Implementing Educational Technology in the Classroom to Teach English Skills: A Systematic Literature Review

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Technology is getting more sophisticated in today's globalized world. Technology also provides educational technology tools, including in English teaching and learning. It aims to support and assist teachers and students to obtain a better English teaching and learning experience. This paper focuses on the implementation of educational technologies in English classrooms. The analysis of the included studies shows that: (1) true experiments, quasi-experiments, and causal-comparative research were the research methods used in the studies; (2) 8 types of educational technologies were found to be implemented in the studies; (3) a variety of relationship between educational technology tools and English skills were identified. This paper also shows that there had been little research regarding English skills (listening, reading, grammar, and pronunciation) in the context of educational technology. Finally, this study provides other significant information on limitations and implications followed by a conclusion.

Keywords: educational technology, systematic literature review, English classrooms, teaching English, English skills

INTRODUCTION

Technology changes education and affects both the acquisition of skills that students require to prepare for university and a career, and the integration of digital instructional strategies by teachers (Delgado et al., 2015). Technology and innovations are pervasive in the lives of teachers and students and have been seen to have pedagogical advantages for education (Schmid et al., 2014). Educational technology's role in teaching is of substantial importance due to information and communication technology utilization (Stosic, 2015). Educational technology is also a fundamental aspect of higher education and has a particularly important role in affecting students' engagement (Teng & Wang, 2021).

Digital educational technology involves educational applications (Delgado et al., 2015) and has three functions: 1) technology as a tutor (computers provide instructions and direct users); 2) technology as a teaching tool; 3) technology as a learning tool (Stosic, 2015). In using educational technology, we have to

focus on the educational value of the applications, how sufficient they are for the knowledge acquisition, whether there is an interaction between users and tools, and whether there are positive effects in applying the tools (Stosic, 2015). With educational technology implementation, students can progress independently to master materials, to decide the work pace, to relearn unclear materials, which after examinations conducted quickly obtain the results and trail the progress (Stosic, 2015).

Evidence for the effectiveness of educational technology tools is that online educational technology tools have improved online education, and enhanced and simplified the delivery of online teaching and learning (Mbuva, 2015). According to research, online settings can be really advantageous. Integration of the course platform WebCT, for example, has been found to increase reading engagement and critical thinking skills (Burgess, 2009). Additionally, in a study by Morin, Thomas, and Saadé (2012), students believed that utilizing the Internet aided in the development of critical thinking skills the most. Further, online courses enable students to master their learning, learn at their own pace, and participate in online debates anonymously (Saadé, Morin, & Thomas, 2012). Nevertheless, online education challenges include equity and accessibility to technology by all students, achievement improvement, value and affordability, hidden costs issues, computer literacy, self-discipline requirements, students' suitability for online education, minimum social interaction, sufficient faculty training, and being consistent to be motivated to increase sustainability (Mbuva, 2015).

The role of technology is crucial in English language education because it has facilitated and increased English learning to a substantial level (Alsulami, 2016). The tools that are worth mentioning involve English language learning websites, Computer-Assisted Language Learning programs, presentation software, electronic dictionaries, chatting and email messaging systems, CD-players, and learning video-clips (Nomass, 2013). The utilization of digital libraries, dictionaries, and thesauri has speeded up learning and enhanced students' vocabularies substantially (Alsulami, 2016). Word processing programs have user-friendly and have become essential applications for reading and writing (Alsulami, 2016).

Thus, the objective of this systematic literature review critically presents an overview of research methods used in the studies focusing on the educational technology implementation, types of educational technology tools, and the relationship between the educational technology tools and English skills from published empirical studies from 2015 to 2021 while maintaining the PRISMA model's principles as inclusion and exclusion criteria of the studies. This study could also provide insights for teachers, academics, practitioners, and researchers to enhance students' English skills by providing an overview of the findings of this study for redesigning the implementation of educational tools and conducting more studies on educational technologies for future English classrooms. Hence, the following are the research questions that guided this systematic literature review:

1. What are the research methods used in the studies that focus on the implementation of educational technology tools to teach English?
2. What are the types of educational technology tools used in the studies?
3. What is the relationship between the educational technology tools and English skills that have been investigated?

LITERATURE REVIEW

Educational Technology in the Classroom

Educational technology is a method of using modern technology to enhance the quality of education in a systematic and structured way (efficiency, optimal, true, and others) (Stosic, 2015). Many technology applications are used as effective educational technology tools in schools (Teng & Wang, 2021). Integration of technology tools into the curriculum becomes an inseparable aspect of good teaching (Pierson, 2001). Teachers must expand their knowledge and skills in order to integrate technology into their teaching practice (Almerich et al., 2016); otherwise, they will not be able to integrate it into their daily educational practice (Buabeng-Andoh, 2012; Wastiau et al., 2013; Kabakci Yurdakul & Coklar, 2014). Technology integration in the classroom instruction requires more than just teaching computer skills; it also entails educators looking for innovative ways to increase students' engagement and learning (Solano et al., 2017).

As a result, recent research has sought to better understand the applications used during lectures from the viewpoint of students, such as multimedia, computer-based simulations, animations, and statistical tools (Neumann et al., 2011).

Advantages of implementing educational technology in the classroom are as follows:

1. improving the whole learning process (Lee & Spires, 2009);
2. providing learners with subject-matter knowledge, encouraging meaningful learning, and increasing professional productivity (Tomei, 2005);
3. resulting in more innovative teaching and learning methods (Shapley et al., 2011);
4. increasing and developing students' outcomes, self-esteem, and attitude (Lei & Zhao, 2007);
5. enhancing students' comprehension and encouraging students' engagement (Geer & Sweeney, 2012);
6. influencing students to learn actively and motivating them, resulting in an effective learning process (Saidin et al., 2015); &
7. positively impacting on students' learning mastery and having a substantial development and supportive effect (Abykanova et al., 2016).

Thus, educational technology plays an important role and has a strong effect on teaching and learning process. Not only teachers, but also students obtain great benefits in implementing educational tools in the classroom. In this way, teachers create innovative teaching methods that impact on students' understanding, learning mastery, self-esteem, motivation, attitude, and engagement.

Teaching English Skills

English nowadays plays a significant role in the development of global education. Due to its widespread use, English has become the lingua franca in many countries and the most widely spoken language in the world. As a result, it is highly valued in schools, colleges, universities, and other institutions (Al-Sobhi & Preece, 2018). Students must focus on both productive and receptive skills in order to become proficient English users. The productive skills are speaking and writing, whereas the receptive skills are listening and reading (Hidayati, 2018). One of the most essential aspects in English teaching and learning is pronunciation because it has an impact on students' linguistic abilities and performance (Gilakjani & Sabouri, 2016). Grammar and vocabulary are also considered as essential components in teaching and learning English (Cabrera et al., 2018).

Various strategies and methods can be applied in teaching English skills, including the use of technology. In the English language field, technology facilitates interactions with peers or cooperation (Sun, 2007; Lee, 2016). English language learning activities are expected to involve information and communication technology (ICT) applications even though the applications can be in diverse forms (Lee, Yeung, & Cheung, 2019). In a study by Solano et al. (2017), teachers most commonly used YouTube-based videos, Power Point, and Prezi presentations in their English classes. Padlet and Prezi are recommended for enhancing reading and writing skills, while podcasts and YouTube are ideal for quickly, simply, and effectively developing listening and speaking skills. To sum up, appropriate English teaching strategies and methods, especially the implementation of technology tools, will assist teachers to provide better learning experience for students. Students will also be motivated and interested to actively participate in a dynamic and interactive English learning activities.

MATERIALS AND METHODS

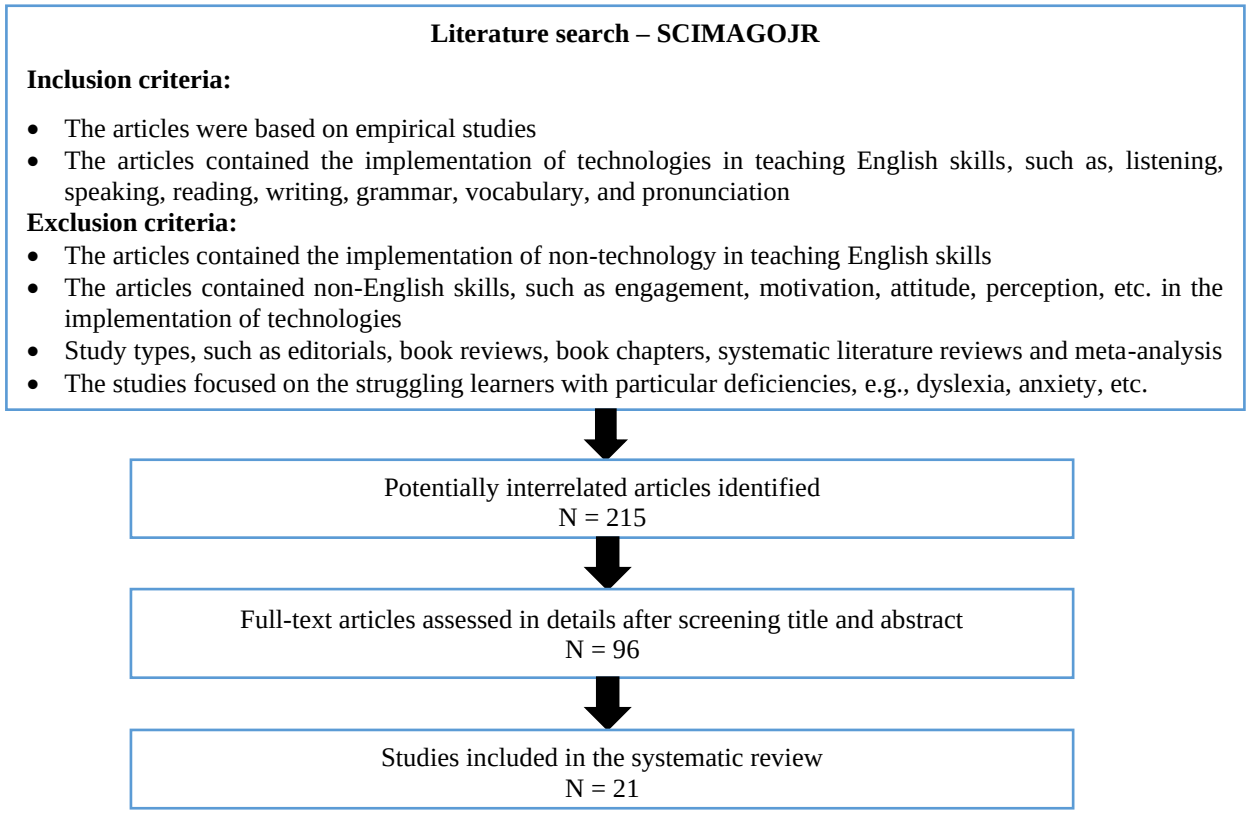
The methodological approach used in this study was a systematic literature review. A systematic literature review (SR) is a way of synthesizing scientific evidence to answer a specific research question transparently and reproducibly, while seeking to include all published evidence on the topic and assessing the quality of this evidence (Lame, 2019). An SR is a method to identify, evaluate, and define all existing published research that is relevant to answering a specific research question, topic area, or interest phenomenon (Kitchenham & Charters, 2007). An SR is a method of locating, appraising, and synthesizing evidence (Petticrew, 2001). SRs are essential tools in summarizing evidence accurately and reliably

(Liberati et al., 2009). SRs hold potential for research design and can help researchers in addressing some crucial issues, but work is needed to specify appropriate review methods for each type of research question, and to adapt guidance to our own needs and specificities (Lame, 2019).

The main objective of the SR approach is to reduce the risk for bias and to improve transparency at each stage of the review process by relying on explicit, systematic methods to minimize bias in the selection and inclusion of studies, to assess the quality of the included studies, and to summarize them objectively (Liberati et al., 2009; Petticrew, 2001). An SR strives to compile all empirical evidence that matches pre-specified eligibility criteria to answer a particular research question, providing credible findings to make conclusions and decisions (Liberati et al., 2009). An SR should be based on a protocol explaining the rationale, hypothesis, and planned review methods. A detailed and well-explained protocol can simplify the review method understanding and assessment, as well as the method modification discovery and selective reporting in a completed review (Moher et al., 2015).

The review process in an SR has three phases: planning the review, conducting the review, and reporting the review (Kitchenham & Charters, 2007). Reporting the SR was guided by the Preferred Reporting Items for SRs and Meta-Analyses (PRISMA) statement (Moher et al., 2009). The PRISMA statement aims to assist researchers to enhance the SRs and meta-analyses reporting (Moher et al., 2009). The literature selection process by the PRISMA statement is shown in Figure 1. The selected articles that included in the SR were taken from four journals in the SCImago Journal & Country Rank (SCIMAGOJR). SCIMAGOJR is a publicly accessible portal that contains the journals and country scientific indicators developed from the information included in the Scopus® database. The journals are categorized by subject field (27 major thematic fields), subject group (313 particular subject groups) or by country. Citation data are drawn from more than 34,100 titles, more than 5,000 international publishers and country performance metrics from 239 countries (SCImago, n.d.).

FIGURE 1
THE LITERATURE SELECTION PROCESS



Planning the Review

Article Selection

The articles were selected from four journals, namely Computers and Education, Educational Technology & Society, International Journal of Educational Technology in Higher Education, and Australasian Journal of Educational Technology. The articles that included in the SR were published from January 2015 to December 2021. We selected the recent papers from those specific high-quality journals in order to a) encapsulate the implementation of educational technology tools on English skills in a wide variety of contexts, b) guarantee that the educational technology implementations were conducted to a high standard. Among the top twenty journals in the category of "Social Sciences" and "Educational Technology" at Google Scholar, the first rank is Computers and Education, with an h5-index of 109 and an h5-median of 172; the fourth rank is Educational Technology & Society, with an h5-index of 54 and an h5-median of 94; the tenth rank is International Journal of Educational Technology in Higher Education, with an h5-index of 43 and an h5-median of 87; and the fifteenth rank is Australasian Journal of Educational Technology, with an h5-index of 39 and an h5-median of 55 (Google, 2021). We selected the articles from four high-quality journals that have different ranks (between the top rank, middle rank, and bottom rank), h5-indexes, and h5-medians to obtain the various data regarding educational technologies in English classrooms in a wider variety of contexts.

The numbers of the articles selected are shown in Table 1. The contents of the articles consisting of abstracts, introductions, methodologies, results, discussions, and conclusions were examined.

TABLE 1
NUMBER OF ARTICLE SELECTION

	Journal				**Total**
	Computers and Education	**Educational Technology & Society**	**International Journal of Educational Technology in Higher Education**	**Australasian Journal of Educational Technology**	
Number of the examined articles	96	79	12	28	215
Number of the assessed articles after screening the title and abstract	36	53	1	6	96
Number of the selected articles	3	15	1	2	21

Article Description

21 papers were selected to be in the SR. Those articles revealed a variety of educational technology tools implemented in teaching English. Some of the studies (n = 9) focused on vocabulary, four studies focused on speaking, four focused on writing, one focused on reading, one focused on pronunciation, one focused on grammar, and one other study focused on learning performance consisting of listening, reading, speaking, and writing. All studies were conducted in educational settings; they included institutes or colleges or universities (n = 16), intermediate school (n=1), elementary school (n=3), and kindergarten (n=1). Half of the studies were conducted in Taiwan (n = 12), followed by China (n = 3), Malaysia (n = 1), Saudi Arabia (n = 1), South Korea (n = 1), Turkish Republic of Northern Cyprus (n = 1), Italy = (n = 1), and not stated any country (n = 1).

Conducting the Review

The significant information of all articles was created in a spreadsheet, i.e., Journal name; Name of authors; Title; Publication year; Volume; Issue; Page; and DOI. To analyze the selected articles in detail, a format for abstracting the articles was developed. This resulted in the following format: 1) Journal name; 2) Name of authors & publication year; 3) Title; 4) Skill; 5) Methodology; 6) Technology tool/platform; and 7) Outcomes.

Reporting the Review

The data in the articles were analyzed to address the research questions. To report the findings, the first section describes the research methods used in the studies focusing on the use of educational technology tools in teaching English; the second section describes the types of educational technology tools used in the studies; and the last section describes the relationship between the educational technology tools and English skills.

RESULTS AND DISCUSSION

Research Methods in the Studies of the Implementation of Educational Technology Tools in Teaching English

The research methods used in the 21 studies are shown in Table 2.

TABLE 2
THE RESEARCH METHODS USED IN THE 21 PAPERS

Research designs	Research methods	Number of papers
Quantitative	True experiments	2
	Quasi-experiments	4
	Causal-comparative research	5
Mixed method (analyzed for quantitative only)	True experiments	3
	Quasi-experiments	1
	Causal-comparative research	5
Exploratory	True experiments	1
Total		**21**

The majority of studies used quantitative methods (n = 11) for collecting the data, followed by mixed methods (n = 9), and one exploratory study. For the quantitative studies (n = 11), two of the studies used true experimental designs (Wu, 2015; Angelini & Carbonell, 2019), four studies used quasi-experimental designs (Alfadil, 2020; Chen & Lee, 2018; Chu, Wang, & Wang, 2019; Lin & Mubarok, 2021), and five used causal-comparative research (Ali, Segaran, & Hoe, 2015; Yang & Wu, 2015; Wei, Kao, Lu, & Liu, 2018; Chen, Chen, & Dai, 2018; Fu & Yang, 2019).

The two studies that adopted true experimental designs investigated the development of a smartphone app (Word Learning-CET6) as a tool to assist students in learning English vocabularies (Wu, 2015), and the implementation of situational simulations and a large-scale web-based simulation in enhancing engineering students' English writing skills (Angelini & Carbonell, 2019).

The four studies using quasi-experimental designs investigated: the implementation of the virtual reality game (House of Languages) in improving English vocabulary acquisition of intermediate school students (Alfadil, 2020); the development of an educational game (My-Pet-Shop) to improve English vocabularies of young children (Chen & Lee, 2018); the development of concept map-based collaborative mobile gaming on grammar performance (Chu, Wang, & Wang, 2019); the implementation of the mind-map-guided AI chatbot approach in a university flipped English speaking classroom (Lin & Mubarok, 2021).

Five studies adopting causal-comparative research investigated: the implementation of 3D talking-heads on pronunciation learning among the students with low English pronunciation skills (Ali, Segaran, & Hoe, 2015); the implementation of an e-learning system (My English Vocabulary Assistant, MyEVA) based on a mixed-modality vocabulary strategy in enhancing English vocabularies for English as a second language (ESL) learners (Yang & Wu, 2015); the integration of a competitive game (Monopoly) with a personalized assistance strategy to enhance the students' English vocabulary acquisition (Wei, Kao, Lu, & Liu, 2018); the development of a narrative-based contextual game (PlanetAdventure system) in improving English vocabulary learning achievement of the students (Chen, Chen, & Dai, 2018); the implementation of online-video pronunciation dictionary (YouGlish) to facilitate English as a foreign language (EFL) learners' speaking skills (Fu & Yang, 2019).

For the mixed method studies, a quantitative method that was focused on for this study because it was used to collect and analyze data regarding the implementation, development, or effectiveness of educational technology tools on English skills. However, qualitative methods were used to collect and analyze the data containing non-English skills, such as engagement, motivation, attitude, perception, etc. Those non-English skills were excluded for this study.

For the quantitative methods in the mixed method studies (n = 9), five studies used causal-comparative (Zhonggen, 2018; Lin, 2015; Lee & Kim, 2016; Yeh, Tseng, & Chen, 2019; Huang, 2021), three used true experimental (Hung & Young, 2015; Yang, 2015; Hong, Huang, Hsu, & Shen, 2016), and one study used quasi-experimental (Banaeian & Gilanlioglu, 2021).

Zhonggen (2018) examined the effectiveness of serious gaming on English vocabulary learning. Lin (2015) investigated the integration of learner-centered blogging into EFL writing instruction in enhancing the students' writing performance. Lee & Kim (2016) explored the effectiveness of a Social Network Service-based writing platform (Kakao-Talk) on less proficient second language university students' writing performance. Yeh, Tseng, & Chen (2019) investigated the implementation of online peer feedback through blogs to improve students' speaking performance. Huang (2021) examined the effectiveness of smartphone-based collaborative vlog projects on EFL learners' speaking performance. Those five studies adopted causal-comparative research for the quantitative method in the mixed method studies.

Hung & Young (2015) explored the implementation of e-readers in facilitating EFL students' academic writing. Yang (2015) investigated the effectiveness of automatic scaffolding and measurement of three-layer concept maps to enhance university students' writing skills in summarizing. Hong, Huang, Hsu, & Shen (2016) examined the development of robot-assisted instructional materials to improve elementary school students' English learning performance. Those three studies adopted true experimental designs for the quantitative method in the mixed method studies. One study that adopted a quasi-experimental design by Banaeian & Gilanlioglu (2021) explored the impact of the NAO robot as a teaching assistant for university students' vocabulary learning.

One exploratory study was implemented in a true experimental setting (Mazzoni & Benvenuti, 2015). This study is about the experiment of deploying a humanoid robot (MecWilly) as a child's partner using Socio-Cognitive Conflict to assist the children in learning English vocabularies. In this study, the researchers created playful activities in which the children worked in pairs with another child or with MecWilly on an assignment of vocabulary-picture association. The experiment of those two situations (child-child and child-robot) was conducted to find out the effectiveness of Socio-Cognitive Conflict in assisting the children to enhance their English learning (Mazzoni & Benvenuti, 2015).

In the studies that adopted a true experimental design, the researchers divided the students into two groups, i.e., as a test group (those with Word Learning-CTE6) and a control group (those without Word Learning-CTE6) (Wu, 2015) or as an experimental group (those who received simulation-based instruction) and a control group (those who attended a regular English course) (Angelini & Carbonell, 2019). The students were randomly assigned into one of the two types of groups to make it obvious as a true experimental design. One exploratory study was also implemented in a true experimental setting (Mazzoni & Benvenuti, 2015) by having two kinds of situation, a group of child-child and a group of child-robot. However, the researchers that adopted a quasi-experimental design assigned the students to an experimental group and a control group in a non-random technique, i.e., a study of House of Languages in vocabulary

acquisition by Alfadil (2020); a study by Banaeian & Gilanlioglu (2021) exploring the impact of the NAO robot on students' vocabulary learning.

Meanwhile, other studies adopted causal-comparative research because the objective was to examine significant differences in the variables within a group or between two or more groups in the target sample/population (Mertens, 2014; Johnson & Christensen, 2016). These included a study by Ali, Segaran, & Hoe (2015) investigating the effects of three different multimedia presentation strategies in 3D talking-head Mobile-Assisted-Language-Learning (MALL), and a study of the effects of YouGlish on speaking skills, including pronunciation, intonation, and word usage (Fu & Yang, 2019).

Based on these findings, quantitative methods are the most widely used methodology in most studies focusing on the use of educational technology tools in teaching English. The research methods consist of true experiments, quasi-experiments, and causal comparative research. Other methodology like qualitative method was unexplored.

Types of Educational Technology Tools

The sample of 21 studies captured a variety of educational technology tools in teaching English skills. Types of educational technology tools implemented in the studies are shown in Table 3.

TABLE 3
TECHNOLOGIES IMPLEMENTED IN THE STUDIES

Technologies	Number of papers	Description	Skills
Mobile learning (i.e., smartphones, tablets, iPads, laptops, or other electronic devices)	4	• Smartphone app (Word Learning CET6)	Vocabulary
		• E-readers	Writing
		• 3D talking-head	Pronunciation
		• Smartphone-based collaborative vlog projects	Speaking
Games/Mobile games	5	• Interactivity-prone serious games (Hujiang Fun Vocabulary; Baicizhan) and less interactivity-prone serious games (New Oriental Fun Vocabulary; Kingsoft Vocabulary)	Vocabulary
		• My-Pet-Shop system	Vocabulary
		• A game similar to Monopoly	Vocabulary
		• PlanetAdventure system	Vocabulary
		• The concept mapping-based collaborative English gaming system consisting of the "Personal Learning phase" and the "Collaborative Learning phase"	Grammar
Virtual reality (VR)	1	• Virtual reality game (House of Languages)	Vocabulary

E-learning system	3	• My English Vocabulary Assistant (MyEVA)	Vocabulary
		• An automatic three-layer concept map as scaffolding and measurement	Reading and writing
		• A video-assisted dictionary (YouGlish)	Speaking
Web 2.0 learning technologies (i.e., Social Network Service (SNS), social media, Blogs or Wiki)	3	• A blogging platform (Lang-8)	Writing
		• SNS (Kakao-Talk)	Writing
		• A blog website (WordPress.com)	Speaking
Robotics	3	• The humanoid robot (MecWilly)	Vocabulary
		• A programmable humanoid robot (Bioloid)	Listening, Reading, Speaking, & Writing
		• The NAO robot	Vocabulary
Artificial Intelligence (AI)	1	• AI chatbot (the Replika app)	Speaking
Web-based simulation	1	• A web-based simulation from the International Communication and Negotiation Simulations (ICONS) platform	Writing
Total	**21**		

The fact that games represent one of the technologies that was frequently implemented in teaching English skills suggests that games are supportive in assisting students to improve their English skills, i.e., the development of My-Pet-Shop system by Chen & Lee (2018), and a study by Chen, Chen, & Dai (2018) for the development of the PlanetAdventure system.

There was also a high proportion of studies that focused on the implementation of mobile learning in teaching English skills, for instance: how a smartphone app could be effectively implemented for the students' vocabulary learning (Wu, 2015); why e-readers could be beneficially used on the students' writing skill (Hung & Young, 2015); how 3D talking-head could be successfully implemented on pronunciation learning (Ali, Segaran, & Hoe, 2015).

Using e-learning systems, web 2.0 learning technologies, and robotics were also very common in English classrooms, including a study by Yang & Wu (2015) in designing MyEVA to assist the students for their vocabulary acquisition, the exploration of Kakao-Talk in students' writing activities (Lee & Kim, 2016), and demonstrating MecWilly as a child's partner in learning English (Mazzoni & Benvenuti, 2015).

A study by Alfadil (2020) in investigating Houses of Languages on the students' vocabulary learning, the implementation of the Replika app in the speaking classroom (Lin & Mubarok, 2021), and the implementation of a web-based simulation on the students' written production (Angelini & Carbonell, 2019), are other examples of educational technologies implemented in English classrooms. They include e-learning systems, web 2.0 learning technologies, and web-based simulation.

From the results of this study, eight types of educational technology tools implemented in English classrooms were found: mobile learning, games, VR, e-learning system, web 2.0 learning technologies, robotics, AI, and web-based simulation. Games are the most widely used educational tools. The next frequently implemented educational tools are mobile learning, e-learning system, web 2.0 learning

technologies, and robotics. However, the least frequently used educational tools are VR, AI, and web-based simulation. There should be more studies in implementing VR, AI, and web-based simulation to investigate their effectiveness in teaching English skills.

The Relationship Between the Educational Technology Tools and English Skills

The variety of educational technology tools had been implemented in different English skills, and is shown in Table 3.

Most educational technologies were most likely to be able to be implemented on students' vocabulary learning or acquisition. A study by Wu (2015) found that the students in the experimental group identified 50.52% of 1274 words, while the students in the control group memorized 43.56%, a percentage difference of 6.96%. This indicates that smartphones are effective tools to assist the students in learning English vocabularies. The implementation of interactivity-prone serious games and less interactivity-prone serious games by Zhonggen (2018) revealed that the interactivity-prone serious gaming was significantly more effective than the less interactivity-prone serious gaming in English vocabulary learning at the significance level $p = 0.05$; the less interactivity-prone serious gaming was significantly more effective than the traditional approach in English vocabulary learning at the significance level $p = 0.05$. This indicates that the type of game influenced the students' vocabulary learning.

However, a study conducted by Wei, Kao, Lu, & Liu (2018) showed that both personalized assistance and competitive gaming had significant interaction effects. This notes that personalized assistance had a positive impact on English learning outcomes - the improvement in English learning outcomes could not be achieved if the students only interacted with the competitive game. It can be concluded that proper learning strategies should also be implemented during the gaming learning activities to have better learning outcomes.

There was also another study developing a concept mapping-based collaborative English gaming system on grammar learning performance (Chu, Wang, & Wang, 2019). The result of the study revealed that the post-test of the experimental group was significantly higher than that of the control group ($F = 4.84$, $p = 0.03$, $\eta^2 = 0.37$). This shows that English gaming strategy could also enhance the students' grammar performance.

Studies involving mobile learning, e-learning systems, web 2.0 learning technologies, and AI, were able to be implemented on the students' speaking performance. One study was facilitated with smartphone-based collaborative vlog projects, which resulted in the improvement of the students' speaking performance from a pre-test mean score of 57.62 to a post-test mean score of 67.54 (Huang, 2021). The result was statistically significant ($t = 29.38$, $p < 0.001$) and showed that the students' speaking performance significantly increased in terms of speaking quality. The other study also provided the students the opportunity to use the online-video pronunciation dictionary, YouGlish, and revealed that the students' word usage skills, with a pre- and post-test mean score difference of 2.23, increased the most, followed by intonation (mean score difference of 1.54), and pronunciation (mean score difference of 0.91) (Fu & Yang, 2019). Another study that implemented an AI chatbot approach in the speaking classroom (Lin & Mubarok, 2021) found that the scores of the experimental (mind-map AI) and control (conventional AI) groups are 8.16 and 6.90, and the F score is 61.71 ($p < 0.001$, $\eta^2 = 0.57$). This indicates that appropriate learning strategies should also be implemented with the AI chatbot approach.

Studies of mobile learning, e-learning systems, web 2.0 learning technologies, robotics, and web-based simulation, also considered the students' writing proficiency. For instance, Hung & Young (2015) investigated the effectiveness of e-readers on the students' academic writing, which resulted in the difference between the students' learning achievement in the experimental and control group. Other studies were conducted by Lin (2015) investigating about learner-centered blogging in an EFL writing classroom, and Lee & Kim (2016) exploring a Social Network Service, Kakao-Talk, in students' writing activities. The results of those two studies proved that there was a significant difference between the pre- and post-test writing performance scores.

The findings showed that some types of technologies were effectively implemented on particular English skills. However, there had been only a few studies investigating on grammar, pronunciation,

listening, and reading. This study suggests that more studies are needed on the implementation of educational tools on those skills.

LIMITATIONS AND IMPLICATIONS

We reviewed and analyzed empirical studies on the educational technology implementation in teaching English skills, published in the four journals, i.e., Computers and Education, Educational Technology & Society, International Journal of Educational Technology in Higher Education, and Australasian Journal of Educational Technology, in the SCIMAGOJR from 2015 to 2021. In the first place, we wished to know the research methods used in implementing educational technology tools in teaching English. Types of research methods were identified – true experiments, quasi-experiments, and causal-comparative research – and adopted quantitative, mixed method, and exploratory studies. Second, the types of educational technology tools used in the studies included mobile learning, games, VR, e-learning systems, web 2.0 learning technologies, robotics, AI, and web-based simulation. And third, we wished to find out whether there was a relationship between the implementation of those educational technologies and students' English skills, that is, whether the educational technologies could assist the students to enhance their English skills or not.

However, there is still a lack of studies on the implementation of educational technologies on grammar, pronunciation, listening, and reading. This study reported that there are only a few studies conducted on the implementation of educational tools on those skills. Thus, this study suggests that it is time to conduct more studies on the effectiveness of educational technologies on those skills since technology is becoming more sophisticated in today's worldwide society, including in English language education field.

Therefore, the findings of this analysis provide a critical and current overview of educational technology implementation in English classrooms for practical implications for teachers, academics, and practitioners. We anticipate that this SR provides insight for researchers to conduct more studies on educational technologies. Thus, these findings could extend the body of knowledge on the implementation of educational tools to enhance English skills.

CONCLUSION

Teaching and learning English is crucial for both teachers and students, especially in this technology era. It would be an overstatement to say that the improvement of students' English skills is affected by the used learning tools. This SR brings together the available research in a systematic manner to reveal the past research on the implementation of educational technologies in English classrooms from 2015 to 2021.

Of the 21 studies in this SR, 12 were conducted in Taiwan, 3 were conducted in China, and the rest were conducted in Saudi Arabia, Turkish Republic of Northern Cyprus, Italia, Malaysia, South Korea, and a not-stated country. Those studies were also exclusively conducted in formal educational settings, such as kindergarten, elementary school, intermediate school, and institute/college/university. More variation in research methods and diverse types of research questions in more various research contexts can expand the scope of future research. The wider scope can provide meaningful information regarding the implementation of educational technologies in teaching English in more various contexts, i.e., informal and non-formal educational settings.

The findings further illustrated eight types of educational technologies to be implemented to enhance English skills, such as vocabulary, pronunciation, grammar, listening, speaking, reading, and writing. A further recommendation would be to keep moving forward toward more implementation of educational technologies in English classrooms.

In the age of technology, the implementation of educational technologies in English classrooms is valuable and beneficial to enhance the students' English skills. This SR points out that there is still much to learn regarding the implementation of educational technologies in English language education field. Future research that systematically explores educational technology implementation in teaching English, with a wider scope and more variation in research methods, and with diverse types of research questions in

more various research contexts, will move the research forward and reveal more about how implementing educational technology to support English skills is able to improve students' English learning.

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