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Integration of Mentimeter into the Classroom: A Scoping Review

Fatemeh Ranjbaran Madiseh (fatemeh.ranjbaran@nct.edu.om)
University of Technology and Applied Sciences - Nizwa https://orcid.org/0000-0001-9326-4475

Abdullah Al Abri
University of Technology and Applied Sciences - Nizwa

Hadi Sobhanifar
University of Technology and Applied Sciences

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Abstract

The rapid development in technology and information has inspired educators to explore innovative technological resources and assets to promote the quality of teaching and learning. Student Response Systems (SRS) have been acknowledged as having a significant influence on student engagement, motivation, and overall achievement. This scoping review investigated the integration of *Mentimeter* in the educational context to determine its effectiveness for both teaching and learning processes. The included studies were screened for only those that investigated the use of *Mentimeter* in the classroom, while including peer-reviewed journal articles, conference proceedings, short articles, book chapters, and review articles from 2015 to 2022 that were available in English without limitation on discipline. The 57 publications that met the eligibility criteria were coded for various characteristics, the most significant of which are discipline, geographical region, publication type, research method and outcomes. Our results reveal the numerous merits gained from integrating *Mentimeter* in educational settings, including: 1) benefits not only to enriching student-centered pedagogy, but also encapsulating a diverse audience of cultural backgrounds and competencies; 2) providing immediate feedback for anonymous student responses; 3) enhancing student motivation; 4) engaging students' active participation. The results of this study provide initiatives for teachers and educational researchers to conduct further research on various educational technology platforms, and highlight the advantages of integrating technology into the educational setting. While teachers and practitioners persevere to transform the learning experience through technology, we emphasize the necessity for continuous research to investigate different learning platforms that considerably improve learning outcomes.

Introduction

A growing body of research has emphasized that the conversion of teaching methods, from purely passive to more lively learner-centered, yields an abundance of satisfaction and engagement among students (Mayhew, 2020). Students are expected to capitalize on such an engaging learning environment to share their ideas, collaborate with others, solve problems creatively, and more importantly, reflect on the learning experience that takes place. Yet, the current generation of students is more likely willing to be engaged in learning settings that are built on a diversity of ICT tools. One pattern to introduce technology into learning is through the adoption of student response systems (SRS) like Kahoot, Vevox, Crowdpurr, and Mentimeter. These platforms generate a more driving discussion empowering students with concerted attention on understanding rather than memory, and reasoning rather than answering (Beatty, 2005).

Mentimeter is a cloud-based interaction tool that can be employed to engage a large number of participants. It is available on web browsers and can be freely installed on mobile devices. Teachers can register at *https://www.mentimeter.com* and use various features that the platform offers like making an 'interactive presentation'. This platform is mainly used in higher education to convey the lecturing of the theoretical sessions in courses to more engaging and interactive discussions (Quiroz Canlas et al., 2020). The basic drive that stirs lecturers to implement this technology is to diminish the boring one-way

communication implanted in the traditional lecturing where lecturers speak only and students remain passive. Thus, Mentimeter helps students to maintain concentration by enhancing participation in the learning process (Mayhew, 2019). For example, students can use their mobile phones to answer digital questions and no doubt this leads to a more inclusive learning environment.

One vital feature of Mentimeter is keeping anonymity. Lecturers can anonymously display students' answers or responses to the class, thereby building a friendly and collaborative environment (Gokbulut, 2020). In addition, teachers who use Mentimeter in their teaching can get an instant assessment of the students' understanding and progress, and therefore provide their feedback to the students accordingly. Students also get a safe status to raise concerns and make suggestions. Thus, teachers can seek feedback from students for the purpose of modifying the instructions and improving the teaching quality (Elliott, 2003). In this study, we reviewed a considerable amount of research conducted on the use of Mentimeter to determine the exact effectiveness of Mentimeter as a Student Response System (SRS) for both the learning and teaching processes.

Purpose and Research Questions

With the transition to online teaching with the start of COVID-19, teachers and educators have come across a number of obstacles that hinder the teaching and learning process. One of the major challenges faced with in virtual classes is the concept of student interaction and engagement. With this in mind, the researchers felt the need to investigate what digital tools can best be integrated in the classroom in order to overcome these challenges. Therefore, this study has attempted to conduct an in depth research on the use of Mentimeter to facilitate teaching and learning in the classroom. We are specifically interested in the points that overlap in the use of this Student Response System (SRS) in enhancing interaction in the classroom. The rationale behind this examination is two-fold. First of all, technology enhanced teaching and learning has been identified as having a significant impact on student engagement (Graham et al., 2007), motivation (Dunn & Kennedy, 2019), and overall achievement (Daniella et al., 2018; Balacheff et al., 2009; Mohmmed et al., 2020). Second, following the growing shift to virtual teaching and learning worldwide, it has been deemed necessary to implement new technological tools to facilitate the process of teaching, whether it be to enhance student engagement, motivation, or learning skills (Mayhew, 2019; Kuritza et al., 2020; Pichardo et al., 2021; Skoyles & Bloxsidge, 2017; Wood, 2020; Vallely & Gibson, 2018; Mayhew et al., 2020; Wong & Yunus, 2020; Muñiz-Rodríguez et al., 2020; Lin & Lin, 2020).

The converging point of technology enhanced learning and innovative tools being used in the classroom today brings us to this area of inquiry. Mentimeter, a tool that has been extensively used in the educational context of the 21st century classroom, requires careful investigation.

Therefore, the present scoping review aims to investigate: (1) study design; (2) methodology; (3) learning outcomes; and (4) learning factors influenced by the use of this educational technology. With this purpose in mind, this scoping review is guided by the following research questions:

1. What were the substantive features of the included studies, such as discipline, type of publication, and region of the world the study was conducted?
2. What were the methodological features of the included studies, such as the research methods employed and data collection approaches?
3. What is the impact of Mentimeter on learners' learning outcomes?
4. How does Mentimeter help the teacher in the process of teaching?
5. What learning factors are being influenced by integration of Mentimeter in the classroom?

Research Design

This study uses a scoping review method to explore the existing research on the use of the Student Response System, Mentimeter, in the classroom. Compared to a systematic review, in which the objective is to evaluate findings across studies, the purpose of the scoping review is to summarize the studies that have been conducted, with specific focus on the range of content identified in order to report a certain issue or recommendation. This scoping review follows the six-stage methodological framework developed by Arksey and O'Malley (2005). The key concept behind the scoping review framework is replication of the search strategy and enhancing reliability of the study findings (Pham et al., 2014). The framework includes the following stages: 1) identifying the research question; 2) identifying relevant studies; 3) reviewing and selecting studies for relevance; 4) charting the data; 5) collating, summarizing and reporting the results; and 6) consulting with stakeholders to validate study findings for quality assurance.

Sampling and Relevance Criteria

We sampled articles by searching the *Web of Science (WoS), JSTOR,* and *ERIC (EBSCO)*. Considering that the use of Mentimeter has recently gained insight, and in order to expand our scope to all cases of its use in the context of education, we extended our search to include review articles, book chapters, short articles, and conference proceedings in addition to peer-reviewed journal articles. Since educational technology has a very wide scope, in order to limit our search to only Mentimeter, we only included the keywords *Mentimeter*, *teaching*, and *learning*. The Boolean operator AND was used to combine the search terms for each of the three main keywords. The search was modified for each database, and encompassed a period from 2015 to 2022, because Mentimeter was founded in 2014 and studies on its application began to emerge the following years, with over 90% of the studies carried out between 2020-2021. After the initial electronic search phase, searches were conducted using the Google Scholar search engine, and a snowball method was undertaken by inspecting the reference lists of the included articles.

Inclusion and Exclusion Criteria

The included studies met the following three criteria:

1. The included studies examined the use of Mentimeter by teachers in the classroom. Articles were excluded if they were about the use of any other digital tools other than Mentimeter.
2. The included studies were peer-reviewed journal articles, conference proceedings, short articles, book chapters, and review articles from 2015 to 2022 and were available in English. Articles published in languages other than English were excluded from the study.
3. Included studies were those which reported both empirical and non-empirical research on the effect of using Mentimeter in the classroom, and were not limited to any specific discipline.

Data Collection and Analysis

The search process, screening and final eligible articles in this scoping review are presented in Figure 1. After elimination of duplicate articles, the database searches retrieved 290 articles. First, two researchers screened the articles based on title and abstract considering the inclusion criteria. In this phase, 133 articles were eliminated as irrelevant. Second, the researchers screened the full text of the remaining 195 articles to identify whether they met the inclusion criteria. After the full text screening, 57 articles met the inclusion criteria and were included in the study. Figure (1) shows the flowchart of the article selection process.

Coding Scheme

After the search process was complete, we designed a detailed coding template to organize the articles and facilitate information retrieval. The coding template, developed in Microsoft Excel, encompassed substantive and methodological features. The following dimensions from each study were included in the spreadsheet: 1) authors' names, 2) year of publication, 3) country of publication, 4) type of publication (research article, review, conference proceeding, thesis, book chapter), 5) discipline, 6) education level (elementary, secondary, or higher education), 7) sample size (number of participants), 8) study design (qualitative, quantitative, case study, mixed methods design), 9) data collection tools (survey, interview, observation, think-aloud), and 10) outcomes of the study.

Frequency distributions were created for the items. Then each thematic category was closely evaluated considering the article content and major areas addressed were summarized. The data set was examined using a content analysis approach. Specifically, descriptive statistical analyses were conducted to answer the research questions stated previously.

Findings

Since Mentimeter was founded by a Swedish company in Stockholm in 2014, it has gained over 400 million users worldwide. Applications of Mentimeter are not limited to the educational context, but also extend to business, medical sciences and entrepreneurship. The objective of this study, however, was to focus on research conducted in the educational context, specifically to pinpoint the effects of Mentimeter on teaching and learning. Research on the use of educational technology has risen sharply over the past 2 years, and the use of Mentimeter is not an exception. Each year has yielded an increasing number of

publications, which mirrors the way Mentimeter application in the classroom has grown since its development. Our search yielded a total of 290 articles through the beginning of 2022, with an overall 57 articles in English and directly related to Mentimeter use in the classroom.

Disciplines

The main disciplinary categories that appeared in the overall search are classified in Table 1. It was found that the majority of studies conducted on using Mentimeter in the classroom were in the ELT context (18 studies/32.5%). This discipline was followed by the Sciences at 19.6% (11 studies), Mathematics, Political Sciences, and Education at 7% (4 studies each), Engineering, and Language & Literature at 5.3% (3 studies each), IT, Management and Multidisciplinary studies at 3.6% (2 studies each), and Geography, Sociology, Industrial and Computer Sciences at 1.8% (one study each).

Table 1
Categorization based on discipline

	Discipline	Number	Percentage
1	**English Language Teaching**	18	32.5%
2	**Sciences** (Physiology/Dentistry/Health & Social Care/Public Health/ Life Sciences)	10	19.6%
3	**Mathematics**	4	7%
4	**Political Sciences**	4	7%
5	**Education**	4	7%
6	**Engineering**	3	5.3%
7	**Language & Literature**	3	5.3%
8	**Information Technology**	2	3.6%
9	**Multidisciplinary**	2	3.6%
10	**Management**	2	3.6%
11	**Geography**	1	1.8%
12	**Sociology**	1	1.8%
13	**Industrial Science**	1	1.8%
14	**Computer Science**	1	1.8%

Geographical Region

Articles were also coded by region, reflecting the locale of the study context and participants. The majority of the relevant articles were situated in Europe at 35.7% (20 articles) (including countries such as the UK (13), Germany (2), Spain (2), Norway (1), Sweden (1), and Ukraine (1). This was followed by Asia with 33.9% (19 articles) (including Indonesia (19), China (2), Hong Kong (1), Malaysia (1), and South Korea (1). The Middle East had 8 articles with 14% of the retrieved articles and North America had seven articles with a total of 12.5%. Studies done in the Middle East were mainly from Turkey (2), Iran (1), Cyprus (1), and Oman (4). North American articles included six from the US. Two articles were reported from Australia, and one from Brazil, bringing South America a share of 1.8% among the retrieved articles. It is important to note that the relative dearth of articles found in certain countries, and generally in comparison to the population, does not mean that Mentimeter is not being used and researched in these regions, but rather that the findings are not being published in journals and conference proceedings. As an example, we can refer to its use in the higher education context of the Netherlands (Academic Skills Training Course conducted in the University of Wageningen, the Netherlands, January 2021); however, the research findings here do not confirm this claim because the results of such applications have not been published. It is quite probable that more research focused on Mentimeter use in education has been published nationally and regionally, in the language of the target users and school contexts, where it may have the greatest relevance and impact on practice.

Publication Type

Among the articles studied, the majority of studies (54.4%) were empirical research articles (31 articles), while 16 were conference proceedings, six were review articles, two were book chapters, and two were theses, respectively.

Research Methods

Overall, the majority of studies employed a qualitative research design at 35.1% (n=20). 22.8% (n=13) of the studies were quantitative, and 21.1% (n=12) incorporated a mixed method design. Among the 57 studies, 12 (21.1%) were non-empirical studies, including review articles, conference proceedings, and book chapters (Fig. 4). As part of our analysis, we also identified the type of data collection types used within each research method for the 57 included studies (Fig. 5). Having a higher number of qualitative studies was the norm for evaluating technology integration, with a greater focus on teachers and students' perspectives on the use of new technology in the classroom (Brinkmann et al., 2014; Lune & Berg, 2017). However, it is suggested that triangulation of data should be considered for more reliable outcomes (Flick, 2018), and is at an average rate among these studies, as seen in Fig. 5.

Discussion

The growth of research in educational technology over the past decade is not surprising, and the use of SRSs have been gaining more interest in the educational domain. The researchers have attempted to pinpoint the numerous merits of using this platform in both online and f2f classrooms, and to investigate

how Mentimeter can help teachers and students overcome the current barriers in the teaching and learning process.

A number of studies have evaluated the use of Mentimeter to assess the perception, development and future possibilities of online collaboration and awareness – raising the topic of sustainability in a digital learning environment, and hence resulting in a feeling of community, through interaction (Westerman et al., 2021; Blyznyuk et al., 2021; Lima et al., 2020; Santos et al., 2019; Lilleker & Thompson, 2019). One of the major benefits of this platform is obtaining student responses and increasing participation. Many students refrain from answering in class because they are shy or afraid of giving the wrong answer. Mentimeter allows for anonymous responses, hence increasing student participation. In several studies, (Musliha & Purnawarman, 2020; Little, 2016; Langley et al., 2021), results showed that the use of Mentimeter in eliciting the students' responses in formative assessment helped to overcome the students' fear of giving responses.

Mentimeter allows instructors to adopt an active, student-centered pedagogy and, in doing so, has the potential to increase attention, engagement, motivation, peer learning and attainment within the discipline (Mayhew, 2019; Skoyles & Bloxsidge, 2017; Chinaza, 2020; Annie Prud'homme-Généreux, 2016; Hill, 2020). This is while Mentimeter is also a useful tool for real-time formative assessment and exam preparation in clarifying difficult concepts (Dong, 2021; Kuritza et al., 2020; Puspa & Imamyartha, 2019). In a study by Ahmad (2020) more than 80% of students found the active learning sessions met their expectations or far exceeded their expectations.

Pichardo et al. (2021) conducted a very comprehensive study in which they evaluated the effectiveness of mentimeter from both the teachers and students perspectives. Twelve teachers were invited to a focus group with the objective of evaluating their experience and describing the potential of Mentimeter for teaching and learning, the strategies they developed, the difficulties they encountered and how they had overcome them, together with tentative suggestions to optimize its use during online and face-to-face classes. Educators completed a survey to explore the teachers' high levels of engagement in the project and their satisfaction with Mentimeter after their experience. Then a survey was given to the students to extract their impressions of using Mentimeter in class. Students and educators both highlighted the inclusive potential of Mentimeter, as it allows participation from a diverse audience with different backgrounds and capacities, ensuring inclusive and equitable education for all.

In another study done in a South Korean school, the researchers evaluated the results from both students and teachers perspectives. From the students' perspective, Mentimeter helped students become more focused, it was fun to be able to do activities with friends, even during virtual classes, students felt like they were taking classes together, and it was good to see the results of the learning activities. From the teachers' perspective, it was possible to express each other's thoughts and opinions in a video class where a large number of people participated, it was possible to check each others' learning outcomes and to send and receive feedback. Since the real-time interaction was visually displayed, the student's learning

deviation was less, it was possible to develop the same class as offline even in a physically separated online learning environment (Shin & Eom, 2020).

The utilization of an ARS, specifically Mentimeter, was overall well-received by medical students. Mentimeter could be a beneficial tool for educators to use, especially when preparing for exams or assessing students' understanding of challenging concepts. The students commented on the value of these tools appreciating the Mentimeter quizzes that provided instant real time feedback on their knowledge retention and potential areas to review before exams (Kuritza et al., 2020). Similar results were obtained regarding the positive impact on students' attitude and performance, while providing real-time feedback to students in other disciplines (Mohin et al. 2020; Blyznyuk et al., 2021; Dong et al., 2018; Aryal, 2021; Patterson et al., 2020; Mara et al., 2021).

Mayhew et al. (2020) reported the student satisfaction of Mentimeter, as it increases student enjoyment, enhances the student voice, and can help to improve student learning. Benefits and challenges surrounding the staff experience include:

- The 'inclusive potential' of Mentimeter, 'giving a voice' to students who are less likely to participate due to the influence of culture, gender, disability and other factors.
- Improved attendance
- Disciplinary variance
- Optimized class management.
- Timely feedback
- Staff also identified the potential of adopting a more agile approach to teaching and, where time allows, session content.

Sari (2021) also evaluated Indonesian students' perspective of using Mentimeter through an open-ended survey. Students' positive perception towards Mentimeter included it being amusing and fun, its anonymity, attractiveness (with regard to presentation and various types of activities), practicality (paperless, simple method, class is not noisy), and freedom (not having to speak in public). Students' negative perception of Mentimeter included Internet connection problems and that it is not accessible in all smartphones. The study showed that Mentimeter significantly impacts the students' engagement in English learning.

Wood (2020) studied student and staff reactions and perceptions of Mentimeter use in large lectures. Students said that Mentimeter allowed them to gauge their understanding of the material, made class more interactive and exciting, allowed them to compare their understanding of the material with their classmates, and overall made them feel more involved in their own learning. Meanwhile, lecturers found Mentimeter useful for teaching although they warned against doing it without a clear plan. They also mentioned the need to learn how to use SRS as well as how to integrate it into existing lecture material.

Razzaqul Ahshan (2021) used Mentimeter frequently to assess the students' understanding of the previously discussed materials or any new materials being delivered in the lesson. They proposed a framework that provides student–student, student–instructor interactions and ensures social presence during the remote/online sessions due to the active learning activities implemented by this tool. Synchronous teaching pedagogy adopted in the proposed framework was practical in active student engagement, aligning with the lesson outcomes.

Vallely and Gibson (2018) propose training more students to use this technology in their group presentations; in fact, some of the teacher-training students have been inspired enough by Mentimeter that they have gone on to use it in school. This study discusses, with reference to recent literature, the advantages and disadvantages of Mentimeter as a form of student engagement; it shares three key multi-disciplinary strategies that can be supported by Mentimeter to engage students: 'gauging opinion', 'engaging discussion' and 'voicing concerns'. The authors offer their ideas for future plans for the tool, with the hope of inspiring other colleagues in higher education to trial Mentimeter or integrate it further into lectures and seminars to promote student engagement and enhance the teaching and learning experience.

Gokbulut (2020) did an experimental study with teachers to assess whether Mentimeter-based instruction had an effect on the attitudes of prospective classroom teachers for e-learning and found that there was a large effect size on e-learning as a result of Mentimeter-supported education. In a study by Sari et al. (2020) the most remarkable usage of online applications such as Mentimeter was for real-time exercise in the classroom. They also took benefits from those applications that were for establishing communication, encouraging students' self-study, improving the assessment, motivating the students and improving the teaching instructions.

Rudolph (2018) review the use of Mentimeter as a Student Response System and highlight seven main features: 1) Mentimeter offers six different types of questions, 2) data can be collected anonymously, 3) Data can be stored for analysis, comparative purposes and educational research, 4) improved attentiveness of students, 5) increased knowledge retention, 6) anonymity, 7) it is freemium (i.e. free and premium versions are available).

Pratama (2021) came to the conclusion that students prefer Mentimeter to Google Form in teaching listening for specific purposes, because it makes the lecture more interactive and inclusive, while Prasad (2020) found that integrating Mentimeter increases student outcome and satisfaction and helps to 'bridge the gap' between generations.

Law and Masterton (2021) pinpoint some of the benefits of Mentimeter use in a school of veterinary medicine. It is useful as it allows students to receive focused peer feedback and relevant response statistics, achieve high levels of student interaction and generate stimulating clinical discussions amongst staff and students. In addition, students have gone on to use their Mentimeter data as evidence in their professional portfolios, and found that using Mentimeter also cuts down on administrative demands for staff on the rotation.

Crump and Sparks (2018) found that mentimeter positively improves the level of attention and participation in the classroom environment, supports quality learning through encouraging interaction and discussion from even the most introverted students, and gives useful feedback to both the instructor and students. Students do not have to reveal their votes publicly, so the feedback is assumed to be more honest than a paper vote or show of hands. Students also value real-time feedback given immediately after presentations are delivered.

Canlas et al. (2020) evaluated the effectiveness of the Mentimeter App integration model to computer science lecture classes. They highlight the many positive outcomes of Mentimeter as follows: 1) ease of use of the application; 2) level of participation in the class; 3) ability to express oneself without being afraid of embarrassment; 4) motivation; 5) recalling past topics; 6) preparation for the next sessions; 7) retention of salient points of the discussion; 8) class engagement and coping with boredom; 9) obtaining immediate feedback on learning; and 10) recommendation to integrate Mentimeter with other teaching content.

Coyle's (2021) study showed the innovative blending of technology - Mentimeter, Powerpoint, and videos - with panel-style, tutor-led discussions, to be effective in integrating well being into the teaching and learning of law. In another instance, Göthberg and Nilsson (2021) conducted a study to deliver guidelines for the design of inspirational user experience for Mentimeter and drew on the benefits as increasing user satisfaction and level of inspiration.

A number of experimental studies have shown students improvement in communication abilities and overall achievement when comparing pre-test and post-test scores after integrating Mentimeter in the teaching process (Sirajudin & Hasan, 2021; Ranjbaran et al., (in press); Wong & Yunus, 2020; Kemberley et al., 2020).

Mohammadi et al. (2021) evaluated the application of the Mentimeter educational tool based on cooperation element, compared to Kahoot educational tool based on competition element, and found that Mentimeter has a more significant effect on student's learning and approach on motivation in the gamified environment, indicating that gamified environments based on cooperation are better than the competition-based milieu.

Moorhouse and Kohnke (2020) also found that there are several pedagogical benefits of using Mentimeter in the EAP/ESP classroom, including increasing interaction and engagement, soliciting opinions, and formatively evaluating student understanding. Andriani et al. (2019) observed that it is necessary to develop learning media based on blended learning to improve students' creative thinking ability by using Mentimeter.

Overall, the results of the studies indicated benefits for both the learners' learning outcomes and the teachers' teaching process. The two main factors that are repeatedly observed in all studies is that Mentimeter enhances student interaction, engagement and motivation in the classroom, while creating a better learning experience. From the teachers' perspective, Mentimeter provides a more dynamic approach

to teaching, by providing real-time feedback and increasing emphasis on teacher-student and peer-peer dialogue inline with dialogic teaching approaches.

Conclusion

This scoping review shows that the application of SRS is gaining rapid interest in the field of ELT and education. The main purpose of the study was to broadly investigate how Mentimeter, a cloud-based interface, has improved teaching and learning in different educational contexts across the globe, and specifically identify the methodological features and learning outcomes of using this educational technology in these domains. We investigated these domains to contribute to our understanding of how Mentimer has recently been applied within educational technology environments and bring attention to the significance of designing courses that are technology enhanced.

It was observed that using Mentimeter in the educational context has many advantages, and both students and teachers can benefit from the learning experiences created by such an interactive tool. Its merits expand from adoption of an active student-centered pedagogy, allowing participation from a diverse audience with different backgrounds and capacities, anonymous elicitation of student responses, engaging students' active participation in an otherwise tedious, lecture-based virtual classroom, enhancing student motivation, and providing immediate feedback of the learning outcomes. Teachers and practitioners can consider the outcomes of Mentimeter enhanced lectures when designing courses and revising learning initiatives across their lesson plans.

This study has implications for future initiatives of educational researchers to evaluate the uses of Mentimeter in contexts other than teaching, such as business, medicine, healthcare, commerce, and tourism and address the impact and challenges of using interactive technological tools in different settings. Furthermore, since most studies thus far have implemented a qualitative research design, it is suggested that mixed methods design be implemented when evaluating the use of educational technology, in order to triangulate the data and gain higher validity and reliability of the findings.

Declarations

We declare that all authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Fatemeh Ranjbaran, Abdullah al-Abri, and Hadi Sobhanifar. The first draft of the manuscript was written collaboratively by all authors. The final draft of the manuscript was revised and modified by Fatemeh Ranjbaran and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

Compliance with Ethical Standards

Conflict of interest The authors confirm that they have no conflicts of interest.

Research involving Human Participants and/or Animals This study does not involve human subjects.

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Figures

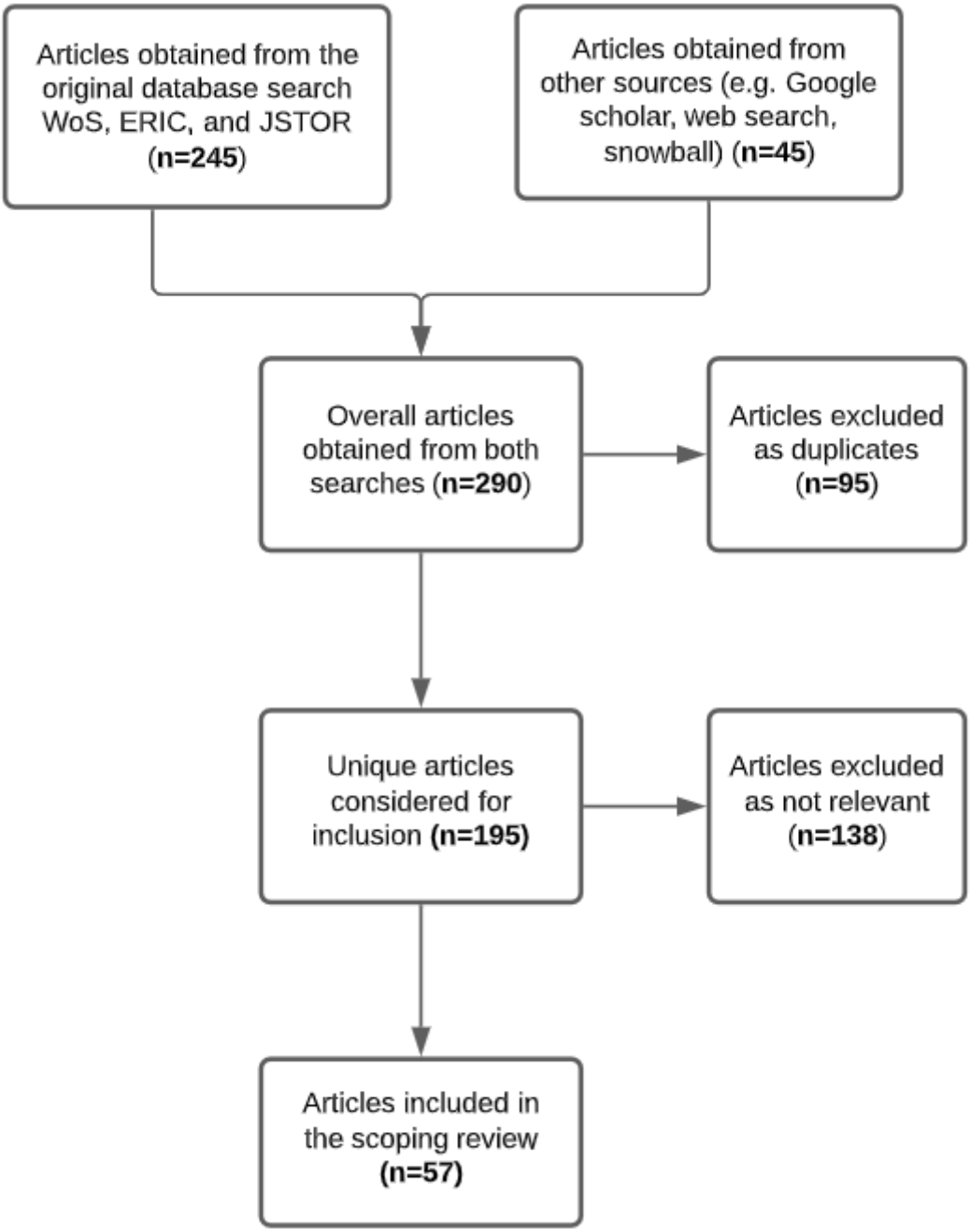

Figure 1

Flow diagram of the article selection process

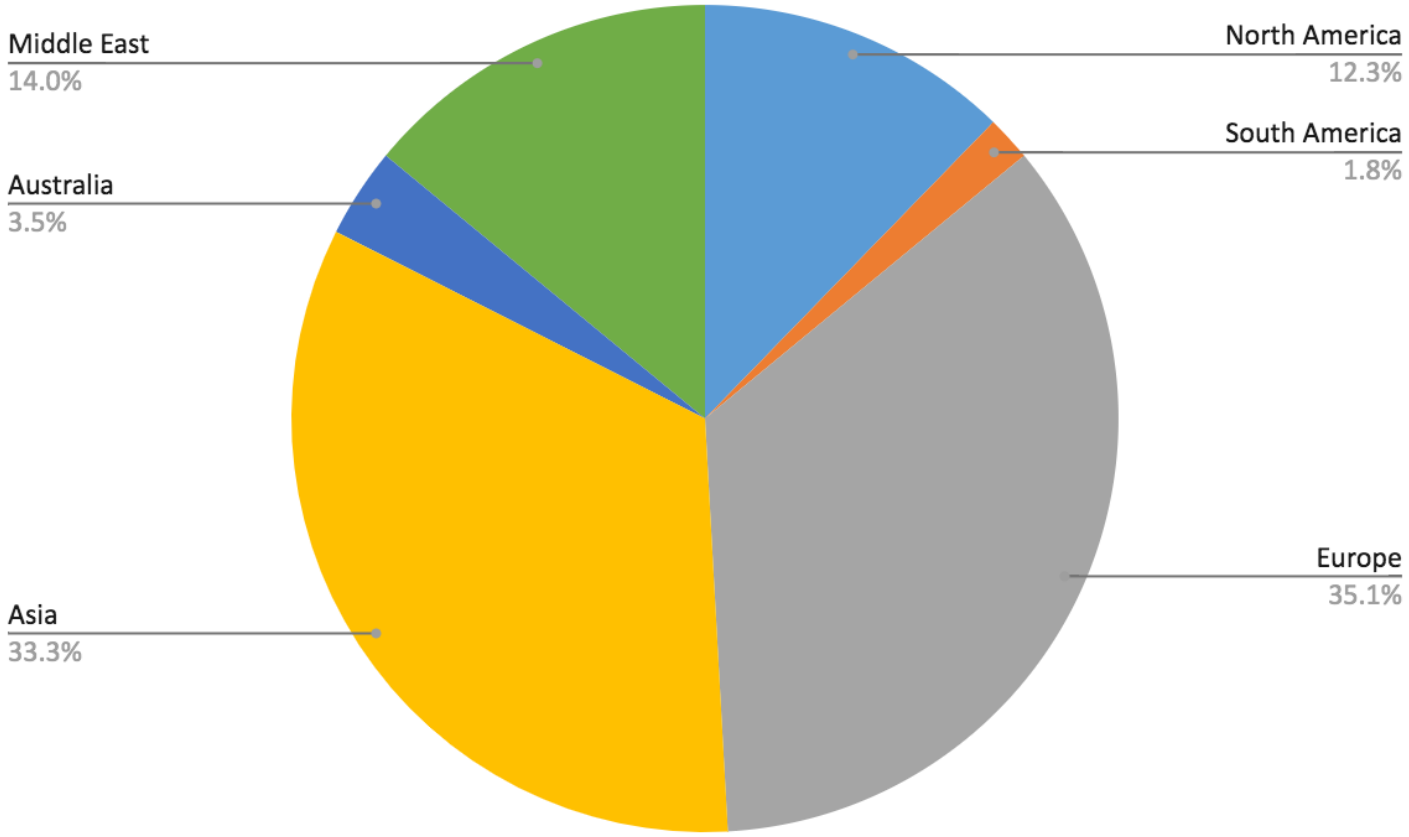

Figure 2

Distribution of articles based on region

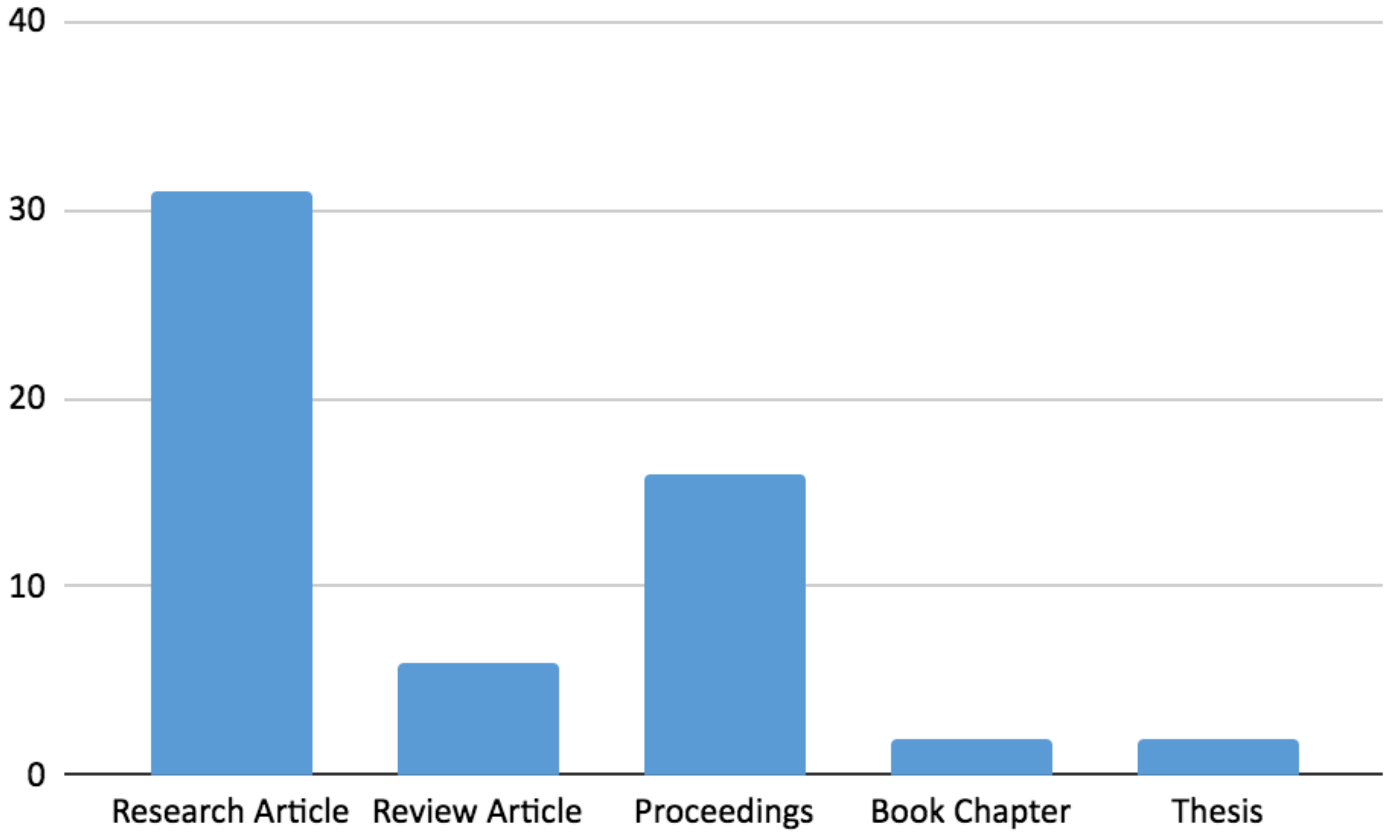

Figure 3

Distribution based on publication type

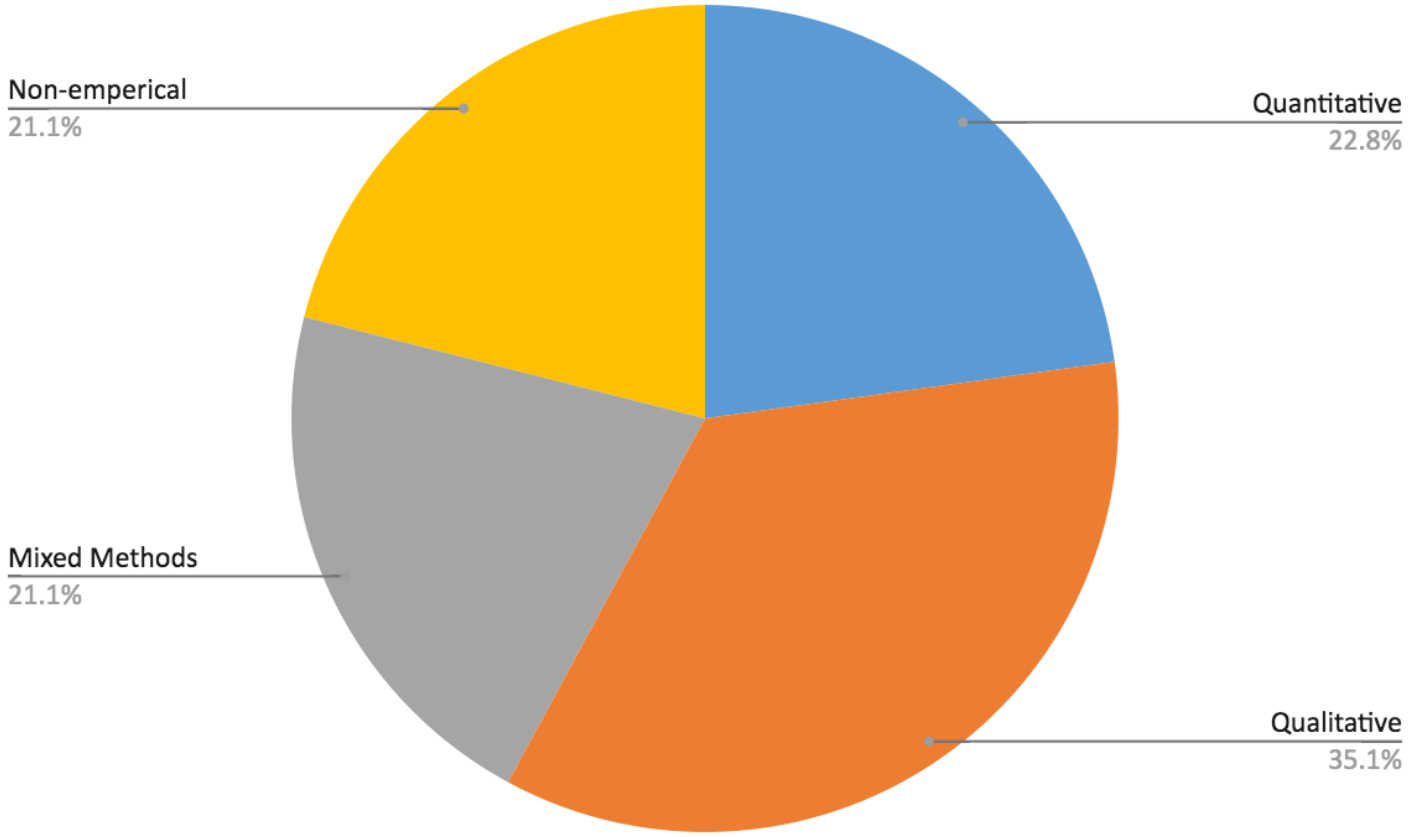

Figure 4

Distribution by study design

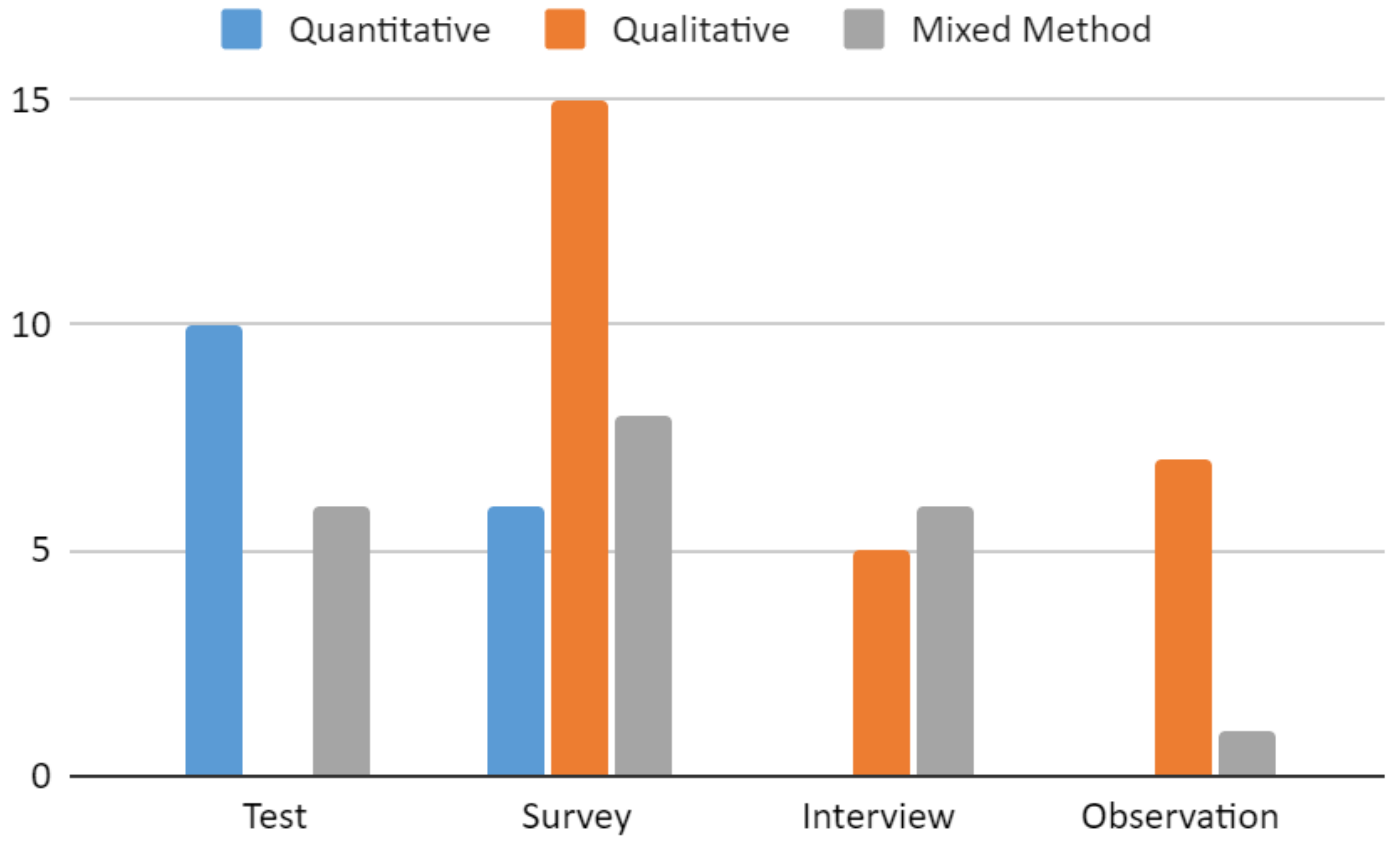

Figure 5

Distribution of research method by data collection type