WhatsApp as a Pedagogical Tool During COVID-19: A Bibliometric Review

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Abstract

The COVID-19 pandemic triggered an abrupt shift to remote learning, which exacerbated existing inequities for disadvantaged students owing to limited internet connectivity, inadequate access to devices, and a less conducive learning environment at home. In this context, accessible digital platforms like WhatsApp became vital for maintaining educational continuity. This bibliometric review systematically analysed scholarly literature from the Scopus database to explore the use of WhatsApp as a pedagogical tool across all educational levels during the pandemic. The objective was to map global research trends, geographical distribution, and thematic clusters. After applying specific inclusion and exclusion criteria, the review analysed 234 articles published between 2019 and 2024. VOSviewer was used to visualise metrics including yearly publication counts, geographical contributions, and keyword co-occurrence networks. The findings highlight WhatsApp's diverse use in facilitating interactivity and dialogic teaching, which is characterised by five core principles: collective, reciprocal, supportive, cumulative, and purposeful learning. This article provides valuable insights into leveraging accessible technology to enhance educational outcomes, dialogue and interactivity, specifically benefiting educators, policy makers, and curriculum developers in the post-pandemic era.

Keywords: accessible technology; pedagogical tool; WhatsApp; COVID-19; educational continuity; dialogic teaching; bibliometric analysis

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Introduction

The COVID-19 pandemic significantly disrupted traditional classroom practices by forcing educational institutions worldwide to rapidly transition from traditional in-person teaching to remote learning environments (DeCoito and Estaiteyeh 2022). This abrupt shift posed significant challenges, including maintaining student engagement, ensuring effective communication, and facilitating a conducive learning environment (Durgungoz and Durgungoz 2022). While various digital tools were used to address these challenges, social media platforms that were traditionally used for social interactions were also systematically adopted as pedagogical tools. WhatsApp, a widely accessible mobile application that is considered an "enabler for keeping people connected despite physical distance" (Tunjera 2023, 1), was one such social media platform that gathered considerable attention for pedagogical purposes. During the COVID-19 pandemic, despite the use of many e-learning platforms to ensure education continuity, most educators preferred to use WhatsApp, which they considered more accessible to provide dialogue and communication with their students (Tunjera 2023).

The traditional classroom practice encourages dialogue. According to Manalo (2019, 30), "dialogue can be in the form of interactions with teachers and other students – as well as of course other people – in one-to one or group situations." Dialogic learning encourages students to actively participate in the construction of knowledge as they partake in dialogue. This stirs up critical thinking that entails a "careful and reflective thinking that is deliberate and goal-directed" (Manalo 2019, 31). Critical thinking, according to Manalo (2019, 43), entails a "collaborative venture, aimed at sharing and refining knowledge." Dialogue and critical thinking are closely related. They both "refer to abilities to carry out certain processes and/or achieve certain outcomes" (Manalo 2019, 24) and are key features in dialogic teaching. Alexander (2017, 5) identifies five principles of dialogic teaching: (1) collective, in which the classroom is a site of joint learning and enquiry; (2) reciprocal, in which participants listen to each other, share ideas and consider alternative viewpoints; (3) supportive, in which participants feel able to express ideas freely without risk of embarrassment over "wrong" answers, and they help each other reach common understandings; (4) cumulative, in which participants build on their own and each other's contributions and chain them into coherent lines of thinking and understanding; and (5) purposeful, in which classroom talk, though open and dialogic, is structured with specific learning goals in view.

Owing to the extensive use of WhatsApp for educational purposes during the COVID-19 era, many studies have been done on its use and effectiveness for teaching and learning (Chukwuemeka et al. 2021; Haron, Al Abri, and Alotaibi 2021; Tunjera 2023; Van den Berg and Mudau 2022). However, a gap remains in how WhatsApp can be used as a pedagogical tool to attain the five core principles of dialogic teaching. Therefore, there was a need to systematically analyse the existing literature to identify trends, geographical distribution, key themes, and the impact of WhatsApp on dialogic teaching and interactive learning. This bibliometric review, using the Scopus database,

aimed to fill the critical gap in research by providing an in-depth analysis of scholarly articles that explore the use of WhatsApp in education during the COVID-19 and post-pandemic periods. This analysis offers insights into the effectiveness of WhatsApp and its potential to enhance student engagement and learning outcomes, and it also examines its potential as a sustainable educational tool in a post-pandemic world. The review considered the five core principles of dialogic teaching identified by Alexander (2017). To achieve this aim, the study had the following objectives:

(1) Explore the main themes and trends in literature related to the use of WhatsApp as a pedagogical tool.
(2) Assess how the studies align with the five core principles of dialogic teaching.
(3) Examine how the studies foster critical thinking.
(4) Evaluate how the studies enhance learning achievements.

To achieve these objectives, the study was guided by the following research questions:

(1) What are the main themes and trends in studies related to the use of WhatsApp as a pedagogical tool?
(2) How do the studies follow the five core principles of dialogic teaching?
(3) How do the studies portray critical thinking?
(4) How do the studies highlight learning achievements?

WhatsApp as a Pedagogical Tool

During the pandemic, a ubiquitous mobile messaging application, WhatsApp, emerged as an innovative pedagogical tool to maintain educational continuity by facilitating interactivity in remote learning environments (Tunjera 2023; Van den Berg and Mudau 2022). WhatsApp offered a variety of functionalities that were adapted for educational purposes, such as group chats, where students could engage in synchronous and asynchronous discussions, get and share resources, and collaborate on assignments (Chukwuemeka et al. 2021). It promoted a sense of belonging among students during the pandemic (Van den Berg and Mudau 2022). Furthermore, WhatsApp's accessibility made it a valuable tool, particularly in regions with limited access to computers, laptops, or reliable internet connections (Madge et al. 2019). WhatsApp still presents a unique opportunity for educators to leverage technology for enhanced learning experiences by harnessing its interactive features and developing a sense of community, resulting in it contributing to positive student interactivity and engagement.

Dialogic Teaching

Education is considered a dialogic process that both educators and students enhance by adding meanings, which they then reason and analyse (Sedova, Salamounova, and Svaricek 2014). Constructive interactions and dialogue between students and educators and among peers are core elements of dialogic teaching. According to Yıldırım and Uzun (2021, 2), dialogic teaching is an "approach that maximizes learning through interactive dialogues during which students exchange their ideas by reasoning, discussing, critical thinking, and voicing their notions. Sharing the authority and

responsibilities, students and teachers work collaboratively to engage in dialogic discussions for productive learning outcomes."

Dialogue, which is primordial in dialogic teaching, is considered a discussion that is fruitful for learning in a classroom context. Sedova, Salamounova, and Svaricek (2014) consider dialogue as an exchange of different intellectual viewpoints. This entails that every participant communicates something distinctive and original. The focus of dialogic learning is sharing and evaluating ideas; collectively building ideas; reasoning; providing justifications and elaborations; and using justification to back up arguments (Fisher 2007; Manalo 2019; Yıldırım and Uzun 2021).

Interactivity

Interactivity is considered a major element in the teaching and learning process. It is the pattern of communication between the educators and the students and entails the social, cooperative, or collaborative exchanges that take place in the classroom (Bannan-Ritland 2002). Students are more open to exchanging ideas with their educators and peers, actively participate, and are attentive in class when there is interactivity (Sims 2003). Increased classroom interactivity has the potential to positively impact student learning outcomes, including academic achievement and attitude towards the subject matter (Al-Rahmi, Othman, and Yusuf 2015).

Principles of Dialogic Teaching

Dialogue not only has a high cognitive impact on students but also requires a mastery of the subject knowledge and pedagogical skills by the educator, particularly through the application of scaffolding and effective questioning (Fisher 2007). Dialogue outweighs the different forms of classroom talk, like rote and recitation, and takes a more conversational approach (Fisher 2007; Yıldırım and Uzun 2021). This can be attained by respecting the five core principles of collective, reciprocal, supportive, cumulative, and purposeful learning (Alexander 2017). The following are the explanations for these principles:

- *Collective:* The collective principle means teaching and learning are applied in a more communal way rather than in an individual manner. Here, the educator is a facilitator and participant in discussions with students. Dialogue becomes a shared experience that can challenge some of the authoritarian dynamics in the classroom (Egan-Simon 2022). One of the ways to institute collective dialogue is through "the creation of a democratic community of enquiry" (Egan-Simon 2022, 1) by providing "a dialogue space to agree/disagree, challenge, question, appeal to reason and allowing possible self-correction" (Fisher 2007, 617–618). This can only be attained when there are mutually respectful relationships (Egan-Simon 2022).

- *Reciprocal:* The role of participative listening and sharing of ideas is highlighted in this principle. Participants listen attentively and respond by giving challenging ideas

and points of view (Egan-Simon 2022). This helps enhance dynamism and interactivity in the classroom.

- *Supportive:* Students freely give their contribution without fearing embarrassment because there is no right or wrong answer (Alexander 2017). Every idea is appreciated and respected by all the participants, to reach a collective understanding (Egan-Simon 2022).

- *Cumulative:* Both educators and students work on their personal and each other's ideas to form a synergy of a coherent line of thought and enquiry (Smith et al. 2004). This is developed through open-ended questions and answers between the educators and students that are aimed at enhancing problem-posing and problem-solving (Egan-Simon 2022).

- *Purposeful:* Every discussion in dialogic teaching has a distinctive and educational goal. Lessons in a dialogical classroom are not a "free for all." Educators plan, implement, and skilfully facilitate lessons with particular learning objectives in mind (Egan-Simon 2022).

Research Methodology

The article focused on WhatsApp as a pedagogical tool for dialogic teaching and aimed to analyse how effective WhatsApp was as a pedagogical tool during and post COVID-19, while considering its potential to enhance interactivity and dialogic teaching that is facilitated by the five core principles, namely collective, reciprocal, supportive, cumulative, and purposeful learning (Alexander 2017). The scope of this investigation is deliberately not confined to a single educational stage. We collected and analysed data concerning the use of WhatsApp in education across a range of settings, encompassing primary, secondary, and higher education levels. This comprehensive approach was chosen to provide a holistic understanding of the application's role and use, which transcends specific age or grade divisions.

The literature was searched on Scopus using the keywords "WhatsApp," "education," "teaching," "learning," "pedagogical tool," "educational tool," "educational technology," "teaching aid," "COVID-19," "pandemic," and "coronavirus." The following search query was used to conduct the advanced search on Monday, 3 June 2024:

> TITLE-ABS-KEY ("WhatsApp" AND ("Education" OR "Teaching" OR "Learning" OR "pedagogical tool" OR "Educational Tool" OR "Educational Technology" OR "Teaching Aid") AND ("Covid-19" OR "Pandemic" OR "Coronavirus"))

The first search resulted in 814 publications. As the authors were looking at WhatsApp as a pedagogical tool during COVID-19, it was necessary to apply specific filters to the search criteria to align the results with the objectives of the article and to narrow the search to more relevant literature. The search was restricted to articles published from 2019 onwards to ensure the relevance of the studies to the COVID-19 pandemic period. This timeframe captures the most recent developments and responses in the area. Only peer-reviewed journal articles were included to maintain high academic standards and ensure that the data analysed were credible and had undergone rigorous peer review. The search was limited to articles published in English to enable a thorough comprehension and accurate analysis by the authors, thereby avoiding potential misinterpretations due to language barriers. Therefore, further refinement was done based on the criteria presented in Table 1.

Table 1: Criteria for search refinement

Criteria	Refined Search Limitations
Year	2019–2024
Document Type	Article
Language	English
Source Type	Journal

The following is the final search query that was used to conduct the advanced search with all the refinements:

> TITLE-ABS-KEY (“WhatsApp” AND (“Education” OR “Teaching” OR “Learning” OR “Pedagogical Tool” OR “Educational Tool” OR “Educational Technology” OR “Teaching Aid”) AND (“Covid-19” OR “Pandemic” OR “Coronavirus”)) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (DOCTYPE, “ar”)) AND (LIMIT-TO (LANGUAGE, “English”)) AND (LIMIT-TO (SRCTYPE, “j”)))

After careful refinement, the dataset was reduced to a total of 564 publications. These 564 publications were screened to ensure the selected articles were highly relevant and addressed the research questions and objectives of the article. The screening process was conducted to identify studies that explored the use of WhatsApp in promoting classroom dialogue and interactive teaching during the COVID-19 pandemic. The key focus was on the principles of dialogic teaching, namely collective, reciprocal, supportive, cumulative, and purposeful. The authors screened the article abstracts to ensure that they specifically addressed the role of WhatsApp in promoting dialogic teaching methods and interactive classroom dialogue, particularly during the COVID-19 pandemic. The inclusion criteria required the studies to discuss WhatsApp’s use in enhancing interactivity and dialogic teaching characterised by any of the five core principles. Articles not focused on these aspects, or outside the pandemic context or

using WhatsApp as a data collection tool were excluded. A further 283 studies were excluded because they did not address the role of WhatsApp in promoting interactivity and dialogic teaching but used WhatsApp as a data collection tool. After the initial abstract review of the studies, a full-text review was done to confirm the studies' alignment with the dialogic teaching principles and their relevance to the pandemic period. Each author conducted the screening and eligibility process to ensure consistency, with discrepancies resolved through discussion. These steps were crucial to maintaining the relevance and focus of the article. A further 47 studies were excluded because they were irrelevant. Finally, 234 studies met the inclusion criteria. The findings were organised and presented using various metrics, such as yearly publication counts, publications by country, highly cited documents, and keyword co-occurrence networks. Visual representations of these co-occurrence networks were created using VOSviewer, a powerful and user-friendly tool for analysing and visually mapping network data (Van Eck and Waltman 2013). An outline of the research methodology is shown in Figure 1.

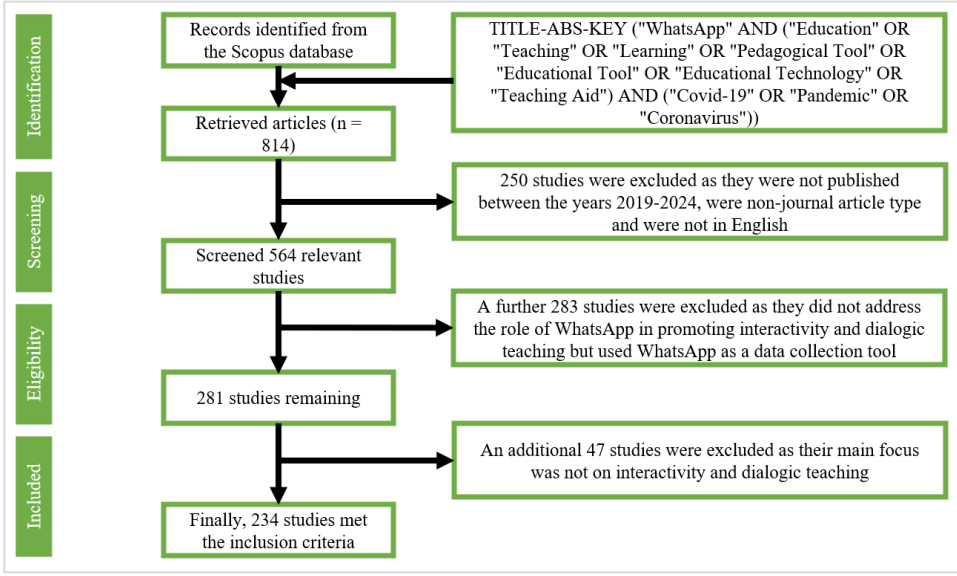

Figure 1: An outline of the research methodology of the research framework

Data Analysis

A total of 234 journal articles were extracted. These articles were analysed using a variety of metrics. These metrics encompassed yearly publication counts, publications by country, publications per subject area, and keyword co-occurrence networks. Publication counts included the total number of publications within the timeframe studied, as well as the growth rate over time to identify publication trends. Publication per country metrics examined the distribution of publications among researchers and countries by looking at the average number of publications per country. Publication per subject examined the distribution of publications among the different disciplines by

looking at the average number of publications in an area and its implications. Keyword analysis explored the most frequently used keywords and their co-occurrence networks. These networks visually map the relationships between keywords to reveal how different research topics are connected and form a comprehensive picture of the key themes in the field. Finally, the most relevant literature was identified to highlight particularly influential research into the context of the article.

Publications Per Year

There was an upward trend in the yearly publications on the use of WhatsApp as a pedagogical tool from 2020 to 2022 and a downward trend from 2022 to 2024. This could be attributed to the devastating effects of COVID-19 on human health. The pandemic, therefore, became a driving force behind digital learning adoption and use among educators, students, and institutions (Abu-Hudra and Mohamed 2022). Researchers were pulled by the increase in reliance on WhatsApp as an educational continuity tool because of its accessibility and its multimedia features that facilitate real time communication, making it an appealing alternative to ensure education continuity and to maintain contact between students and their educators and students and their peers (Chitanana 2024). From 2022, the increase in vaccination efforts led to a decline in the rate of infection. The alleviation of the pandemic restrictions led to many educational institutions adopting blended learning models, while others returned to the traditional face-to-face classroom setting. The downward trend in publications from 2022 to 2024 can therefore be attributed to a shift in focus to other areas of interest. This is illustrated in Figure 2.

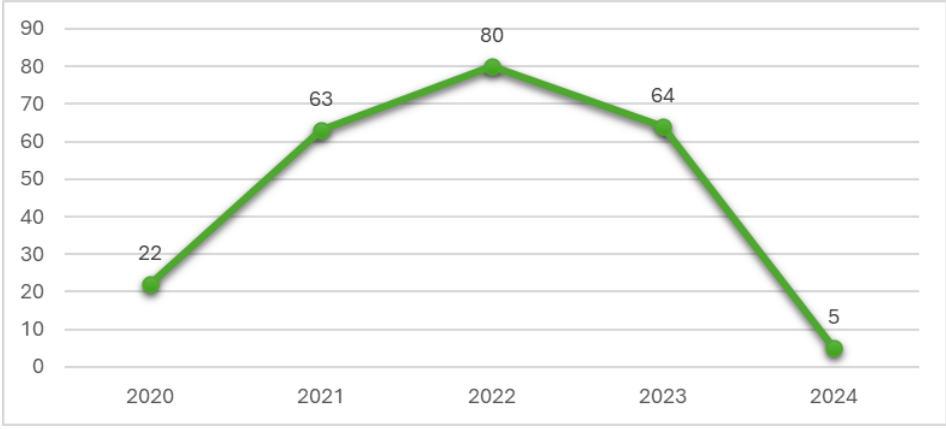

Figure 2: A graph of the publications per year

Publications Per Country

The highest publication rates were from countries that are technologically less advanced, such as countries in Africa and South Asia, while most of the countries with the lowest publication rates are technologically advanced countries like Western European countries, the United States, and Australia. This may be indicative of the

technologically advanced countries using online learning platforms and having internet infrastructure with high bandwidth and access to learning management systems like Canvas or Moodle and video conferencing tools like Microsoft Teams, Google Meet, and Zoom even before the advent of the COVID-19 pandemic. Hence, there was little to write about the use of WhatsApp since they had more sophisticated educational technology platforms to focus on, and digital learning was already part of their daily activities. In contrast, online platforms like WhatsApp were used in less technologically advanced countries to overcome the challenges of the high internet bandwidth that was required for the learning management systems. Balakrishnan and Long (2020) found that the WhatsApp application requires low internet bandwidth for its operation. Hence, WhatsApp became extremely popular in most developing countries because of its free availability, ease of use, speed, convenience, and ability to offer a reliable personal mode of communication (Maphosa, Dube, and Jita 2020). Researchers therefore wrote on the local context and available pedagogical tools, and to instruct and sensitise users on the usage of the WhatsApp platform as a pedagogical tool. Figure 3 illustrates the top 20 countries based on publications.

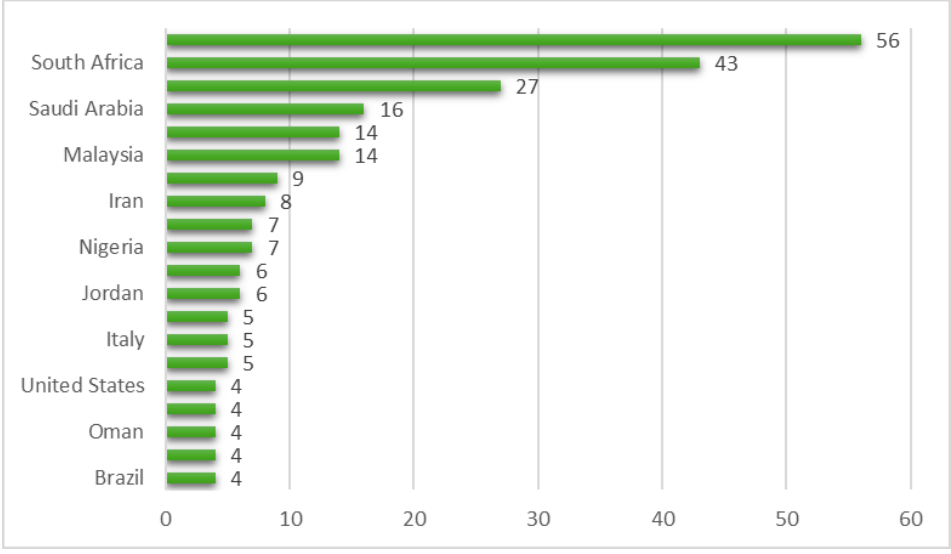

Figure 3: The top 20 countries based on publications per country

Publications Per Subject Area

The top five areas in terms of publications per subject area in hierarchical order were the social sciences (46%), computer science (14%), medicine (7%), arts and humanities (6%), and psychology (5%). Figure 4 illustrates the top 10 subject areas based on publications.

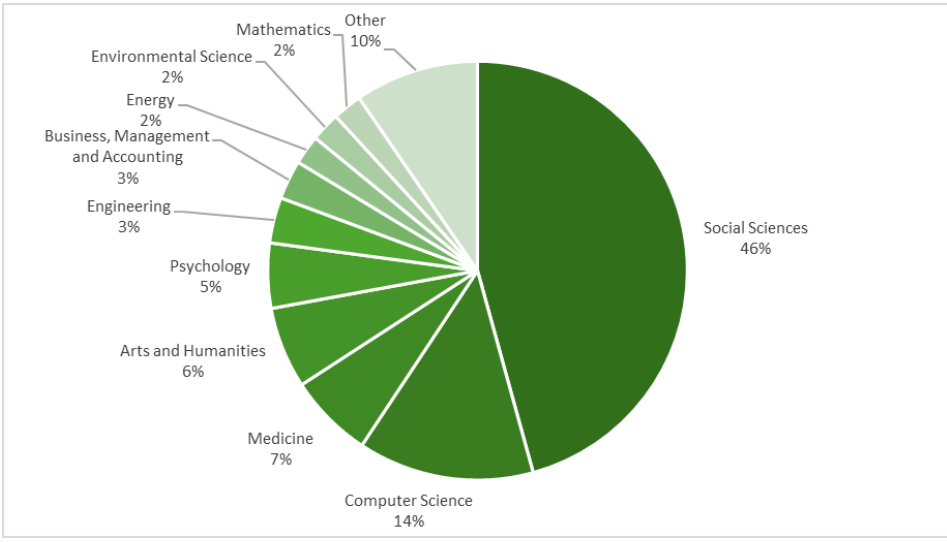

Figure 4: Top 10 subject areas based on publications per subject area

This finding can be explained by the fact that the research in the social sciences sought to understand human attitudes as well as societal and cultural responses to the swift transition to the use of online platforms like WhatsApp for pedagogy during the pandemic. Societal and cultural norms and attitudes have a significant impact on the adoption of an innovation (Chang and Wu 2023). It was also necessary to study the challenges of shifting to an online learning mode (Mahanta and Sharma 2022) and the role of stakeholders, parents, students, educators, and educational institutions in the execution of e-learning (Dhankar 2020). The transition to digital learning required the study of the possibilities for computer devices and online platforms like WhatsApp to enhance communication, information, and interaction between educators and students. There was also the need to explore WhatsApp's potential to cross the boundary between traditional face-to-face learning and remote learning (Lyken-Segosebe, Gamariel, and Bagai 2022). Hence, a high percentage of publications were in the field of computer science.

Medicine is an experiential field; it was therefore necessary to research the potential of WhatsApp as a pedagogical tool to deliver the expected outcome in medical education and communication and the effect of the use of online platforms like WhatsApp on students' physical health (Khan et al. 2023; Mahanta and Sharma 2022). In the field of arts and humanities, it was necessary to study how the potential of WhatsApp to deliver real time communication could be used to enhance interaction, ideas, knowledge sharing, and debates and to effectively manage time and learning space (Menggo et al. 2023). And finally, the field of psychology studied the impact of the swift transition from face-to-face learning to remote learning on the mental health of the students and their degree of motivation (Fazriyah and Kusrohmaniah 2023; Mahanta and Sharma 2022).

Research Focus Based on Co-Occurring Keywords

To identify and analyse emerging patterns in the research, a co-occurrence keyword analysis was used. This technique examined how frequently specific keywords appear together throughout the extracted literature (Donthu et al. 2021). During the co-occurrence network analysis of the extracted bibliographic data, a minimum threshold was set for the number of times keywords appeared together. The study used five as the predefined minimum number of co-occurring keywords, which helped ensure that the extracted keywords formed meaningful clusters that represented key themes. By analysing these thematic clusters, the authors gained valuable insights into the scope of research on WhatsApp as a pedagogical tool. This technique also revealed prominent themes, topics, and research trends in the area and helped identify relationships between these themes, along with potential patterns or outliers in the research landscape (Donthu et al. 2021). Figure 5 shows the network visualisation map for the 46 co-occurring keywords and their four different clusters.

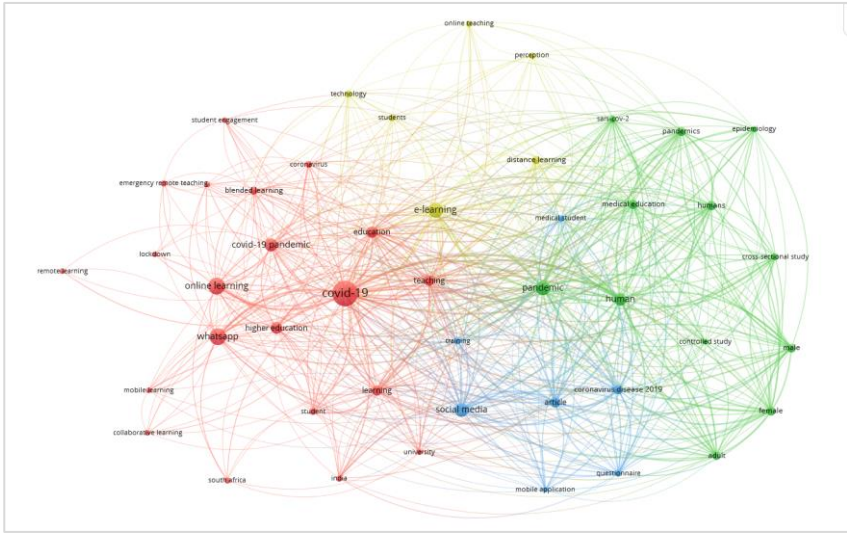

Figure 5: Network visualisation map for co-occurring keywords

The following four clusters were identified:

- *Cluster 1: Modes of instructional delivery and digital learning platforms for education during COVID-19*. Cluster 1 is a representation of research articles about the use of WhatsApp as a pedagogical tool during the COVID-19 pandemic, as the point of intersection. The keywords are "COVID-19," "distance learning," "collaborative learning," "WhatsApp," "students" engagement," "mobile learning," "blended learning," "emergency remote learning," "teaching student," and other related terms. Each of these terms in the cluster gave an insight into how students and educators used WhatsApp as an emergency remote learning platform during the COVID-19 pandemic. For example, COVID-19 highlights the context, which is the pandemic, and emergency remote learning demonstrates the swift adaptation

measures instituted by authorities to ensure the continuation of teaching and learning during the pandemic. Mobile learning refers to the use of mobile devices for teaching and learning, while WhatsApp highlights the mobile application that was used. Student engagement captures students' active involvement in learning, and blended learning presents the combination of traditional face-to-face and online learning that became prominent as a result of COVID-19.

- *Cluster 2: WhatsApp-mediated learning during COVID-19*. Cluster 2 delineates a subclass of publications related to the use of WhatsApp as a pedagogical tool during the COVID-19 pandemic. The keywords are "pandemic," "medical education," "humans," "adult," "epidemiology," "cross-sectional study," "controlled study," and other related terms. The co-occurrence of these keywords suggests that this cluster focuses on medical education. This implies that researchers were investigating the impact of the COVID-19 pandemic on medical education and the behaviour of people towards the use of WhatsApp to mitigate the effects of the pandemic on medical education.

- *Cluster 3: Evaluating WhatsApp-based education during COVID-19*. Cluster 3 is another subset of studies related to the use of WhatsApp as a pedagogic tool during the COVID-19 pandemic. The keyword co-occurrences are "article," "coronavirus 2019," "medical students," "mobile application," "questionnaire," "social media," and "training". These keywords' co-occurrence relates to articles that explore how medical students were trained via social media applications like WhatsApp in the context of COVID-19.

- *Cluster 4: Modes of instructional delivery and perceptions of technology for education during COVID-19*. The keywords in Cluster 4 are "distance learning," "e-learning," "online teaching," "perception," "students," and 'technology." Distance learning, e-learning, and online teaching indicate the teaching and learning modes that were used during the pandemic and the perception of students towards the use of digital technologies for learning.

Research Focus Based on Year of Publication

Figure 6 shows the network visualisation map for the 46 co-occurring keyword clusters based on time, that is, in the different years of publication. With a minimum of five occurrences, it was observed that the most recent publications related to modes of instructional delivery of remote learning, blended learning, and mobile learning in the context of using WhatsApp.

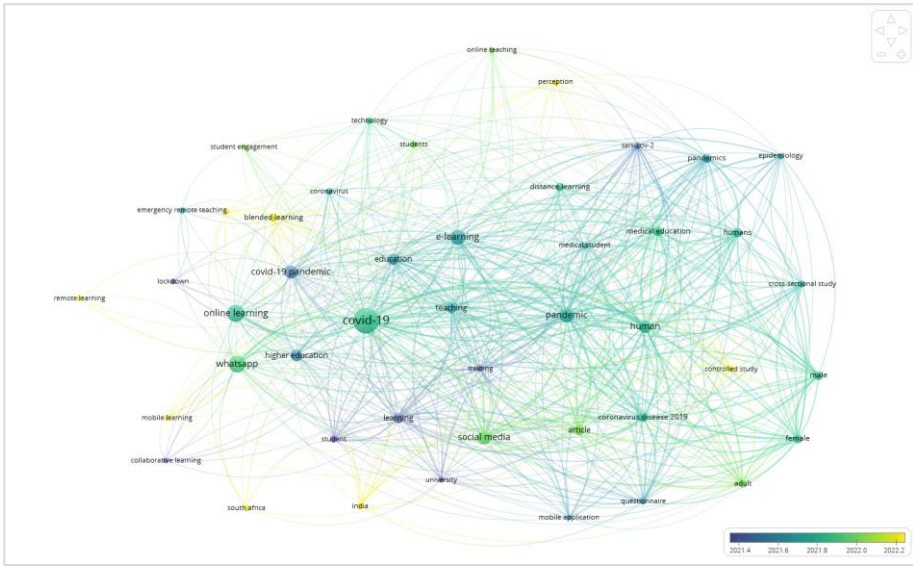

Figure 6: Network visualisation map for co-occurring keywords over time

The analysis of recent publications revealed a growing interest in exploring WhatsApp as a pedagogical tool during and post-pandemic, particularly in the context of remote learning, blended learning, and mobile learning. The current focus on using WhatsApp, especially in countries like South Africa and India, highlights existing available digital technologies and online mobile platforms being explored for their sustainability in instructional delivery in developing countries. This trend might be driven by the need to address the challenges faced in developing countries, such as unreliable internet connections, cost implications, and limited resources and infrastructure hindering accessibility. Educators can leverage the functions of WhatsApp, like group chats and file sharing, to offer solutions for dialogue, interactivity, and collaboration among students in developing countries. Furthermore, the distribution of cost-effective smartphones makes WhatsApp a potentially more accessible platform than specialised learning management systems, which might have higher infrastructural demands.

Discussion

A prominent feature of classroom dialogue is its positive role in fostering critical thinking and learning achievement in students. For higher-order learning outcomes to be achieved, educator–student interaction and dialogue between the educator and the students are needed (Chitanana 2024). Manalo (2019) considers dialogic teaching a collaborative venture that aims at sharing and refining knowledge. With the advent of the COVID-19 pandemic and the initiation of a lockdown, a chasm was created that hindered students from physically interacting with their educators and peers. WhatsApp performed a bridging function that enabled students and educators to cross the boundary

between the traditional classroom face-to-face learning and the imposed online learning (Lyken-Segosebe, Gamariel, and Bagai 2022).

Apart from the diverse classroom functions performed by WhatsApp, it also fostered a conducive social atmosphere that encouraged dialogic teaching and interaction among students (Lyken-Segosebe, Gamariel, and Bagai 2022). According to our findings, one element that made WhatsApp very popular and that was highlighted in most of the literature is its ability to facilitate the five core principles of dialogic learning, namely collective, reciprocal, supportive, cumulative, and purposeful learning.

According to Alexander (2017), the collective principle is characterised by joint learning and knowledge sharing. In a learning environment where the collective principle is respected, the educator facilitates and participates in discussions with students (Egan-Simon 2022). Studies showed that during COVID-19, WhatsApp was used for group learning and to share knowledge. Mawarni et al. (2020) found that students could send pictures, videos, and exercise questions on WhatsApp groups for their peers to solve or answer the problem before the intervention of the educator. Maphosa, Dube, and Jita (2020) also found that members of a WhatsApp group could collaboratively take part in a discussion on a specific topic, and individual members had the chance to instantly address a question either to the educator or to other group participants. It allowed students to acquire knowledge through experiential learning and collaboration by sharing their points of view, discussing concepts, and constructively agreeing on a theory.

When the reciprocal principle was applied, participants listened to each other, shared ideas, and considered alternative viewpoints (Alexander 2017). Participative listening and feedback are core elements of this principle. WhatsApp was used to enhance reciprocity during COVID-19. Written discussions and peer evaluations were conducted via WhatsApp group chats, and oral feedback was provided through WhatsApp voice notes synchronously. The WhatsApp group chat functionality enabled synchronous and asynchronous discussions, resource sharing, and collaboration on assignments, thus creating a virtual classroom environment that mirrored traditional in-person interactions. Cano-Hila and Argemí-Baldich (2021) also demonstrate a reciprocal bond among students to the extent that they felt accompanied by their peers and accompanied their peers.

When the supportive principle was applied, "participants feel able to express ideas freely, without risk of embarrassment over 'wrong' answers, and they help each other to reach common understandings" (Alexander 2017, 5). The application of this principle using WhatsApp as a pedagogical tool during the COVID-19 pandemic was evident. Aduba and Mayowa-Adebara (2022) indicate that WhatsApp created a conducive learning environment that enabled an interactive, collaborative, and participatory teaching/learning process in which students could freely share learning materials and ask questions, which improved educator–student relationships. Jacobs, George, and

Anga'ama (2023) also state that giving a wrong answer, which initially was considered a taboo, was transformed into an asset that gave students the chance to discuss the correct answers and understand why some answers are incorrect.

In the application of the cumulative principle, "participants build on their own and each other's contributions and chain them into coherent lines of thinking and understanding" (Alexander 2017, 5). WhatsApp helped enhance cumulative knowledge during COVID-19. Chitanana (2024) demonstrates that students learnt from their peers by referencing them on their postings. Chitanana (2024) further states that students were able to build on their knowledge via the ideas and concepts acquired through their experience of learning by connection. Herath, Bano, and Vasantha (2021) back this claim by stating that students' understanding was enhanced through interpersonal skills.

The purposive principle indicates that "classroom talk, though open and dialogic, is structured with specific learning goals in view" (Alexander 2017, 5). The purposive principle of WhatsApp as a pedagogic tool is highlighted by Chitanana (2024), who states that educators emphasised that their students' postings should be those that will engage them to debate challenging ideas, unravel underlying assumptions, and have more insightful reflections on their personal stances and views.

The application of the five core principles of dialogic teaching generates interactivity, critical thinking, and academic performance, which are vital elements of the learning process. Interactivity is a pattern of communication that involves the social, cooperative, or collaborative exchanges that take place in the classroom (Bannan-Ritland 2002). Al Adwan et al. (2023) found that WhatsApp offered real-time, face-to-face interaction between classmates and instructors. Azer et al. (2023) confirm that WhatsApp enabled students to gain a sense of connectedness to their mates and easily collaborate with others. Herath, Bano, and Vasantha (2021) also found that WhatsApp's multiple interactive features, such as unlimited messaging, group chats, multimedia, and the possibility of exchanging voice notes, videos and images, enabled students to interact with one another, share knowledge, and develop interpersonal contact.

The fundamental aspect of critical thinking is "careful and reflective thinking that is deliberate, and goal-directed" (Manalo 2019, 32). Fisher and Scriven (1997, 21) define critical thinking as "skilled and active interpretation and evaluation of observations and communications, information and argumentation." Herath, Bano, and Vasantha (2021) found that collaborative learning among students, which was characteristic of the use of WhatsApp for pedagogic purposes during the COVID-19 pandemic, enhanced critical thinking. Alsharif et al. (2021) corroborate this assertion because they found that the collaborative learning potential and the ubiquitous availability of WhatsApp created an effective and motivational environment that enhanced the critical thinking abilities of students.

Academic achievement refers to the contentment that students derive from their educational progress and performance during online learning (Anderson, Guan, and Koc 2016). Sheikh and Anderson (2018) define academic achievement as the degree of success achieved by students at the end of their formal education. Alsharif et al. (2021) found through an experimental study that students who used WhatsApp in a blended learning strategy group demonstrated better academic performance than their counterparts who practised only the traditional face-to-face learning. Atmojo, Muhtarom, and Lukitoaji (2020) demonstrate that WhatsApp groups enable students to have good learning achievement by showing that students with the highest average of self-regulated learning are those who used the WhatsApp group application.

On the other hand, Mawarni et al. (2020) state that owing to limited data connection quotas and unstable internet networks, some students had difficulties focusing on their lessons and were also hindered from discussing their work with their friends. This view is in line with that of Aduba and Mayowa-Adebara (2022), who also found that the cost of data and network failure hindered lectures. They add that the laxity and nonchalance of some students also played an impeding role. These remarks make the collective principle questionable. The supportive principle can also be questioned from the findings of Chitanana (2024), who found that alternative views that did not align with those of dominant voices were disregarded or dismissed, and that this discouraged many students from sharing their opinions for fear that their ideas would be invalidated or ignored. Almahasees, Mohsen, and Amin (2021) found that the use of WhatsApp for learning acts as a barrier to students' engagement in real class activities and that students lack peer learning, which contradicts the principle of reciprocity. Almahasees, Mohsen, and Amin (2021) also found that a plethora of messages and notifications were generated in some active groups, which led to some students becoming overwhelmed and unable to keep up with the discussions. This makes the cumulative principle debatable. Maphosa, Dube, and Jita (2020) highlight that some students diverted their regard and used inappropriate language and indulged in relations that extended beyond academic discourse, thereby bringing into question the principle of purpose.

Conclusion

The COVID-19 pandemic necessitated a rapid transition to remote learning and thereby significantly challenged traditional educational practices. This abrupt shift posed numerous challenges, including maintaining student engagement, ensuring effective communication, and fostering a conducive learning environment. WhatsApp emerged as a vital tool because of its accessibility and ability to facilitate synchronous and asynchronous communication to maintain educational continuity. The application of WhatsApp during the pandemic highlighted its potential to support dialogic teaching by fostering interactivity, critical thinking, and academic performance through the five core principles of collective, reciprocal, supportive, cumulative, and purposeful learning. This tool's ability to facilitate the five core principles of dialogic teaching further reinforced its effectiveness as a pedagogical tool. However, the challenges faced in the

use of WhatsApp as a pedagogic tool during the COVID-19 pandemic were also highlighted. This article highlighted the importance of exploring sustainable digital technologies for educational continuity, particularly in developing countries, to address challenges related to access and equity in education.

Implications

This article offers a contribution for educators and researchers. It highlights the potential of a widely used app like WhatsApp by showing it to be a practical and accessible tool for enriching classroom dialogue, even with resource constraints. The article goes beyond mere suggestions as it provides evidence-based practices that demonstrate the affordances of WhatsApp's functionalities by outlining the five core principles of successful dialogic learning. This provides indicators and empowers educators to leverage the affordances of WhatsApp as a pedagogical tool. Furthermore, the article acknowledges and addresses potential challenges like the digital divide and limited data and internet access in developing countries. The findings of the study will help education administrators understand the advantages and setbacks of learning through WhatsApp and to create policies and guidelines that will help strengthen the educational, technical, and instructional capacity of WhatsApp as well as mitigate the inconveniences of using WhatsApp as a pedagogic tool. Finally, the research initiates future exploration into addressing large groups on WhatsApp, the development of assessment methods for online learning with WhatsApp, and investigating the long-term impact of digital tools like WhatsApp on educational outcomes to ensure all students can benefit from advancements in educational technology.

Limitations and Future Scope of Research

This article acknowledges that while WhatsApp offers a promising pedagogical tool, there are limitations to consider for future research. The article primarily focused on the pandemic context, leaving open the question of WhatsApp's effectiveness in non-emergency online settings. Furthermore, the focus on the single platform of WhatsApp highlights areas for further exploration for other social media platforms, such as Telegram. Additionally, the heterogeneous impact of WhatsApp as a pedagogical tool should be taken into consideration. While the application's use for educational continuity is established, a critical direction for future research is an empirical investigation into how student diversity, encompassing factors such as socio-economic status, digital literacy, gender, learning disability status, and access to resources shapes the adoption, use, experience, and effectiveness of WhatsApp-based instruction. We suggest using an intersectionality framework to critically examine the use of WhatsApp across various student groups. This approach would move beyond a uniform assumption and provide crucial insights into issues of pedagogical equity and digital exclusion, offering evidence-based recommendations for inclusive technology integration in education. Another limitation is that the article focused on published articles in the Scopus database, but valuable insights might exist in other publications, databases, or unpublished sources. Future research would benefit from including a wider range of

databases and exploring unpublished sources to capture a more comprehensive picture of WhatsApp's use in education. Furthermore, the reliance on WhatsApp highlighted the disparities in technological infrastructure between developing and developed countries. While technologically advanced countries had access to internet infrastructure and learning management systems during the COVID-19 pandemic, developing countries like South Africa and India relied on more accessible and affordable tools like WhatsApp. This trend highlights the need to explore sustainable and inclusive digital technologies for instructional delivery. WhatsApp has proven to be a valuable educational tool, particularly in addressing challenges related to access and equity in education during the COVID-19 pandemic. Future research should continue to investigate the long-term impacts of such digital tools on educational practices and outcomes, especially in developing countries and the sub-Saharan region.

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