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A bibliometric analysis of tablet for early childhood from 2014-2024 using VOS viewer

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Abstract

The widespread use of tablets across various contexts highlights their potential in educational settings. Tablets using along with technological advances can be used at home and currently the use of tablets in schools is considered. This study investigates the evolution of research on tablet utilization in early childhood education from 2014 to 2024 using bibliometric methods and VOS Viewer. Data were sourced from 195 articles identified via Publish or Perish (PoP) across databases such as Google Scholar, Scopus, Semantic Scholar, and Crossref. This study provides a forward-looking view of the development of research related to the use of tablets in early childhood education environments.

Keywords

Bibliometrics, Tablet, Early childhood education, Preschool, Kindergarten

Introduction

The application of learning using technology in this era of advanced technology is not something new. Portable electronic devices have become one of the technological media that should be considered for use by teachers in education. There are various portable devices that can be used, including mobile phones, laptops, and tablets. Each device has its own advantages and disadvantages depending on the needs and implementation. One of the devices that can be used is a tablet.

Devices such as iPads, Android tablets, and Windows-based tablets are now widely used in both household and educational settings. People of all ages, including adults and children, utilize these devices and their associated applications for a variety of purposes, ranging from learning to entertainment [1]. One key factor influencing the adoption of tablets in schools is teachers' confidence in incorporating them into classroom activities. Based on the research, it was found that teachers believe that tablets enhance collaboration and participation in the classroom, with children as subjects of technology

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acquiring many ideas and creative solutions that develop while using tablets [2]. Further research underscores the significant advantages of incorporating tablets into early childhood education environments. For instance, a study conducted by Studhalter et al. [3] revealed that digital tablets play a crucial role in enriching interactions between teachers and children, particularly in game-based learning contexts. These devices not only serve as tools for educational content delivery but also foster dynamic and engaging exchanges that enhance the learning experience. Another comprehensive study by Papadakis et al. [4] find deeper into the perspectives of kindergarten teachers regarding tablet usage in the classroom. The findings indicate that teachers view tablets as highly beneficial due to their unique features, such as portability and ease of accessing the internet. These attributes enable educators to seamlessly integrate digital resources into their lessons, regardless of time or location. This flexibility empowers teachers to build upon their existing instructional methods, creating more interactive and effective learning environments. Teachers also reported that tablets contribute to increased student engagement, motivation, and collaboration, highlighting their transformative potential in early childhood education. Moreover, teachers noted that incorporating tablets into the classroom significantly enhances student engagement, motivating learners and fostering a heightened enthusiasm for educational activities. These devices not only support collaborative learning but also promote opportunities for creative play, making them particularly well-suited for preschool children. By encouraging teamwork and imaginative exploration, tablets serve as valuable tools in creating an interactive and stimulating learning environment tailored to the needs of young learners.

Additionally, tablet devices are frequently utilized by children at home, driven by parents' perception of their value as both entertainment platforms and educational tools [5][6]. Supporting this perspective, a study by Nikolopoulou revealed that most parents either agree or strongly agree that tablets contribute to teaching essential technology skills, introducing foreign languages, and making the learning process more enjoyable for children [7]. These findings highlight the multifaceted role of tablets in supporting children's development both in academic and recreational contexts.

Given this context, it is crucial to explore the research landscape and track record concerning the use of tablets in early childhood education. Such an investigation is essential for identifying trends, challenges, and opportunities that can guide future research directions and inform policymaking. Bibliometric analysis serves as a valuable tool in this endeavor, enabling the identification of patterns, trends, and impacts within a specific field [8]. When conducted effectively, bibliometric studies provide a robust foundation for advancing a field in innovative and meaningful ways. This approach equips researchers to (1) obtain a comprehensive overview of the field, (2) pinpoint existing knowledge gaps, (3) generate fresh research ideas, and (4) strategically position their contributions within the academic landscape [9]. Despite the growing relevance of tablets in early childhood education, bibliometric analyses in this domain

remain scarce. Thus, the objective of this study is to examine the progression of research on the utilization of tablets in early childhood settings over a decade, from 2014 to 2024. By doing so, this study aims to offer insights into the evolution of this research area and provide a basis for future academic and policy-oriented initiatives.

Method

This study employs bibliometric analysis; a quantitative research method designed to evaluate scientific productivity and detect trends within specific research fields [10][11]. The bibliometric analysis conducted here focuses on examining keywords, article titles, author information, and annual publication trends related to the use of tablets in early childhood education from 2014 to 2024. The research process begins with the identification of relevant publications using the Publish or Perish (PoP) application. Key databases, including Google Scholar, Scopus, Semantic Scholar, and Crossref, serve as sources for locating research articles. The search is guided by a set of predefined keywords such as "tablet," "tablet computer," "preschool," "kindergarten," "early childhood education," and "iPad," covering the timeframe of 2014 to 2024.

The process of identifying, selecting, and refining relevant articles follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flow diagram. This structured approach ensures a systematic and transparent methodology for curating research articles that align with the study's objectives. By leveraging these tools and techniques, this analysis aims to provide a comprehensive overview of the research landscape surrounding tablets in early childhood education (Figure 1).

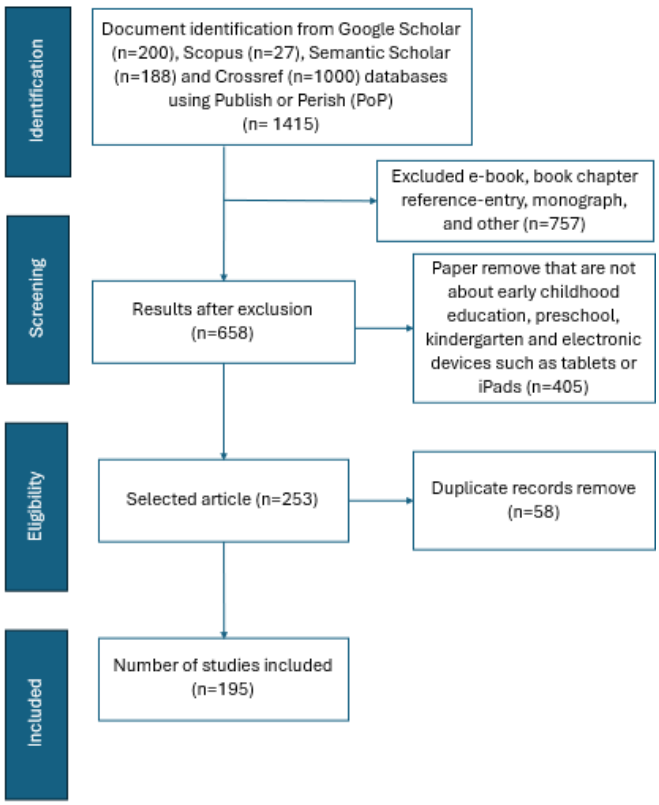

Figure 1. PRISMA

Based on the selected and included documents, metadata from 195 articles were exported to RIS format from the PoP application. Next, they were imported into the Mendeley application for verification, including the full names of the authors, affiliations and countries, titles, journal names, author keywords, and abstracts. If the included articles have complete metadata, the data is saved in the form of (*.ris) for further analysis using VOSviewer.

VOSviewer is a software tool for creating maps based on network data and for visualizing and exploring those maps [12]. The map is created based on the keywords from each article.

Results and Discussion

The results obtained from the Bibliographic analysis of 195 articles on the use of tablets in early childhood from 2014-2024 show the number of articles published each year (see Figure 2).

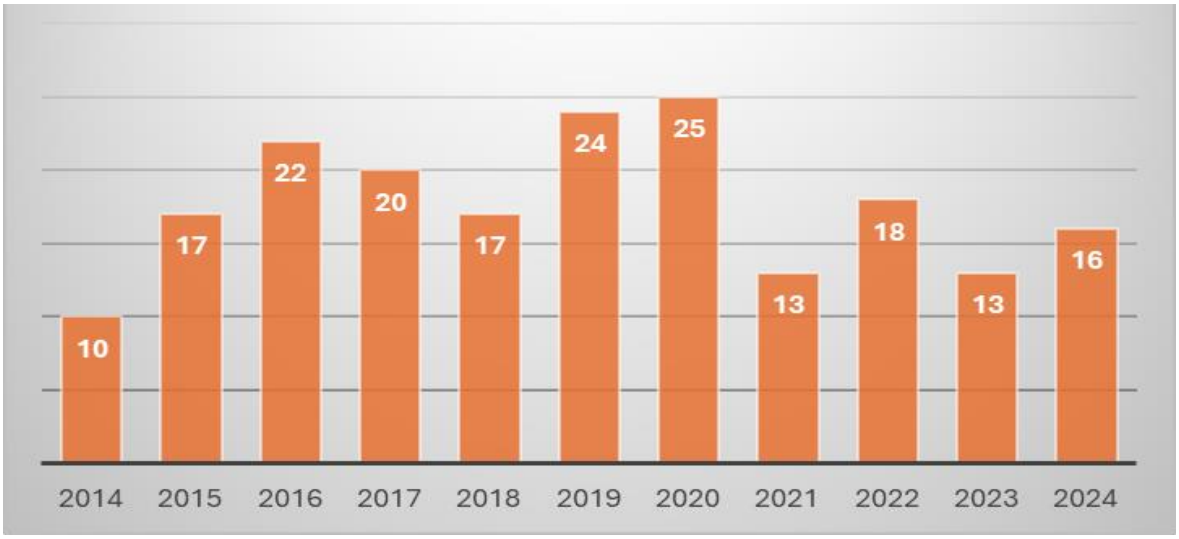

Figure 2. The number of articles about tablets in early childhood from 2014-2024

Based on Figure 2, the lowest number of articles on tablets in early childhood was in 2014 with 10 articles, while the highest was in 2020 with 25 articles, followed by 2019 with 24 articles. The highest number of articles was between 2019 and 2020, due to the emergence of the COVID-19 pandemic worldwide, which led to very strict restrictions and lockdowns to prevent its spread. Therefore, outdoor activities were very limited, even non-existent. This makes early childhood learning activities conducted online using electronic devices like tablets. Overall, the number of articles published each year has fluctuated up and down.

Articles on the use of tablets in early childhood published from 2014 to 2024 found 11 most-cited articles, showing interesting citation patterns from various articles. Table 1 highlights several noteworthy articles based on their total citation (TC) counts, reflecting their influence and relevance in the research community. The article with the highest TC, titled "Toward the Autism Motor Signature: Gesture patterns during smart

tablet gameplay identify children with autism," published in 2016, has garnered 295 citations. This suggests its pivotal role in connecting tablet use with autism research and gameplay interactions.

Table 1. Most cited tablet for EC articles

No	Citations	Keyword	Journal	TC
1	Anzulewicz et al. [13]	Autism spectrum disorders; Biomedical engineering; Diagnostic markers; Human behaviour; Motor control	Scientific Reports	295
2	Kalogiannakis & Papadakis [14]	mobile devices; natural sciences; re-service kindergarten teachers	International Journal of Mobile Learning and Organisation	225
3	Blackwell et al. [15]	Early childhood education; Logistic regression; TPACK; Tablet computer; Technology	Computers & Education	221
4	Papadakis et al. [16]	Curriculum and pedagogy; Media and technology; Quantitative research	Education and Information Technologies	215
5	Reich et al. [17]	eBooks; electronic books; emergent literacy.; reading; tablets; young children	Journal of Developmental & Behavioral Pediatrics	183
6	Nikolopoulou [18]	Mobile technology; Mobile phones tablets; Teacher perceptions; Secondary school; Greece	Journal of Computers in Education	178
7	Pila et al. [19]	Apps; Coding; computational thinking; Digital games; Educational; Technology; STEM	Computers & Education	167
8	Pitchford [20]	evaluation; intervention; mathematics; primary school; randomized control trial; tablets; technology	Frontiers in Psychology	143
9	Lin et al. [21]	Touch-screen tablet; child development; fine motor; preschool	Physical & Occupational Therapy in Pediatrics	141
10	Wollscheid et al. [22]	Digital tool; Pen and pencil; Early writing; Writing test; Pilot study	Computers & Education	107
11	Gerth et al. [23]	children; graphomotor control; handwriting; movement kinematics; tablet; writing acquisition	Frontiers in Psychology	107

Additionally, more recent articles have also gained considerable attention due to their significant citation numbers. For instance, the article titled "Evaluating pre-service kindergarten teachers' intention to adopt and use tablets into teaching practice for natural sciences," published in 2019, achieved a TC of 225. Similarly, the article "Secondary education teachers' perceptions of mobile phone and tablet use in classrooms: benefits, constraints and concerns," published in 2020, recorded a TC of 178.

These findings underline a growing academic interest in exploring the integration of tablets into classroom learning. The high citation counts of these articles demonstrate their impact on advancing knowledge regarding the benefits, challenges, and implications of tablet use in educational settings. This trend highlights the increasing recognition of tablets as essential tools in modern teaching and learning processes.

The data mapped using VOS viewer produces a network visualization (Figure 3). The mapping conducted is based on keywords and results in a dataset grouped into 4 clusters, totaling 17 items, as shown by the network visualization. The clustering of the

clusters includes i) cluster 1 (6 items): child development, early childhood, early childhood education, tablet computer, tablet computers, technology; ii) cluster 2 (5 items): apps, emergent literacy, IPads, Parents, young children; iii) cluster 3 (4 items): iPad, mobile technology, preschool, tablets; and iv) cluster 4 (4 items): children, digital media, mobile devices, and tablet.

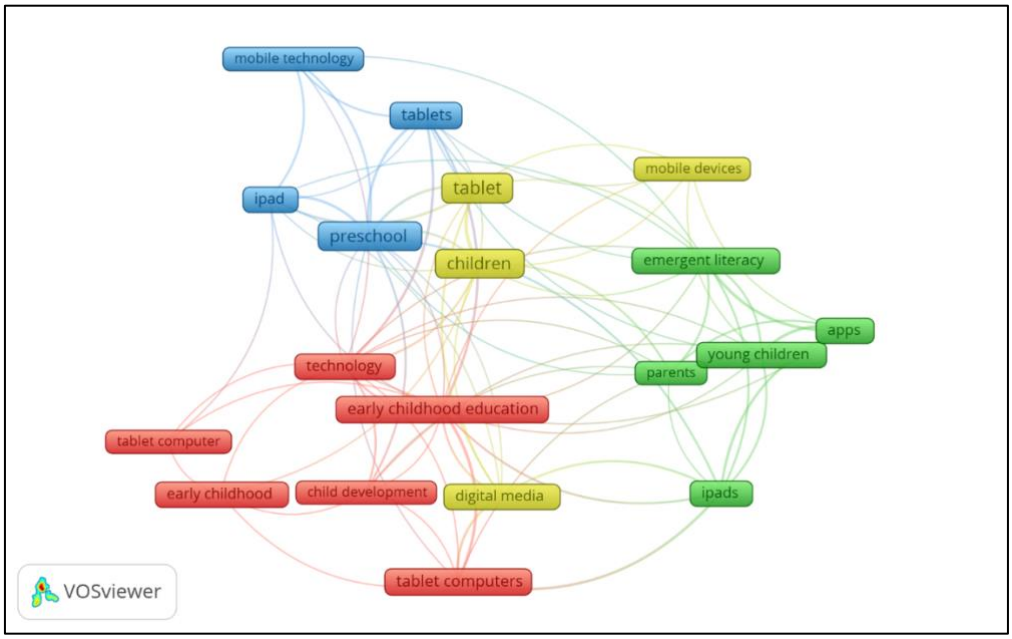

Figure 3. Network Visualization of 19 Most Popular Keywords About tablet in ECE

Based on Figure 3, which shows the network visualization according to the colour in each area. In the red area, the combination of keywords "early childhood education," "technology," "tablet computer," "early childhood", "child development", and "tablet computers" is related to the use of technology or tablet computer for child development in early childhood. In the yellow area, the combination of keywords "digital media", "children", "tablet" and "mobile devices" is related to the use of tablet and mobile devices as digital media for children. In the green area, the combination of keywords "iPads," "parent," "young children," "apps," and "emergent literacy" is related to the use of apps in iPads or tablet for emergent literacy young children and how tablet or iPad utilized by parent. In the blue area, the combination of keywords "preschool," "iPad," "tablets," and "mobile technology" is related to the use of tablets or iPad are mobile technology for preschool.

Conclusion

The research is related to the use of tablets in early childhood education. The results obtained from the analysis based on keywords from 195 articles yielded 4 clusters. Cluster 1 is related to the use of technology or tablet computer for child development in early childhood, cluster 2 is about the use of tablet and mobile devices as digital media for children, cluster 3 is about the use of apps in iPads or tablet for emergent literacy young children and how tablet or iPad utilized by parent, and cluster 4 is about the use of tablets or iPad are mobile technology for preschool.

This bibliometric analysis highlights the evolving role of tablets in early childhood education from 2014 to 2024. Key findings indicate a growing body of research, particularly during the COVID-19 pandemic, underscoring the significance of tablets as educational tools. Tablets have demonstrated potential in enhancing student engagement, fostering creativity, and supporting collaborative learning. Despite these advantages, challenges remain, including the need for effective teacher training, addressing screen time concerns, and ensuring equitable access to technology. Future research should focus on the long-term impact of tablet use in early education and strategies for maximizing their benefits while mitigating potential drawbacks. This study offers valuable insights into trends and opportunities for integrating technology into early childhood learning, providing a foundation for informed decision-making and policy development.

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