PAPER

Information and Communication Technologies for the Civic Participation of Parents in Schools: A Systematic Review

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ABSTRACT

The Internet has become a space where parents share their parenting experiences. However, citizenship education requires digital skills that go beyond the simple critical ability to evaluate virtual information and understand its relevance. This paper is a systematic literature review that examines the progress of parents' citizenship participation in schools through information and communication technologies (ICT) over the period from 2016 to 2024. The study adopts a bibliometric approach and follows the guidelines of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement. It analyzes 50 articles in the context of the PRISMA declaration. It focuses on three main aspects: the panoramic vision of digital citizenship, the semantic connection between groups of interconnected terms, and the role of parents in shaping citizenship. The results reveal a notable 31.61% increase in parents' civic participation in school, identifying parents' expectations in their children's learning as well as students' civic participation in school, highlighting the use of digital technologies to foster collaborative and academic learning in the construction of ICT-mediated citizenship.

KEYWORDS
civic participation, information and communication technologies (ICT), parents, schools

1 INTRODUCTION

Technology has gradually imposed itself on civic education and on individuals' relationships with society and education, giving rise to new channels of communication between schools and parents [1]. In addition, it acts as a regulator of group communication, counteracting the tendency to focus solely on negative aspects. Citizens thus have access to more direct and diversified information. According to [2] and [3], technology not only has an impact on the social sphere but also on the development of individual behavior by mobilizing resources and becoming a key player in the exercise of active citizenship.

Today, the Internet has become a space where parents share aspects of their personal lives [4], exchange information on parenting habits, and share experiences. This practice has evolved from a spontaneous action to a conscious practice, even becoming a common habit. If it is so easy to participate in various social networks [5], [6], it is because these platforms offer an ideal environment for presenting parenting, sharing information about it, and tackling challenges.

In the wake of the COVID-19 pandemic, virtual communication groups between all educational establishments and parents were created worldwide. It is clear that even parents who were less familiar with digital communication were able to access them immediately and continuously from each of their phones, resulting in a weakening of authority in digital interactions relating to educational and school aspects. This phenomenon is linked to the empowerment of citizens in virtual environments [7]. Consequently, digital citizenship involves a series of cognitive, emotional, behavioral, and civic factors that are not limited to media and forms of communication but also to parenting practices. In addition, it encompasses the relationship between parents and teachers, and these digital media are gradually gaining ground in school-family communication [8].

Addressing this challenge is essential to strengthening the relationship between the educational community and parents, as this relationship is currently closely linked to virtual connectivity and digital citizenship. These should promote a positive attitude towards communication, learning, and entertainment [9], enabling users to be critical and able to reflect, master, and exploit their own skills to interpret any content and draw their own conclusions [10]. For this reason, this paper focuses on conducting a systematic study that answers the following question: What was the evolution of parents' civic participation in schools through the use of information and communication technologies (ICT) from 2016 to 2024? Its aims are to understand the chronological evolution of parents' use of ICT in education and to identify relationships between different areas of interest. This analysis adopts a panoramic view of digital citizenship and production over time and an assessment of the degree of development and relevance of study over this period. The qualitative analysis focuses on the contribution to ICT-mediated citizenship formation, highlighting variables such as parents' expectations and involvement in their children's learning, students' civic participation from school onwards, and the use of digital technologies to promote collaborative and academic learning.

The remainder of this document is organized as follows: Section 2 presents the materials and methods used in this study. The main results, in the form of tables and figures, are described in Section 3. These results are discussed in detail in Section 4. The main conclusions and study perspectives are explained in Section 5.

2 MATERIALS AND METHODS

2.1 Research strategy

This paper is a systematic review of bibliometric design [11], [12], [13], using the documentary method. An exhaustive review of the literature dealing with the issue of ICT for parents' civic participation in schools was carried out, taking as criteria: relevance of the topic given by thematic coincidence and educational context; timeliness of the information: date of publication; contribution to current knowledge, applicability, and impact; as well as access and availability of full text, following the guidelines and recommendations of the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement. A total of 162,833 articles published between 2016 and 2024 were reviewed. Of these, an advanced search was filtered taking into

account criteria such as the last nine years, open access, and scientific articles, resulting in the exclusion of 162,223 documents, leaving 610 articles to review (refer Table 1). Subsequently, a detailed reading of the title and abstract excluded 546 theoretical studies, made up of essays and studies not directly related to ICT for parents' civic participation in schools. This process resulted in a final selection of 64 documents, which were exported to the bibliometric tool Bibliometrix for analysis (see Figure 1).

Table 1. Research strategy criteria

| Databases	Search Criteria, According to General Formula	Total Items	Excluded Because They are not Linked to Active Citizenship	First Pick Quantity
Scopus	ICT AND participation AND family AND school AND learning	1,691	1,589	102
Web of Science (WoS)	ICT AND participation AND family AND school AND learning	2,110	1,966	144
PubMed	ICT AND participation AND family AND school AND learning	132	59	73
Dimensions	ICT AND participation AND family AND school AND learning	158,900	158,609	291
Total		162,833	162,223	610
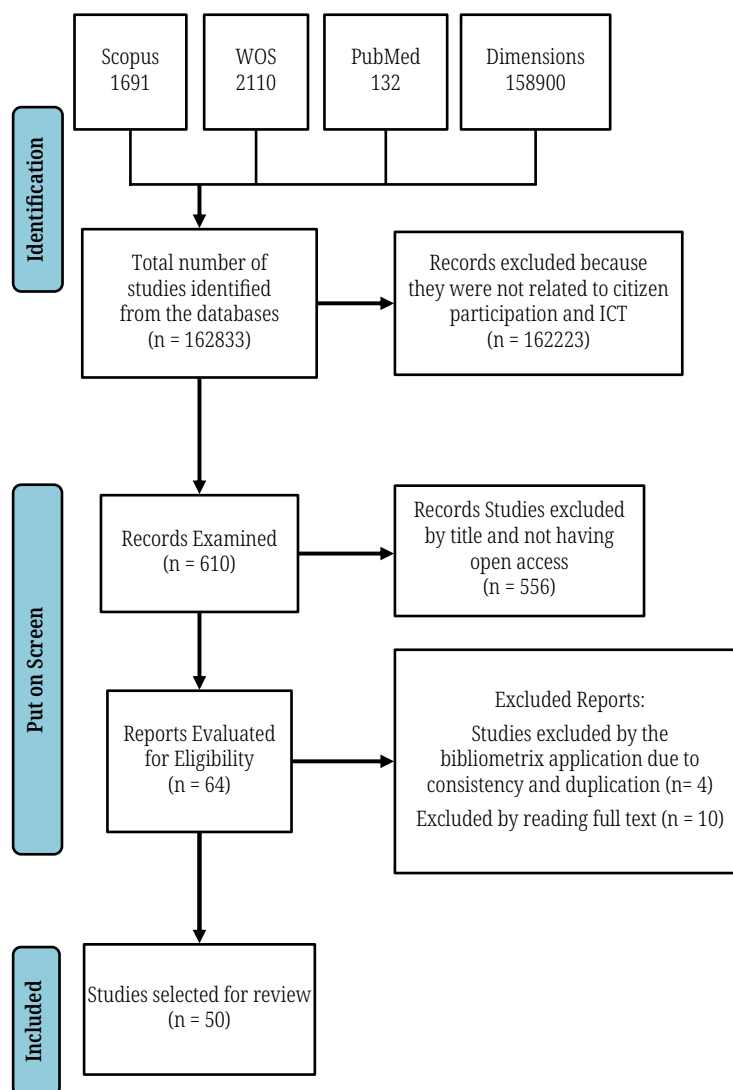
Fig. 1. Exclusion and inclusion diagram

2.2   Databases

The 64 articles selected were then analyzed using the bibliometric tool Bibliometrix. During this process, duplicates were identified in two of them, and four others were discarded because they did not meet the established criteria. Next, the texts of the remaining articles were read in their entirety, leading to the exclusion of 10 of them because their content was not directly related to the subject under analysis. The articles examined in this study were collected from four well-known electronic database indexing sites: Scopus, Web of Science (WoS), PubMed, and Dimensions, which yielded a total of 162833 documents. Articles were searched using the keywords "ICT AND participation AND family AND school AND learning."

Finally, a sample of 50 articles was obtained, constituting the data set used in this systematic review.

Once the selection had been completed ($n = 50$), a synthesis of the results was produced, following a procedure developed in three main sections: an overview of digital citizenship, production over time, and evaluation of the degree of development and relevance of the study. The qualitative analysis focused on examining the contribution of parents to ICT-mediated citizenship formation, focusing on categories such as parental expectations, students' civic participation from school onwards, and the use of digital technologies to foster collaborative and academic learning; aspects directly related to the study's main objective, namely the role of parents in citizenship formation. Although other categories were identified, such as the formulation of guidelines in schools on ethical principles and the use of ICT, collaboration and digital adaptability, and educational disparities between countries and regions, they were not taken into account in the study because they are more related to administrative issues.

3   MAIN RESULTS

Examining the current state of scientific research in the 50 papers in the sample (refer to Table 2), the following results were identified: Over a nine-year period, from 2016 to 2024, there was a remarkable 31.61% annual increase in the number of publications, with the participation of 142 authors, seven of whom contributed to a single paper. An average of 2.92 co-authors per paper was found, and 28% of international coauthors were recorded. In addition, an average of 5.95 citations per paper and 845 references were checked. In addition, 167 additional keywords (ID) and 197 author keywords (SD) were identified. The average age per document was 2.34 years, considering all 50 papers analyzed in this systematic review.

Table 2. Current state of scientific research

Description	Results
Time period	2016–2024
Documents analyzed	50
Annual growth rate (%)	31.61
Average age of documents	2.34
Average number of citations per document	5.95
References	845

(Continued)

Table 2. Current state of scientific research *(Continued)*

Description	Results
More keywords (ID)	167
Authors' Keywords (DE)	197
Authors	142
Single-author documents	17
Co-authors by document	2.92
Percentage of international co-authors	18
Total items	50

3.1 Overview of digital citizenship

In terms of term frequency, keyword analysis using the word cloud (see Figure 2) shows that the terms most frequently used by researchers in the papers consulted are: education, students, ICT, children, and others less frequently used. This analysis provides a clear understanding of the predominant themes in the papers consulted, making it easier to identify specific areas of interest and specialization.

Fig. 2. Word cloud

In addition, the graphical representation of three areas in Bibliometrix (see Figure 3) makes it possible to appreciate the links between variables: abstract, keywords and study title. In this context, words such as education and school stand out in abstracts; technology, parents, internet, and learning in keywords, citizenship, school, learning, and context. This visualization is essential for understanding how they relate to each other, which in turn provides a better understanding of the complexity of parents' civic engagement, particularly in relation to information and communication technologies.
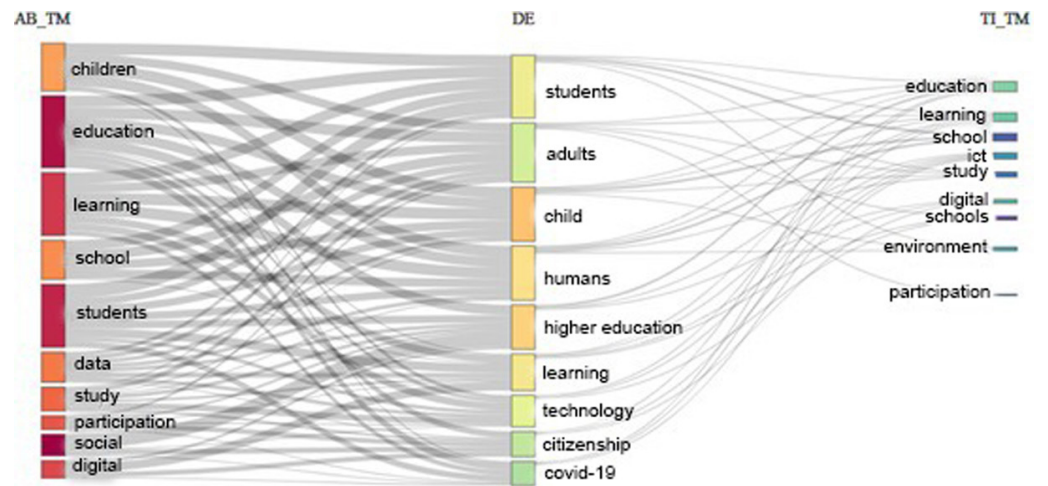
Fig. 3. Three-field graph in Bibliometrix

From a global point of view, a digital society is characterized by the systematic adoption of a positive attitude towards its use in areas such as communication, learning, and entertainment. Above all, however, it implies being a critical user, i.e., possessing the ability to analyze, understand, and draw one's own conclusions about any content.

3.2 Production over time

Technologies play a crucial role in collective empowerment, promoting equity, and facilitating the dissemination and realization of ideals. In this context, an analysis of countries' scientific output over time (see Figure 4) reveals a notable increase in the number of publications on this theme. Spain has emerged as the leader in scientific production on citizenship since 2016 and has maintained this position throughout the years examined. In contrast, Australia caught up with Spain in 2019 and maintained a similar level of production until the end of the period analyzed. Japan, on the other hand, has distinguished itself in 2022 by matching Spain's level of production.
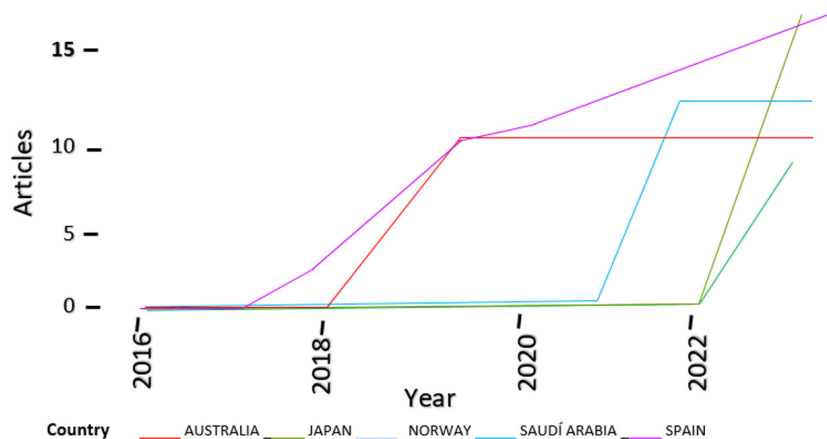

Fig. 4. Country production over time

The identification of journal nuclei (see Figure 5) presents a useful tool for identifying the main sources contributing significantly to the advancement of active

citizenship mediated by ICTs, following Bradford's Law principles. This analysis reveals that the Swiss-based journal Sustainability tops the list for papers related to citizenship and ICT, with three publications during the study period. It is followed by Foro de Education with two papers, and then the British Journal of Education, Cambridge Journal of Education, and Computers & Education, each with one paper.
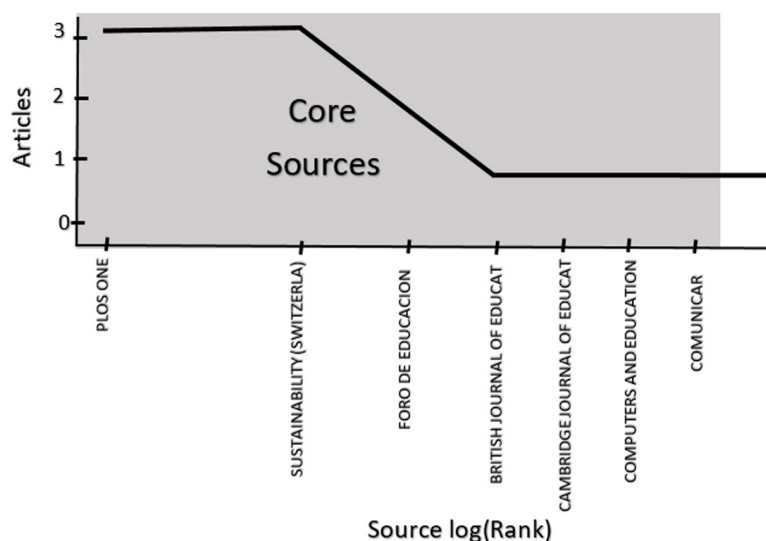

Fig. 5. Journal cores according to Bradford's law

Over the years, the fundamental role of technology as a social instrument for recording social events has been highlighted, encouraging citizen participation in the collective construction of meanings and facilitating multidirectional communication. According to [13], unlike traditional media such as newspapers, radio, and television, new media such as social media emerge from the grassroots, powered by user-generated content, giving them increasing relevance and propelling them towards digital citizenship [14].

3.3 Evolution towards digital citizenship

Discussing digital citizenship involves changing the traditional perspective on technologies and recognizing their evolution, moving from the simple consideration of ICTs to that of learning and knowledge technologies (LKTs) and empowerment and participation technologies (PETs). According to [15], the latter perspective implies considering them not only as educational resources but also as tools for participation, collaboration, and empowerment of individuals.

In this evolutionary process, understanding the significant relationship between groups of terms and their interconnection in study leads to describing the terms linked to the titles of the papers analyzed through the co-occurrence network. The two most important terms are "education" and "students," which are strongly related and essential for understanding citizenship. In addition, a third group indicates a trend towards transformation, including terms such as "engineering training," "virtual reality," and "e-learning" (see Figure 6), which provide crucial information on the dynamics of evolution.
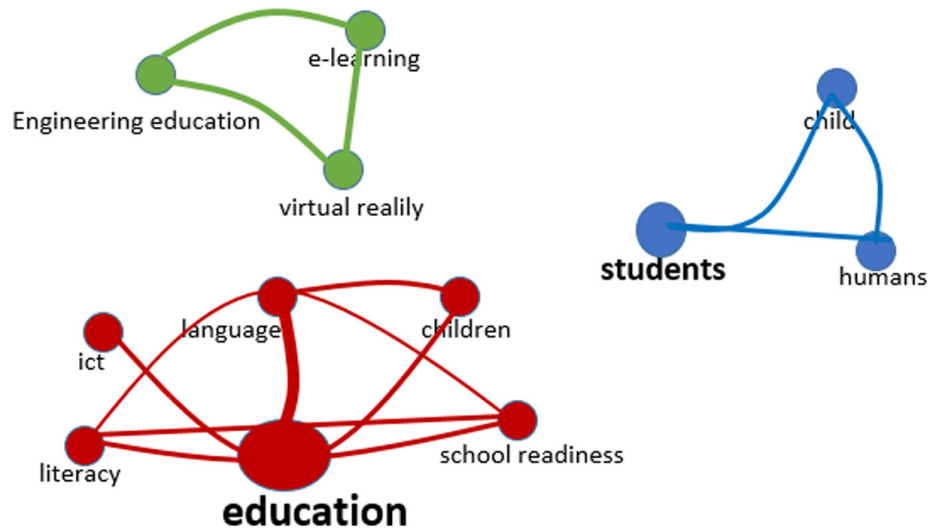
Fig. 6. Co-occurrence network

The identification and analysis of thematic groups in terms of development and relevance is illustrated in Figure 7. Four quadrants represent different levels of relevance and development in the areas studied. In the least relevant and least developed quadrant, we find "aesthetic" aspects, while in the most relevant but least developed quadrant, "virtual reality" and "engineering training" are mentioned. On the other hand, in the most developed but least relevant quadrant, we find "students" and "children." On the other hand, with greater attention and development, topics such as "ICT education" are highlighted, underscoring the importance of studying family involvement in schools to promote active citizenship mediated by information and communication technologies.
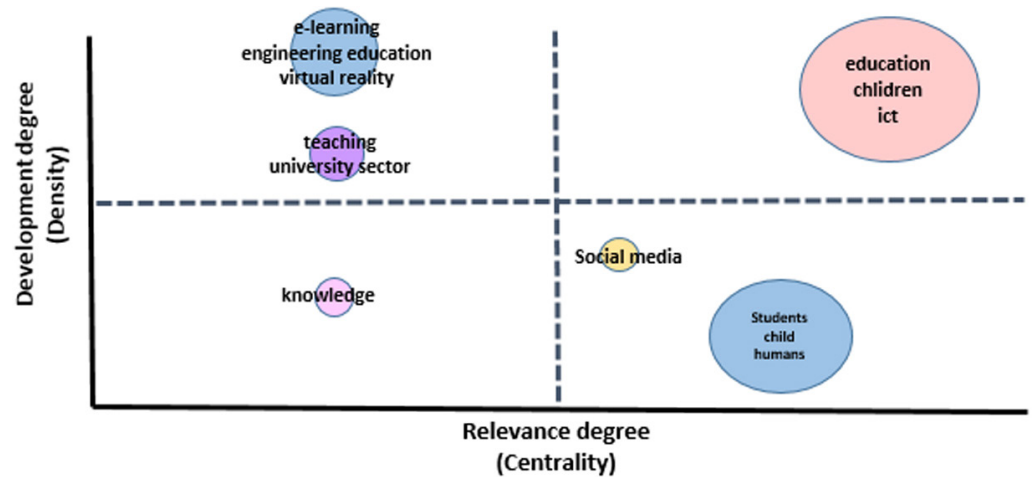

Fig. 7. Thematic groups by degree of development and relevance

3.4 Contributing to the development of information and communication technologies-mediated citizenship through family involvement

This study focuses on the contribution to the formation of ICT-mediated citizenship through active family participation. The relationship between context, objectives, and findings is analyzed, paying particular attention to key variables

such as parents' expectations and involvement in their children's learning, students' civic participation from school onwards, and the use of digital technologies to foster collaborative and academic learning (refer to Table 3).

The active involvement of parents in education is crucial to motivating and preparing children for the digital age. Although young people may not recognize online risks, ongoing collaboration with families influences learning and school skills. The intergenerational expectations of parents and schoolchildren reinforce civic and political engagement and life development. The education system should promote rights, skills, and values, with rules for youth participation, monitoring, feedback, and evaluation of technology use.

Educational establishments need to modernize teaching using ICT, taking into account the risks associated with relationships between students. Parents play a key role in supporting education. It's important to assess the virtual environment to help students stay safe and avoid negative influences. Education on digital platforms promotes engagement and academic achievement, preparing students for the digitized society. Collaboration between teachers and parents strengthens homework support and helps overcome intercultural challenges.

Table 3. Categories of conceptual contribution to active citizenship

Category	Authors' Contribution
Parental expectations	Society evolves with the active participation of parents in schools and educational practices. This involvement is crucial to motivate children and prepare them digitally; Although youth may not recognize online risks, continued collaboration with families is valuable; since they have had a significant impact on family dynamics, underlining the relevance of communication between its members, which is why parental expectations influence children's learning, especially in academic and emotional skills and in their education, transformed various aspects of current family life [16], [17], [18], [19], [20], [21], [22], [23], [24], [25].
Citizen participation	Interactions between generations strengthen civic-political commitment in school environments, guaranteeing successful development in life. Therefore, the educational system is required to address social rights and emotional skills based on ethical and moral values, establishing norms and regulations of youth citizen participation; It is essential to monitor student progress, offer constructive feedback, and carry out evaluations and classifications that reflect the appropriate use of the technological tools available. This requires instructing families in the appropriate use of digital resources to maximize their educational potential and reduce its use for purely social purposes [26], [27], [28], [29], [30], [31].
Appropriation in technologies	Educational institutions must establish directions on ICTs to modernize teaching, given that these digital technologies are an integral part of the social environment where students interact, effective strategies with ICTs must take into account risks in social relationships between students, making education virtual reality a promising resource to complement other approaches that mix dependencies and autonomies, which encompasses the promotion of digital inclusion and the use of technologies. Parents play a key role in educational support through training programs, improving results in academic and everyday environments. However, it is important to evaluate the virtual learning environment from the perspective of the students, to assist them in security issues to strengthen their educational process, avoiding negative influences based on factors such as gender, age or geographical location [32], [33], [34], [35], [36], [37], [38], [39], [40], [41], [42].
Learning pedagogical use	By educating on digital platforms, commitment and academic performance are promoted, current and future benefits for students. A robust approach to teaching and learning in virtual environments increases engagement and better prepares students during periods of digitalization; Therefore, the linear model can be integrated with the development of an efficient hybrid model. The collaboration between teachers and parents is strengthened due to their common interest in educational progress and the appropriate use of technology, providing the necessary support for homework. This collaboration allows us to address intercultural challenges and prepare students to live in a digitalized society [43], [44], [45], [46], [47], [48], [49], [50], [51].

4 DISCUSSION

Over time, society has undergone a comprehensive transformation in the role of parents, who now play an active role in the school community, participating in educational practices [18]. Their collaboration is essential to inspire, motivate,

and provide their children with the digital confidence needed to face their future. However, despite these efforts, many young people are unaware of how to identify risky behaviors or practices online. Additionally, it is important to note that educational programs have undergone significant, changes even for parents, due to the wide range of courses offered [17].

Student civic participation in schools fosters generational relationships and encourages civic and political participation within the school environment. Therefore, the education system must ensure that every child acquires the social rights and emotional skills essential to thrive in life. Establishing guidelines and regulations around ethical and moral principles allows them to raise their level of citizen participation [28], [52].

Information and communication technologies have transformed numerous aspects of family life; their impact on family structure and dynamics requires guidance in their appropriate use because they can negatively affect family relationships and health [23], [24]. However, families who integrate digital technology into their children's learning perceive educational benefits but face emotional challenges. This underscores the importance of educating families in the appropriate use of digital resources to maximize their educational benefits and minimize their social use [30], [31].

The active presence of educators in online environments to maintain a digital balance is an element that influences student engagement and academic achievement. A good teaching and learning methodology in virtual environments not only increases participation but also strengthens school readiness during periods of increased digitalization [48]. Collaboration between teachers and parents is strengthened by shared concerns about children's learning and the use of technology, ensuring support and completion of schoolwork [45], [46]. Even in cross-cultural contexts, it provides resources for incorporating individuals into environments characterized by cultural diversity, preparing them for adult life.

Digital media, the Internet, and other innovative technologies are progressively transforming communication between school and family [53]. They are gradually replacing face-to-face parent-teacher interactions and are often presented as an even more meaningful source of information than the school itself [54]. The integration of online communication into people's daily lives highlights the importance of examining how it is incorporated both in the educational setting and in the interactions between members of the school community escolar [55]. However, one aspect not addressed in the reviewed articles is the quality of internet service, which in schools leaves much to be desired, with intermittent connections that hinder access to online educational resources [56]. The slow loading speed frustrates parents, students, and teachers alike, making it difficult to perform basic academic activities. This situation generates a fragmented and inefficient educational experience, preventing the full use of digital tools in the learning process.

The use of social technologies, as suggested by [57], encourages interaction between individuals, giving rise to uses not anticipated in their initial conception. This encourages citizens to become creators, participants, collaborators, and organizers of information, rather than simply consumers [52], [58]. These learnings emerge as important components in the formation of new social dynamics of interaction between people.

In the dynamic educational field, it is essential to move towards a sustainable future through transformation in the training of educators [41], [42], promoting digital inclusion and the use of emerging technologies to guarantee student success. During the COVID-19 pandemic, innovative strategies were adopted, such as the combination of linear and hybrid educational models and the use of learning

management platforms, significantly improving the organization of synchronous classes and asynchronous tasks [50], [51]. Educational videos on YouTube stood out as effective tools in diverse learning environments. They had a notable impact on family dynamics, highlighting the importance of communication in educational development [25] [22].

Discussing citizenship in the digital society does not imply referring exclusively to individuals residing in a specific and restricted geographical territory [59], but to those who share similar values online and are subject to obligations set out in specific regulatory and legislative frameworks in that area. The presence in the virtual network has expanded the scope of participation and action of citizens, altering distances and space, and simplifying mobilization and contact between people [34]. These changes have given rise to new issues, values to be examined, and obligations to be fulfilled.

However, another aspect not addressed in the articles reviewed is the low cultural level of cultural expression manifested in the proliferation of spelling mistakes, poor grammar, and oversimplification of language. The indiscriminate use of abbreviations and emoticons replaces the richness and precision of vocabulary. Debates are reduced to superficial exchanges with little argumentative depth, contributing to an impoverished digital communication environment. By virtue of this, the present study faces a limitation in the identification of causal relationships given that it is based on data extracted from the selected articles. Therefore, it is not possible to establish causal relationships between the factors studied and the educational decisions of the agents analyzed, leaving new lines of research to be examined in future studies.

Prioritizing citizen training in digital skills is not only limited to technical skills but also encompasses the ability to critically evaluate the information provided through these platforms [43]. Therefore, it is essential to strengthen the creation of interaction environments, such as virtual communities, wikis, blogs, or social networks, accessible to users and within the reach of the general public [27]. Therefore, it is essential to strengthen the creation of interaction environments, such as virtual communities, wikis, blogs, or social networks, accessible to users and within the reach of the general public [28].

The interconnection between students' learning processes and parents' self-leadership skills and abilities suggests a reciprocal benefit between parents and children in the educational process, which transcends beyond the school curriculum [60], [61]. Additionally, parental engagement is linked to distance learning environments that can improve learning capacity and civic inclusion.

5   CONCLUSIONS

The systematic review and bibliometric analysis revealed a significant increase in research on parents' civic engagement in schools through ICT, with an annual increase of 31.61% from 2016 to 2024. It was observed that most of the papers analyzed focused on parental involvement in school life, their expectations and level of participation, as well as the use of digital technologies to promote collaborative and academic learning. However, for future research, it is crucial to direct efforts towards optimizing the impact and quality of Internet service in schools. This means ensuring equitable access and exploring new resources to guarantee reliable, high-speed connectivity. The aim is to promote digital learning in education and facilitate essential academic activities for both students and teachers, as well as improving communication with families.

The formation of ICT-mediated citizenship involves the development of digital competencies that go beyond technical skills, including the critical ability to evaluate the information provided by digital platforms and understand its relevance to the current context. It is therefore essential that parents and the educational community work together to encourage the civic participation of parents in school through ICT, thus ensuring that children acquire the social rights and emotional skills needed to thrive in their lives.

The use of digital technologies has facilitated parents' participation in school life, their expectations and level of involvement, as well as students' civic participation from school onwards. This approach goes beyond the simple acquisition of technical skills, as it involves the development of a critical ability to evaluate online information and understand its relevance in today's context. This has broadened the scope of civic participation, modified physical barriers, and simplified interaction between people.

Finally, the results of this study will help future researchers understand that the relationship between school and parents is fundamental to cultivating strong citizenship skills in students. This interaction facilitates the creation of a holistic learning environment, which fosters an understanding of each individual's rights and responsibilities as an active citizen. By working together, parents and educators can reinforce civic and social values, preparing future generations to contribute positively to society.

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