to higher levels of subject-matter comprehension, enhance the overall learner experience, and foster a constructive, positive educational atmosphere (Avila-Garzon et al.,

2021). Augmented reality in education can be interactive learning using AR apps, visualization of 3D abstractions, and situational simulations (Billinghurst & Dünser, 2012).

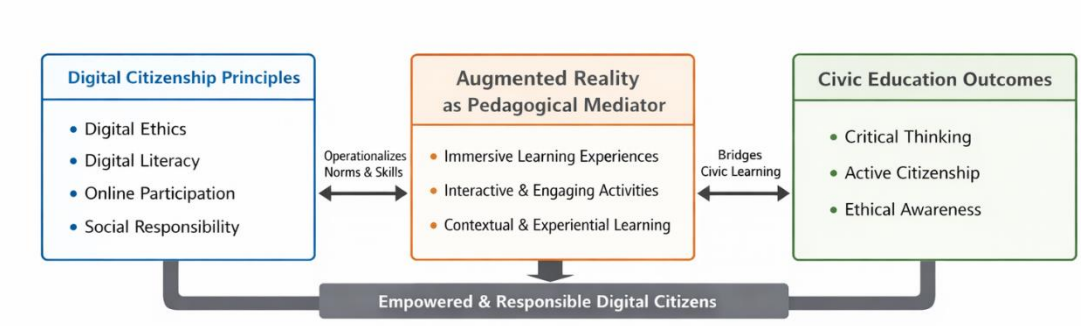
Research into digital citizenship approaches reveals a disconnected landscape. Digital citizenship literature tends to focus on conceptual frameworks, competency dimensions, and assessment frameworks (Choi, 2016; M. Ribble & Bailey, 2011), while AR research tends to focus on instructional effectiveness, usability, and learning outcomes. As augmented reality technology becomes more advanced and readily available, its potential impact on education will continue to grow (Lee, 2012). Augmented reality is a technology that integrates the physical world with digital elements, providing students with an engaging, interactive learning experience. Developments, possibilities and challenges regarding the use of augmented reality in education (Wu et al., 2013).

4. Correlation Between Civic Education, Augmented Reality, and Digital Citizenship

The most significant findings indicate a lack of integration of digital citizenship competencies and augmented reality in civic education learning environments. Research on digital citizenship largely focuses on its ethical and participatory dimensions, whereas research on augmented reality focuses on the learning experience. However, there is a lack of research articulating a comprehensive, pedagogically sound framework for integrating augmented reality and digital citizenship into civic education.

The absence of this framework directly addresses Research Question 4. It emphasizes the main point of this study: the need for a conceptual integration model that views augmented reality not solely as a technological resource but also as a pedagogical tool for developing digital citizenship discourse in civic education. Cumulatively, these findings demonstrate that the available literature has described these two constructs separately but has not yet provided a systematic articulation for integrating civic education goals with the use of augmented reality as a learning tool. This integrative gap is the main theoretical contribution of this study, as shown in Figure 2 below:

Figure 2. Integration Concept AR in Civic Education Model's



The examined literature shows that digital citizenship and civic education aim to promote the same educational goals, especially responsible participation, critical thinking, and participatory democracy in the digital world. Digital citizenship frameworks tend to align with the goals of civic education but place greater emphasis on responsible online participation, the ethics of the internet, and the critical need for media literacy (Choi, 2016; Kahne et al., 2016). Digital citizenship teaches students the importance of being responsible and ethically correct while participating in online spaces. It also teaches digital information literacy, cyberbullying, online safety, digital responsibility, and the mental/emotional

aspects of internet wellness. Teaching digital citizenship enables educators to prepare students for responsible participation in the digital space (Geroimenko, 2020).

Currently, digital citizenship is divided into four categories: digital citizenship as ethics; media and technology literacy; participation/engagement; and critical resistance. (Wulandari et al., 2021). Digital citizenship can be defined as the behavioral norms governing the use of technology. As a way to understand the complexity of digital citizenship and the issues of technology use, misuse, and abuse, we have identified nine common behavioral areas that make up digital citizenship: etiquette, communication, education, access, commerce, responsibility, rights, safety, and security (Ribble et al., 2004).

Digital citizenship refers to the responsible and ethical use of digital technologies and the behaviors, norms, and values that users display (Jones & Mitchell, 2016). As younger members of society, students can acquire the skills and awareness needed to use the digital ecosystem positively and to understand their roles as technology users and their civic engagement responsibilities (Öztürk, 2021). In education, AR technology can transform students' learning experience by offering interactive, immersive learning opportunities that stimulate engagement. AR can be embedded into digital citizenship lessons to develop simulations and scenarios in safe, controlled environments, giving students opportunities to practice responsible online behaviours (Chang et al., 2023).

While augmented reality has been widely applied in science, mathematics, and vocational education, its use in civic education is relatively limited. The current literature indicates that augmented reality could foster civic learning by facilitating experiential simulations and historical explorations and by problematizing representations of social issues (Avila-Garzon et al., 2021; Radianti et al., 2020). This study reinforces the review claim that augmented reality and other forms of technology-enhanced learning can advance civic consciousness and digital citizenship by fostering participatory and contextual learning (Saputra & Saputra, 2024).

Civic education teaches students to be active and informed participants in the community. Topics include democracy, the rights and responsibilities of citizens, and civic engagement (Zheng et al., 2019). The combination of digital citizenship and civic education means that students are taught not only to exercise responsibility when using the internet, but also to analyze the potential effects of their actions on the digital community. In the modern world, it is important to understand the link between online behaviour and civic engagement (Hunter et al., 2021).

The civic education curriculum reconfiguration includes emphasis on the 21st-century skills (Rahayu et al., 2022), integration across disciplines (Usmia & Samsuri, 2023), information communication technology (Kirani & Najicha, 2022), character education of digital literacy (Julaiha, 2014), and the engagement of the community through educational projects or collaborations (Bhat, 2021). In restructuring the ontology of Civic Education, it is necessary to involve education, legal, and other stakeholders. In addition, it is necessary to conduct regular evaluations and development to ensure the effectiveness of this restructuring in achieving the goal of forming good and smart citizens (Çetin & Türkan, 2022).

Digital citizenship is the concept of how people should responsibly and ethically utilize technology and the internet. This encompasses a variety of behaviours that promote positive online behaviour, such as respect for others' privacy, digital literacy, and the positive use of online communication (Manzuoli et al., 2019). Ignorance of one's rights and responsibilities concerning online safety, security, and intellectual property is a violation of

digital citizenship (Ribble et al., 2004). Digital citizenship is a measure of one's ability to use technology and to comprehend, evaluate, and take a critical perspective on digital content and the ethical issues surrounding it (Rumiati et al., 2024). One must also be able to converse, create, and use appropriate tools to research and synthesise in the digital environment. Furthermore, one must be able to make digital decisions that are respectful, responsible, and safe (Isman & Gungoren, 2014).

Civic education in Indonesia has predominantly focused on the nexus between civic knowledge and civic attitudes; however, little attention has been given to the potential of immersive technologies such as augmented reality to enhance the learning experience in digital citizenship (Prasetyo et al., 2013). The most prominent research on digital citizenship has been on community-based digital literacy initiatives (Utomo et al., 2023). This study augments the current literature by considering digital citizenship and civic education in the context of augmented reality as a pedagogical means.

A convergence of theory has been established regarding digital citizenship, augmented reality, and civic education, while a convergence of data is still developing. Digital citizenship provides values and ethics for responsible and constructive technology use; civic education contributes ideological and participatory aspects; and augmented reality provides the technological means for immersive, contextual learning. The alignment of theory, however, has not been accompanied by the same rigor in the empirical studies. The studies, in particular, have been silent on the phenomenon of integration, finding models in which digital citizenship is considered a singular competency, augmented reality is a neutral, contextual, instructional framework, or learning AR environments are designed to promote civic virtues and responsible digital citizenship.

Further research ought to investigate the potential of augmented reality as an orientation tool for continuous learning. Digital citizenship orientation via digital learning methods, including augmented reality, can be influenced by textbooks, learning materials, learning methods, and tech-enhanced learning environments. Research on digital citizenship that focuses on augmented reality can provide an all-encompassing understanding of adoption across other sub-disciplines, such as technology in digital learning environments. To illustrate, future studies can explore the extent to which augmented reality-based learning enhances digital citizenship across all relevant subjects that promote sustainable development in the digital era.

This research offers an integrated conceptual model that positions augmented reality as a pedagogical instrument that, for the first time, bridges digital citizenship competencies as processes in civic education learning. Unlike previous studies, which examine digital citizenship and augmented reality in isolation, the current study integrates the two into a single teaching model. However, very few studies explicitly incorporate digital citizenship and augmented reality-based learning into civic education. This indicates a research gap in systematically integrating the meaningful potential of technology into civic education, particularly in the context of formal education.

CONCLUSION

The aim of this systematic literature review is to identify and analyze conceptual and pedagogical gaps associated with the intersection of digital citizenship, augmented reality, and citizenship education. The review highlights the lack of literature connecting digital citizenship competencies with immersive learning designs, despite substantial growth in the literature on digital citizenship and augmented reality. Augmented reality, in this regard, can

create interactive, immersive learning environments that facilitate active knowledge construction and help learners develop critical digital literacy, civic engagement, and responsible citizenship, including the reflective and responsible evaluation and engagement within the digital ecosystem. As such, augmented reality has the capacity to serve as a pedagogical tool that integrates the principles of digital citizenship, including responsible, participatory, and contributory use of technology, into a real-world learning environment. The originality of this study lies in its creation of a new conceptual position that views augmented reality as a pedagogical tool for integrating digital citizenship into citizenship education rather than merely a technological instrument.

This study constructs a framework that combines digital citizenship theory, digital learning theories, immersive learning design, normative citizenship competencies, and experiential, technology-based learning. From this perspective, the findings confirm that educators and curriculum developers can purposefully leverage augmented reality to develop ethical, critical, and participative digital citizens. However, the studies reviewed remain predominantly conceptual, and future research should focus on empirical and design-based studies to test the theory and refine the model of citizenship education with augmented reality, situated within real-world learning environments.

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The author team declares that there is no conflict of interest related to the publication of this article. All opinions, findings, and conclusions expressed in this article are solely the responsibility of the author team.

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