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REVIEW

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Mentimeter Tool for Enhancing Student Engagement and Active Learning: A Literature Review

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Abstract: This review addresses the growing integration of technology in education by examining the role of Mentimeter, a student response system (SRS), in enhancing teaching and learning. The study aims to consolidate existing research to provide insights into Mentimeter's impact on educational practices, identifying both its advantages and limitations and offering guidance for its effective use in diverse learning environments. A systematic review of 40 peer-reviewed studies published between 2010 and 2023 was conducted using thematic analysis. The studies were selected through extensive searches across six electronic databases, employing predefined inclusion and exclusion criteria. Data extraction and analysis focused on identifying recurring themes and patterns related to the use of Mentimeter in various educational settings. The review reveals that Mentimeter enhances student engagement, encourages collaboration, and boosts participation through its interactive and anonymous response features. It supports active learning and facilitates real-time formative assessment, making it a valuable tool for both in-person and online teaching. However, challenges such as technical issues, costs, and the need for training and ethical guidelines were also identified. The findings suggest that integrating Mentimeter into teaching practices can improve learning experiences by bringing interactivity and engagement. Educators are encouraged to explore innovative applications of the tool while addressing its limitations. Future research should focus on its long-term impact, applications in remote and hybrid learning environments, and comparative evaluations with other SRS.

Keywords: student response system, Mentimeter, student engagement, student satisfaction, polling tool, real-time feedback

1. Introduction

In recent years, the use of technology in education has become increasingly popular [1]. Technology has transformed the way we teach and learn. Consequently, various digital tools and platforms have been developed to enhance the teaching and learning process. One such tool is Mentimeter, a web-based platform that allows teachers to create interactive presentations and engage students in real time [2, 3]. It enables teachers to create and share presentations that include various question types, such as multiple-choice, open-ended, and rating questions, as well as interactive elements such as word clouds, quizzes, and polls [2]. Students can respond to these questions in real time using smartphones, laptops, or tablets, making Mentimeter an ideal tool for engaging students in classroom discussions, quizzes, and other learning activities [4].

The use of Mentimeter in education has been found to enhance teaching and learning as it promotes student engagement, active learning, and feedback. The tool has the potential to improve the quality of education and transform the way teachers interact with their students, both in traditional and online learning environments [5, 6]. However, despite these benefits, existing research on its educational applications remains scattered and limited in scope. Therefore, it is essential to consolidate and examine the available evidence to gain a extensive understanding of Mentimeter's effectiveness as an educational tool.

This review aims to fill this research gap by analyzing and synthesizing existing literature on the use of Mentimeter in teaching and learning. Review studies play a vital role in advancing understanding of a particular topic by synthesizing and analyzing existing knowledge [7]. They provide an overview of the current research field, identify gaps in the literature, and highlight areas for future investigation [8]. The review studies help to identify patterns, themes, and inconsistencies in prior findings by critically evaluating and synthesizing a large body of work [9].

This review is significant for several reasons. First, it provides an overview of existing literature on Mentimeter's use in education and identifies gaps and areas for further research. Second, it highlights the potential benefits of using Mentimeter in teaching and learning, helping educators to understand its value, and motivating them to integrate the system into their practice. Third, the review addresses the challenges and limitations of using Mentimeter, aiding educators to recognize potential obstacles and to develop strategies to overcome these limitations. This review contributes to the broader body of knowledge on Mentimeter in education and offers educators some practical insights on how to effectively incorporate this tool into teaching practice.

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This chapter is now organized into three further sections. Section 2 offers detailed insights into the methods employed to select, review, and synthesize the pertinent literature. Section 3 presents the identified themes and their corresponding findings, thereby offering valuable implications for policymakers to consider. Finally, Section 4 serves as the concluding segment of the chapter, wherein the limitations of the study are duly acknowledged, and future research directions are suggested.

2. Literature Review

2.1. Literature search

For this research, a thorough review of existing literature on the use of Mentimeter in education has been conducted. A detailed evaluation of the findings follows. This approach, known as a "systematic search and review," combines the advantages of a structured search process with critical evaluation [10]. A systematic literature search was conducted to identify studies on Mentimeter's use in education, using articles published between 2010 and 2023. Six electronic databases—Science Direct, Emerald, ProQuest, Wiley Online Library, and Google Scholar—were searched to locate these relevant studies.

The search was based on keywords sourced from Google Scholar's basic search. Keyword searches within chosen databases are among the most common strategies used in systematic reviews. The terms used in this study were "Mentimeter" AND "education" OR "teaching and learning" OR "student response system" OR "active learning" OR "live polling tool" OR "real-time response." Google Scholar was also utilized to verify the search results and identify any additional relevant studies that may have been missed during the initial search. The keywords were applied within the title, abstract, and keyword sections of the studies, following the techniques used in previous research. These keywords were consistently employed to ensure that no relevant articles were overlooked, and these were occasionally combined using the advanced search option. Boolean operators (and, or) were utilized to broaden or refine the search, thereby increasing the effectiveness of the search range.

The use of Boolean operators provided a significant advantage, enabling access to a wider range of resources in some instances—particularly where similar but differing terms were used for the same topic—allowing the searches to be narrowed where needed to identify more specific and relevant sources [11]. The searches were completed in June 2023, after which two independent assessors reviewed and evaluated the search results to ensure the inclusion of all relevant studies (see Figure 1).

2.2. Inclusion and exclusion criteria

The initial search strategy's results were filtered by title and abstract, this strategy having already been used by previous researchers. The full texts of relevant publications were reviewed for inclusion and exclusion [12], with the criteria for inclusion and exclusion outlined in Table 1. In this review, only peer-reviewed studies that investigated Mentimeter in teaching and learning in any educational sector were included for analysis.

During the search process, a detailed examination of databases yielded a total of 118 articles pertaining to the utilization of Mentimeter in the realm of education. Subsequently, a screening process was conducted to assess the compatibility of these articles with the predefined inclusion and exclusion criteria outlined in Table 1. Out of the initial pool, 78 articles were excluded due to their failure to adequately satisfy the stipulated criteria. These comprised review papers, general articles on student response systems (SRS), or those primarily focusing on applications other than Mentimeter. For selecting relevant articles, the researcher initially scrutinized the titles and abstracts, subsequently progressing to an in-depth analysis of the full texts, particularly findings, discussions, and conclusion sections. Consequently, a total of 40 articles were deemed suitable and included in this study's review.

2.3. Data extraction

The selected articles were reviewed thoroughly, and the main findings were extracted [12]. Pertinent information, including a discussion of findings and main conclusions, was documented using an Excel spreadsheet. Any specific details regarding Mentimeter's impact on teaching and learning were carefully noted. Excel's search tool was used to find frequencies of certain words and themes arising within the texts. The extracted frequencies were organized into a table, allowing for a clear and concise overview of the key information within each study.

2.4. Data analysis

A thematic analysis was conducted to identify overarching themes and patterns within the collected data. The extracted findings were reviewed to highlight key themes [13]. Instead of using software, texts were read word by word, helping to guide analysis and theme identification. Coding categories were assigned early on, which led to the emergence of distinct themes. The coding process continued until saturation was reached, identifying themes related to Mentimeter and its use in education.

The identification of themes involved an iterative process, where we constantly consulted and compared the tabulated list of themes and visual maps with the readings of the findings [13]. To provide supporting evidence, we included a few quotes from the reviewed studies in the discussion below. These themes offered a comprehensive understanding of Mentimeter's effectiveness in education across multiple studies.

The use of electronic databases and predefined inclusion/exclusion criteria added rigor to the search process. However, one limitation was the exclusion of studies not published in peer-reviewed journals or written in languages other than English. While the thematic analysis provided an in-depth understanding of the topics discussed across the studies, there remains the potential for coder bias. To enhance the trustworthiness of the analysis and mitigate any bias, two reviewers conducted the data extraction and thematic analysis. Any disagreements were resolved through discussion, ensuring a balanced and reliable interpretation of the data.

3. Findings and Discussion

3.1. Ranking of key themes

A thorough analysis of word frequency and prominence within the selected articles revealed several key themes that are central to understanding the role of Mentimeter in teaching and learning. Table 2 provides a summarized overview of these themes, their frequency, and their relevance in shaping discussions about this topic.

The analysis highlights "student engagement" as the most frequently discussed theme, appearing 20 times. This reflects the growing consensus in educational research that tools such as Mentimeter enhance student involvement by promoting active

Figure 1
The steps involved in systematic literature review

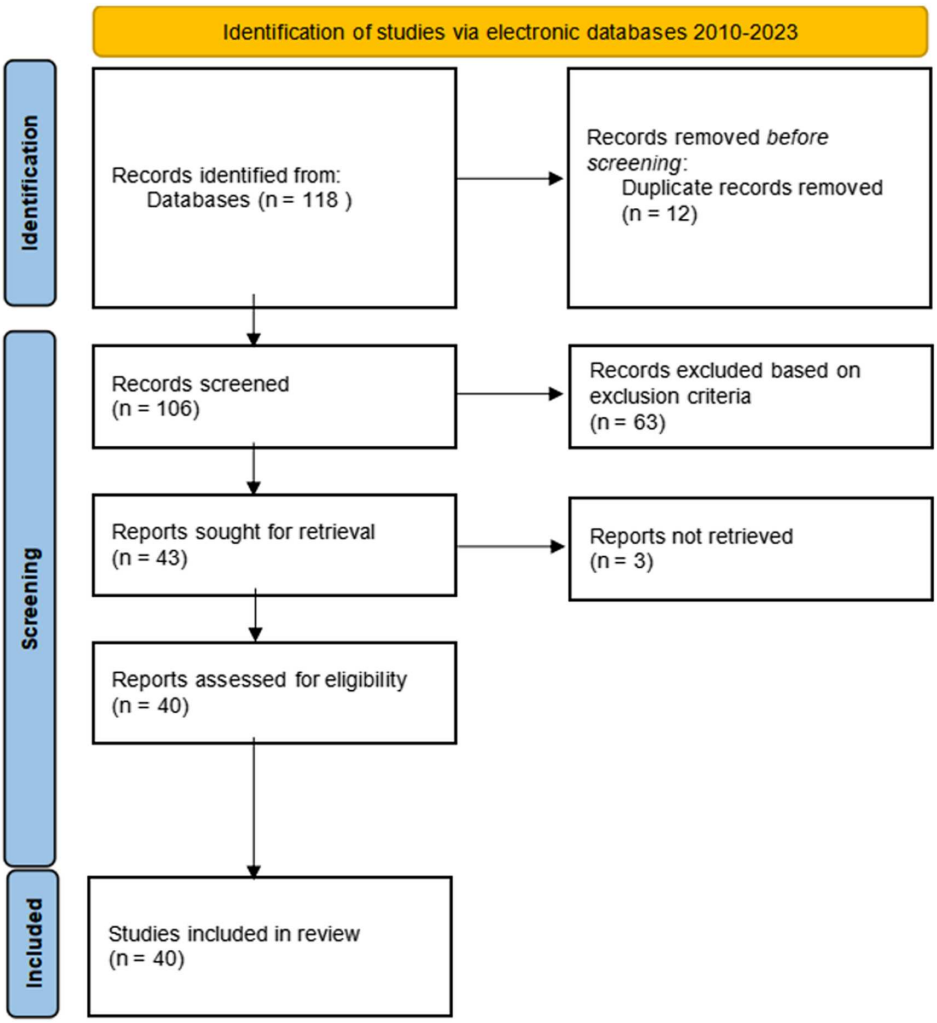

Table 1
Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
Must involve Mentimeter and education as a main topic of research.	Editorials, commentaries, letters to editors, news articles, and opinions are excluded.
The article must discuss the use of Mentimeter in learning and teaching in any discipline, any education setting, and anywhere in the world.	Articles that discuss education in a general context, but which do not explain any connection with live voting, Mentimeter are excluded.
Conference proceedings and pre-printed articles are included.	Studies dealing with other live voting apps are excluded.

learning. Similar findings are reported by Freeman et al. [14], which highlights that active learning strategies significantly improve student performance in science, technology, engineering, and mathematics subjects. The use of Mentimeter aligns with this perspective by encouraging participation through features such as quizzes and polls.

The theme "digital software/application," with 18 mentions, emphasises the integral role of technology in transforming traditional learning environments. This aligns with the study by Bond et al. [15] that emphasizes the adoption of digital tools as a critical component of 21st-century education. The frequency of this theme in the reviewed articles highlights the versatility of digital applications in addressing challenges such as accessibility and student engagement, a finding echoed in a study on digital learning during the COVID-19 pandemic [16, 17].

The prominence of "online learning" (17 mentions) highlights the significant shift toward virtual education environments. This finding is consistent with Vallely and Gibson's study [18] that describes the rapid transition to online learning during the pandemic as a pivotal moment for rethinking educational delivery. However, while many studies focus on challenges, such as inequity and technological barriers, the findings here suggest that tools such as Mentimeter can play a role in mitigating these challenges by creating interactive and engaging online learning experiences.

Themes such as "collaboration and participation" and "interactive learning" (13 mentions each) further illustrate the potential of

Table 2
Frequency of themes emerged

#	Themes	Frequency
1	Student engagement	20
2	Digital software/application	18
3	Online learning	17
4	Collaboration and participation	13
6	Interactive learning	13
5	Anonymity	12
7	Dialogue and discussion	9
8	Immediate feedback	8
9	Positive impact on students' engagement and motivation	4
10	Inclusive learning	4

Mentimeter in supporting constructivist learning models. Collaborative activities are essential for cognitive development, as students learn through social interaction [19]. Mentimeter's features, such as live polling and shared responses, help this interaction, enabling students to work together and actively construct knowledge. This aligns with the findings of the study by Madiseh et al. [20] that highlights the positive impact of collaborative learning on student motivation and academic performance.

The theme of "anonymity," mentioned 12 times, is particularly significant in promoting inclusive participation. Mentimeter's anonymous response feature empowers students who may feel inhibited within traditional classroom settings. Anonymity in digital tools reduces anxiety and encourages more honest and open engagement [21]. However, anonymity may also lead to less accountability in responses, a point that could be further explored in future research [22].

The emphasis on "dialogue and discussion" (9 mentions) highlights Mentimeter's capacity to stimulate meaningful interaction, a finding supported by Laurillard [23] that supports the importance of dialogue in effective learning. Mentimeter enables structured discussions through features such as word clouds and Q&A sessions, creating a deeper understanding of course material.

Finally, the themes of "immediate feedback," "positive impact on students' engagement and motivation," and "inclusive learning" (4–8 mentions) reflect the broader pedagogical benefits of using Mentimeter. Immediate feedback, for instance, aligns with the study by Granberg et al. [24] on formative assessments, which highlights the role of timely feedback in supporting student learning. Similarly, the themes of engagement and inclusivity resonate with the study by Carrillo and Flores [25], which argues that digital tools can help address diverse learning needs by creating flexible and accessible educational experiences.

3.2 Interactive learning and student engagement

Mentimeter, as a software tool, has a notable advantage in promoting active student engagement, a point extensively supported in academic literature. For example, one of the studies proposed by Little [26] highlighted the interactive nature of Mentimeter, stating, "the interactive nature of it (Mentimeter) kept you engaged the entire time". This interactivity is seen as a key factor in promoting active learning and enhancing knowledge retention. Furthermore, the study by Tetep et al. [27] found that Mentimeter significantly increased student engagement, motivation, and participation in online learning environments. Jackly and Lestariningsih's study [28] demonstrated that Mentimeter assists teachers in various aspects, including facilitating interactive activities, initiating lessons, delivering lectures, assessing progress, and enabling discussions.

Mentimeter's ability to maintain student involvement is beneficial in promoting active learning. Its interactive design helps sustain engagement throughout the learning process, contributing to better knowledge retention [26]. In online settings, the use of Mentimeter has led to increased student motivation and participation [27]. Additionally, Mentimeter supports teachers by incorporating interactive elements that enrich the teaching process, from lesson initiation to student assessment and classroom discussions [28].

In using Mentimeter, educators can create interactive presentations that encourage real-time student participation, allowing them to express their thoughts, opinions, and knowledge of the topic at hand. This form of interaction facilitates "dialogic teaching" and "dialogic talk" in the classroom, where a two-way conversation between teacher and students is encouraged [29]. It also creates a more dynamic, inclusive educational environment, shifting away from a unidirectional, teacher-led approach toward a more collaborative exchange of ideas.

3.2.1. Enjoyable

The term "enjoyable" emerges as a prominent theme in the review. Multiple studies have highlighted the significance of enjoyable learning experiences in different disciplinary contexts. The study by Mayhew et al. [30] also highlighted that student groups had expressed high levels of satisfaction across various academic disciplines, both in small and large group teaching settings. This suggests that creating enjoyable learning experiences can positively influence students' perceptions and satisfaction in diverse subject areas, highlighting the potential for such methods to enhance overall educational quality.

In another study by Demirci et al. [31] that focused on English classes, the use of Mentimeter, as an interactive presentation tool, was found to introduce fun and enjoyment into the learning environment. This interactive approach not only made the learning process more enjoyable but also supported an effective language learning process. Educators can therefore use Mentimeter to enhance higher levels of student engagement and motivation, especially in language studies, by making learning sessions more enjoyable.

Yet another study by Pichardo et al. [3] found that enabling anonymous participation, particularly when combined with enjoyable classroom experiences, could enhance active student involvement. Anonymous participation allowed students to express their views more freely, promoting a democratic and collaborative classroom dynamic. This approach encouraged greater student engagement and promoted a shared sense of responsibility among the student cohorts.

3.2.2. Positive impact

The positive impact of using Mentimeter as a tool to increase student engagement and motivation has been well-documented. For example, one study by Anggriani et al. [2] has demonstrated that incorporating Mentimeter into lessons had a direct positive effect on student participation and enthusiasm for learning. The interactive and user-friendly design of Mentimeter is likely to have contributed to the success of promoting student engagement.

Similarly, another study conducted a pilot project involving students and staff and reported positive feedback regarding the use of Mentimeter. Most of the participants acknowledged an increase in student engagement because of the use of Mentimeter. This finding further supports the idea that Mentimeter can be an effective tool for promoting active student involvement in the

learning process [32]. The positive reception from both students and staff emphasizes the potential of Mentimeter as a valuable resource in educational contexts.

One study, which focused on English language learning, highlighted Mentimeter's positive role in supporting inclusiveness and motivating learning settings. Features such as anonymity and ease of use were found to contribute to a more supportive educational environment [33]. The findings suggest that Mentimeter's ongoing use in language lessons could continue to support both student engagement and overall learning outcomes.

3.3. Anonymity

A core feature of Mentimeter is its ability to allow anonymous student responses. Several studies emphasize the positive impact of anonymity in the classroom. For instance, Ahshan's study [34] found that when students responded to questions anonymously, their comfort levels and participation increased significantly. This was further supported by Moorhouse and Kohnke's research [35] indicating that anonymity within the platform promoted a safe environment for students to ask questions or share opinions without fear of judgment.

The ability of Mentimeter to mask students' identities not only alleviates anxiety but also increases engagement, particularly among students who might be reluctant to participate in large group settings [36]. These findings were echoed by Bayu and Sari's study [33] in which students reported that anonymity made them more comfortable participating in classroom discussions, leading to a richer, more interactive learning experience.

Moreover, other research shows that the anonymity feature is particularly beneficial in overcoming the hesitation many students feel when speaking in front of large groups. This aspect of Mentimeter has proven especially useful in cultural contexts where students may be less inclined to openly share their views [37, 38].

3.4. Real-time feedback

One of the distinguishing aspects of Mentimeter is its ability to provide real-time feedback to both students and educators. The immediacy of feedback allows students to instantly see how their answers compare to those of their peers, which can help them adjust their understanding of the material as they learn [39]. The availability of such immediate insights is critical for both the student to identify knowledge gaps and enable continuous improvement throughout their learning process [3].

This real-time feedback is also effective for teachers, who can use it to adjust their teaching strategies in real time based on students' responses [37]. Educators can make lessons more adaptive and responsive by Mentimeter facilitating this real-time feedback, ensuring that they meet the students' learning needs more effectively. Real-time feedback has been shown to promote student engagement, improve retention, and enhance comprehension of key concepts [40].

3.5. Improvement in critical thinking and collaboration skills

The use of Mentimeter has been recognized as a beneficial tool in promoting critical thinking skills among students. Puspa and Imamyartha's study [41] has demonstrated that Mentimeter contributes to an enriched learning experience by increasing student engagement, enhancing collaboration, and developing critical thinking abilities. These findings are consistent with research by Anggriani et al. [2], which found that applying the project-based learning (PBL) model alongside Mentimeter has led to notable improvements in students' critical thinking and collaboration skills. The study by Anggriani et al. [2] further emphasizes that combining the PBL model with Mentimeter proved to be an effective method for enhancing these skills, particularly in science education.

Collaboration is another area that benefits from the use of Mentimeter. The research by Pichardo et al. [3] found that students showed higher levels of engagement and a greater willingness to collaborate with educators and peers in a more relaxed environment when compared to traditional passive learning methods. This illustrates that Mentimeter creates a supportive atmosphere for collaborative learning, encouraging interactions between students and educators. Additionally, it has been highlighted that Mentimeter provides students with insights into their peers' thoughts, feelings, and knowledge [26]. This increased awareness of group dynamics can promote collaboration and teamwork, as students gain a deeper understanding of their peers' perspectives, encouraging more effective collaboration and group interaction [26].

3.6. Integration of student response system technology in online and blended learning practices

The cited sources discuss the importance of using technology, specifically the Mentimeter application, to facilitate blended learning and enhance student engagement and participation in online learning environments. Andriani et al. [42] emphasize the significance of technology in blended learning, particularly for students from the "Y" generation, who are considered proficient in technology usage. They suggest that blended learning, which combines online and face-to-face instruction, is an effective educational approach and propose the use of Mentimeter to support this method.

The study by Tetep et al. [27] demonstrates that using Mentimeter in online learning increased student engagement, motivation, and active participation. Similarly, Chotimah and Cahyani [43] suggest that Mentimeter can be a helpful tool for educators to enhance students' writing skills in online learning environments. It has also been reported that a significant percentage of students strongly agree that Mentimeter is a powerful technology for promoting active student engagement during remote online sessions [34]. It is, however, important to consider students' digital literacy skills, motivation, and language proficiency when implementing Mentimeter in the classroom, as highlighted in another study by Jusuf et al. [40]. This indicates that the effectiveness of Mentimeter and other online applications may be influenced by students' readiness and proficiency in using digital tools [42]. The use of digital interactive technology has also been shown to enhance student engagement, highlighting its potential to improve the learning experience [43].

Wood's study [44] recommends the integration of SRS across the curriculum to enhance the learning and teaching experience. This study suggests that SRS should not be used solely to fill time in a lecture but should be incorporated as intentionally designed teaching activities that improve the learning experience. The findings also suggest that better staff training is necessary to effectively utilize SRS within large lectures [41].

3.7. Ease of use and user-friendliness

Mentimeter has been found to be user-friendly and easy to use in educational settings [45, 46]. Studies have shown that students consider Mentimeter to be highly beneficial, with 86% reporting

its ease of use and 92% finding it easy to learn [15]. The significance of software within the contemporary classroom environment is highlighted by its relative ease of use. Educational software must meet the dual criteria of ease of use and longevity in the market to effectively support modern classroom environments [34]. This perspective aligns with findings that emphasize the importance of ease of use for applications, as software facilitates user interaction and contributes to a positive user experience by minimizing the need for extensive technical knowledge [41].

Mentimeter is therefore a noteworthy example of user-friendly educational software [42]. Its accessibility implies ease of use and user-friendliness, making it easy for both teachers and students to navigate and utilize its features effectively [33]. This finding supports the idea that user-friendly software can significantly contribute to a smooth and efficient classroom experience [33]. Mentimeter's various features contribute to creating an interactive learning environment that satisfies students and enhances their learning experience [15, 41].

3.8. Large classroom teaching

Mentimeter is increasingly recognized as an effective solution for enhancing learning and teaching in large classrooms. The use of Mentimeter's various question types and quiz elements in large lectures has been shown to significantly improve student engagement and enjoyment [47]. This tool offers both easy accessibility and the flexibility required to cater to the needs of large classes, making it a powerful resource for improving the dynamics of such learning environments [48]. Mentimeter promotes active learning, student participation, and enjoyment, all of which are necessary factors for successful educational experiences in large groups [48].

The advantage that Mentimeter has of providing anonymity enables students to overcome challenges associated with large class sizes. The anonymity feature addresses issues of student engagement, particularly when students may lack confidence in voicing their opinions due to the size of the group [33], removing the fear of judgment and promoting a safe environment. Mentimeter allows students to actively participate without reservation, leading to increased engagement and improved learning outcomes [33]. Integrating Mentimeter into large lectures has the potential to enhance the effectiveness of SRS, further benefiting student learning experiences [44].

Overall, the use of Mentimeter in large classrooms has been found to be an effective tool for addressing the common challenges associated with teaching and learning in large groups. Its versatility, ease of access, and promotion of active participation and enjoyment contribute to increased student engagement and improved learning outcomes.

3.9. Gamification-based teaching

Gamification-based teaching has gained popularity, especially during the COVID-19 pandemic, as educators sought innovative ways to engage students in online learning environments [49, 50]. The study by Megasari et al. [51] explored the use of Mentimeter as a learning application aimed at maintaining satisfaction and improving learning service innovation for the millennial generation. The findings indicated that Mentimeter provided a platform for real-time monitoring of student responses, allowing instructors to assess students' understanding more easily. The interactive nature of the application, including the ability to display students' answers on a scoreboard, increased students' enthusiasm and engagement during exams.

Building on this, another study by Handoko et al. [52] discovered that using Mentimeter as an educational tool, with an emphasis on cooperation among students, had a more significant impact on student learning and motivation in a gamified environment compared to the competition-based Kahoot educational tool. The study suggests that designing gamified learning environments with leaderboards based on cooperation rather than competition could be more effective in promoting positive learning outcomes. These findings further support the notion that incorporating gamification-based teaching methodologies, such as Mentimeter, can complement traditional teaching methods and contribute to a more engaging and effective learning experience [42].

Studies by Burlacu et al. [49] and Rahmahani [53] have shown that gamification strategies, including the use of apps such as Mentimeter, can improve student motivation, participation, and perceived learning outcomes. However, some research suggests that while students generally find gamified activities engaging and fun, there is limited evidence of superior learning outcomes compared to traditional teaching methods [54]. Despite this, the integration of gamification in Mentimeter into teaching practices has been well-received by students and can potentially transform classroom dynamics, particularly in higher education settings [40, 48].

3.10. Mentimeter as an assessment tool

The use of quizzes as a method for conducting exams has emerged as a shift away from traditional testing methods. According to a few studies by Puspa and Imamyartha [41] and Handoko et al. [52], students display enthusiasm for quizzes due to the attractive and interactive design of quiz applications, which encourages active participation. This shift toward quizzes is partly attributed to the increasing availability of smartphones and interactive software that facilitate learning and offer a novel approach to teaching and assessment [26]. These technological advancements have made formative assessments more engaging, efficient, and effective. The use of such applications helps increase student participation during formative assessments and allows them to submit responses anonymously, reducing anxiety associated with the fear of making mistakes [4].

Furthermore, technology-integrated learning tools, such as Mentimeter, enhance the interactive and enjoyable nature of formative assessments [48]. Mentimeter enables the storage and analysis of assessment data, facilitating course design and management. Students appreciate the pedagogical benefits of using Mentimeter, as it promotes active engagement and provides a platform for teachers to assess understanding. Teachers can also use Mentimeter to assess student comprehension and refine their teaching methods. These findings highlight the transformative potential of technology in reshaping assessment practices and enhancing both teaching and learning processes [33].

3.11. Limitations of Mentimeter

While Mentimeter offers numerous benefits, it also presents certain limitations. One of the primary weaknesses of Mentimeter is its dependence on internet connectivity [4]. A reliable internet connection is essential for both teachers and students to effectively use this application [42, 55]. Additionally, the platform requires educators to invest time in preparing content, formulating questions, and ensuring their suitability for students. Moreover, unfamiliarity with the platform can create difficulties for students, necessitating an introductory period for familiarization with its features [26].

Another limitation identified is that using Mentimeter may restrict students' opportunities to share their responses verbally,

which could affect class participation and hinder meaningful discussions [40]. Additionally, a limitation specific to Mentimeter is the inability of students to amend their answers once they have been submitted [47]. Overreliance on Mentimeter can also lead to reduced enjoyment among students [56]. These findings indicate that while Mentimeter offers a user-friendly interface, it also presents challenges that need to be addressed.

In terms of functionality, it has been noted that the responses collected through Mentimeter are not mapped to individual students, making it difficult to track progress and provide personalized feedback [34]. Technological issues, such as internet failures or equipment malfunctions, can disrupt classroom activities and hinder the integration of Mentimeter into teaching and learning processes [44]. Finally, the cost of utilizing Mentimeter is a significant limitation [5]. In addition, one of the studies by Pichardo et al. [3] points out that the primary challenge in implementing Mentimeter is the expense associated with accessing its full range of features. Where educational institutions do not provide adequate support, both students and early career educators may face difficulties in fully Mentimeter due to cost-related barriers [5].

4. Conclusion

This review has aimed to examine the published research on the use of Mentimeter in education and provide insights into its effectiveness as a teaching and learning tool. Through a detailed analysis of the existing literature, several key findings have emerged.

The use of Mentimeter has shown the potential to enhance student engagement in both traditional and online learning environments. Mentimeter encourages active student participation by incorporating interactive elements such as quizzes, polls, and discussions, leading to increased motivation and interest in the subject matter. It also adds an element of enjoyment to the learning process while providing anonymity to students who may be hesitant to voice their opinions. Mentimeter has proven to be a valuable tool for promoting active learning and facilitating formative assessment. The immediate feedback offered through Mentimeter allows teachers to gauge student understanding, identify misconceptions, and tailor their instruction accordingly. Its versatility allows for application across various educational contexts, including traditional classrooms, online learning, large lectures, and hybrid models. This adaptability makes Mentimeter an effective resource for educators seeking to engage students and improve their learning experiences, regardless of the learning modality.

However, Mentimeter, as an online learning platform, presents several limitations and challenges. It relies heavily on internet connectivity and requires significant time investment from educators to prepare content. Students unfamiliar with the platform may face difficulties, and the use of technology can restrict verbal participation and limit the ability to amend answers. Additionally, challenges related to tracking individual progress, potential technological failings, and cost-related obstacles to full utilization have been noted.

4.1. Further directions for research

Future research should prioritize longitudinal studies to investigate the long-term impact of Mentimeter on student learning outcomes, academic achievement, and retention rates. Such studies should track the same group of students over an extended period to provide insights into the sustained effects of Mentimeter on student performance. Researchers can gain a deeper understanding of the tool's long-term efficacy by examining trends over time.

It is essential to explore the effectiveness of Mentimeter across different academic disciplines. Future research should examine how the use of Mentimeter varies across subjects such as mathematics, science, language arts, and social sciences. Researchers can identify the subject-specific strengths and limitations of the tool by assessing the differential effects of Mentimeter on learning outcomes in various disciplines.

Additionally, with the increasing prevalence of remote and blended learning, it is important to investigate strategies for effectively integrating Mentimeter into these learning modalities. Future studies should focus on the use of Mentimeter in hybrid and online classrooms, exploring the challenges and opportunities it presents and identifying effective instructional strategies that maximize its benefits in digital learning environments.

Another important area of inquiry is the impact of incorporating Mentimeter into professional development teaching programs. Research should investigate how training and support programs focused on Mentimeter can enhance educators' pedagogical skills and instructional practices. Understanding how Mentimeter can enhance student engagement and learning outcomes through its effective and creative use, as well as its implementation in various classroom settings, is essential for maximizing the tool's potential.

Furthermore, it is essential to explore students' perceptions and experiences of using Mentimeter in their learning. Investigating how students perceive the tool's impact on their engagement, motivation, and understanding of the subject matter can provide beneficial feedback for refining Mentimeter. Additionally, examining variations in student experiences based on age, level of study, and cultural background will help identify contextual factors that influence the tool's effectiveness and usage.

Future reviews could focus on a comparative analysis of SRS in education, including Mentimeter and other similar tools. Such a review would compare features, usability, effectiveness, and impact on student engagement, learning outcomes, and teaching practices. A comparative analysis would provide constructive insights for educators and policymakers in selecting the most appropriate student response system for their specific educational contexts.

Recommendations

Educators should be encouraged and supported in integrating SRS, such as Mentimeter, across different disciplines and learning environments. To enhance student engagement and promote active learning, Mentimeter should be incorporated regularly into classroom instruction. This can be achieved by providing resources, professional development opportunities, and technical support to ensure teachers can effectively use SRS in their teaching practices.

Raising a culture of innovation and experimentation with technology in education is also vital. Teachers should be motivated to explore creative ways of using Mentimeter to enhance student engagement and learning outcomes. Encouraging teachers to think creatively will help to fully realize Mentimeter's potential as an educational technology tool. Furthermore, it is important to establish protocols and guidelines for the ethical use of Mentimeter. Clear guidelines will ensure educators and students can confidently use Mentimeter while upholding ethical standards and safeguarding student information.

Recognizing the value of Mentimeter as an educational technology tool and supporting its adoption in educational settings is necessary. Allocating resources for training, infrastructure, and research will promote its effective use, enabling widespread implementation and maximizing its impact on student learning. However, it has been suggested that the success of Mentimeter largely depends

on the creativity of educators [48]. This implies that educators must be resourceful and innovative in utilizing Mentimeter effectively. Additionally, teachers' openness to new approaches and technologies is essential for successfully integrating Mentimeter into their teaching practices.

Conflicts of Interest

The author declares that he has no conflicts of interest to this work.

Data Availability Statement

Data sharing is not applicable to this article as no new data were created or analyzed in this study.

Author Contribution Statement

Muzammal Khan: Conceptualization, Methodology, Software, Validation, Formal analysis, Investigation, Resources, Data curation, Writing – original draft, Writing – review & editing, Visualization, Supervision, Project administration.

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