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Systematic Literature Review of Foreign Language Teaching Studies from Perspective of Augmented Reality

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Abstract

Augmented reality technology or better known as Augmented Reality (AR) has been widely used in various fields, especially in the world of education. The AR technology combines the virtual world and reality where it uses an interesting rendering technique for displaying three-dimensional objects, animation, audio, and video by simply scanning the smartphone camera towards a specific image that has been designed. This situation has caused many researchers to study foreign language teaching. However, not many researchers have tried to compile and do a systematic literature review on the same issue. To overcome this shortcoming, this article aims to write a systematic literature review on previous studies related to the study of foreign language teaching from the perspective of augmented reality. The process of writing this SLR refers to the PRISMA writing standard (Preferred Reporting Items for Systematic Review and Meta Analysis). In order to find articles and related resources to be included in this SLR, two main databases namely Science Direct and Google Scholar were used. Based on the theme analysis, this SLR has three main themes which are knowledge, readiness, and perspective. By referring to this SLR, AR technology can have an impact on teachers to be fully integrated in foreign language teaching. This study suggests to future researchers to conduct a better systematic literature review in a wider scope, for example more diverse journal databases and more significant research questions.

Keywords: Teachers' Perception, Augmented Reality, Teaching, Foreign Language, Systematic Literature Review

Introduction

Augmented reality (AR) technology has been widely used in various fields. This technique combines virtual world and reality and uses interesting rendering technique to display three-dimensional objects, animation, audio, and video when users scan the smartphone camera towards a specific image that has been designed. On the other hand, according to Delello et al (2015), AR is a technology that combines virtual objects into the real world where users can interact with those virtual objects in real time. According to Redondo et al (2020), the use of this technology as a teaching medium assists teachers as a teaching aid.

The transformation in the education system caused by this technology undoubtedly provides an interesting opportunity to provide a real, interesting, and fun learning environment Garzon (2021) which can improve the learning process. The presence of AR technology also needs to identify the appropriate form or content so as to benefit and become more meaningful to education, especially in language learning and teaching. Therefore, augmented reality helps teachers to attract students' attention to be more focused on the subject.

The use of AR in education is important and has attracted the interest of researchers to study more deeply about foreign language teaching using AR technology. There are previous studies such as those done by Mota et al (2017) as well as the study of Alyousify and Mstafa (2022) which summarized various perceptions of teachers in teaching using augmented reality. There also exists large number of studies on AR technology in education where systematic literature can be conducted so that the findings of previous studies can be collected and understood better. Even though there is a need to do a systematic literature review, but to date, the number is not very encouraging, and the scope is not very extensive. It cannot be denied that studies such as Dwiyanti et al (2021); Rahman-Shams (2019); Wijnen et al (2021); Jenkins (2021); Freeman (2021); Kultsum et al (2021); Gray (2019); Caminiti (2019); Adams (2020) only looked at one scope of knowledge, which is technological knowledge, whereby studies by Manna (2022); Alfadil (2017); Zhang et al (2021); Amin et al (2019); Rheaume (2020); Philippe et al (2020); Yildiz (2022); Morelot et al (2021) only focused on aspects of pedagogical knowledge. Meanwhile, the study of Shah (2022); Erdogmus et al (2021) focused on the aspect of content knowledge. Shah (2022) study examined aspects of technology, pedagogy and content while Daley (2020) focused on two aspects which are pedagogical knowledge and content. Conducting systematic literature review is important because traditional literature review has various issues related to transparency, author bias, recruitment bias, and publication bias. Due to these issues, systematic literature review is needed because it is comprehensive, transparent, and organized (Shaffril et al., 2020).

Research Questions

- What are the aspects of teachers' knowledge of augmented reality technology?
- What are the aspects of teachers' willingness to use augmented reality technology?
- To what extent is the development of augmented reality technology in teaching research foreign language?

Research Objective

To conduct a systematic literature review which covers these areas:

- Identifying teachers' knowledge of augmented reality technology.
- Identifying teachers' willingness to use augmented reality technology.
- Identifying the development of augmented reality technology in the study of foreign language teaching.

Research Methodology

In the collection of previous studies that use systematic literature highlighting methodology, there are some guidelines or protocols that can be used to ensure that the most relevant previous studies are selected for the review process. According to Lockwood et al (2015), the focus of the systematic literature is on evidence, effects, validity, and consequences that encourage researchers to review study design information, method analytics, and chain of

consequences. By doing so, the quality of systematic literature review can be controlled as the resarcher will have robust evidence of past research information. The PRISMA protocol is chosen as a guide in this systematic literature review in line with the opinion of Shaffril et al (2020) that this protocol is a comprehensive guideline for systematic literature highlights in fields involving the evaluation and mixing of certain elements.

PRISMA or its full name Preferred Reporting Items for Systematic Review and Meta-analysis is a protocol that can be used as a guide to present systematic literature review. PRISMA is chosen as a guide because this protocol is able to control quality and quantity selection of articles in large databases such as Science Direct and Google Scholar. The quality and quantity control of article selection is guided by the criteria in PRISMA. These criteria consist of identification, acceptance and rejection of articles, eligibility, evaluation of quality articles as well as data extraction and analysis. All articles need to be evaluated based on these four criteria so that the objective of highlighting this systematic literature can be achieved.

Identification

Identification is a process of identifying and diversifying suitable keywords to be used in the process of searching for articles during a systematic literature review. Keywords are needed in the search process, and they can improve the accuracy of articles obtained to be referenced in a systematic literature review. Based on the research questions stated earlier, four main keywords have been selected, namely perception, augmented reality, teaching, and foreign language. In order to diversify the keywords that can be used, words with the same meaning, related words, and variations to the main keyword have been searched. This search effort was carried out through an online thesaurus by referencing the keywords of previous studies in Science Direct and Google Scholar databases.

Based on the selected keywords, the article search process is done in two main databases namely Science Direct and Google Scholar. Both databases are selected based on several advantages that they have. In accordance with the opinion of Gusenbauer and Haddaway (2020) which stated that the selection of these two basic sources among "search engines" helps to obtain suitable and quality studies for systematic studies. Science Direct is one of 14 major databases in article searches, hence it is selected as the database that lists high-impact journals and articles in this systematic literature review. In addition, this database has the strength in terms of comprehensive search, more stable search results and more search functions than other databases. Martin-martin et al (2018) in their study emphasized the advantages of Science Direct in terms of quality control as well as a systematic index system. Google Scholar is also selected as a second database source to add search results to previous studies.

Table 1
Search String Results Without Filtering

Data base	Search string	Number of articles found
Google Scholar	TITLE-ABS-KEY = (("teacher perception") AND ("augmented reality") AND ("teaching") AND ("foreign language"))	65
Science Direct	KEY = (("teacher perception") AND ("augmented reality") AND ("teaching") AND ("foreign language"))	7

Through the Google Scholar database, as many as (n = 65) articles were found based on search techniques that applied the keywords used. Searches in the Science Direct database also used the same keywords as Google Scholar so that searches will find articles in the same language. The search in Science Direct database yielded a total of (n = 7) articles. Thus, the diversity of the findings from these sources helps in achieving the objective of this systematic literature review.

Acceptance and Rejection of Articles

Findings through the identification step include a large number of articles and no quality control. Therefore, the setting of acceptance and rejection criteria for articles is important to filter out articles that are less relevant or not in line with the research objectives. According to Shaffril et al (2020), scholars have revealed the importance of acceptance and rejection criteria such as publication timeline, publication type and field. Criteria such as those in Table 2 are important for the relevance of article selection, which help to control the quality and quantity of articles in this spotlight. Criteria such as publication timelines help to gather only the most recent studies so that the latest research developments can be examined. With automatic filtering through the database by selecting timeline settings and publication type, the total number of articles found on Google Scholar is (n = 53) articles, while (n = 5) from the Science Direct database. Next, in order to control the quality, this systematic literature highlight only selects the type of publication in the form of journal articles only.

Table 2
Article acceptance and rejection criteria

Criteria	Acceptance	Rejection
Publication timeline	2013 until 2022	2012 and below
Type of Publication	Journal, review, proceeding and chapter in book	Not included in journal, review, proceeding and chapter in book
Area	Field of augmented reality or closely related to technology	Not related to the field of augmented reality or technology

Qualifications

In the qualification section, the option of finding relevant articles manually is also applied. The researchers of this study screened articles based on the research questions and keywords that had been set. Then, the screening was manually stopped on articles that are not relevant to the keywords and meet rejection criteria. Thereby, the acceptance totaled only (n = 24) articles selected from Google Scholar. A manual screening in the Science Direct database resulted in (n = 3) articles. The number of identical articles stacked in Google Scholar and Science Direct that were removed was (n = 2). Figure 1 below shows a summary of the process from the beginning to the final selection of articles based on the PRISMA stream. Figure 1 adapts example flowchart from Moher et al (2009) according to actual information based on this article. The steps in the PRISMA protocol in this flowchart have been explained more clearly in the previous subtopics.

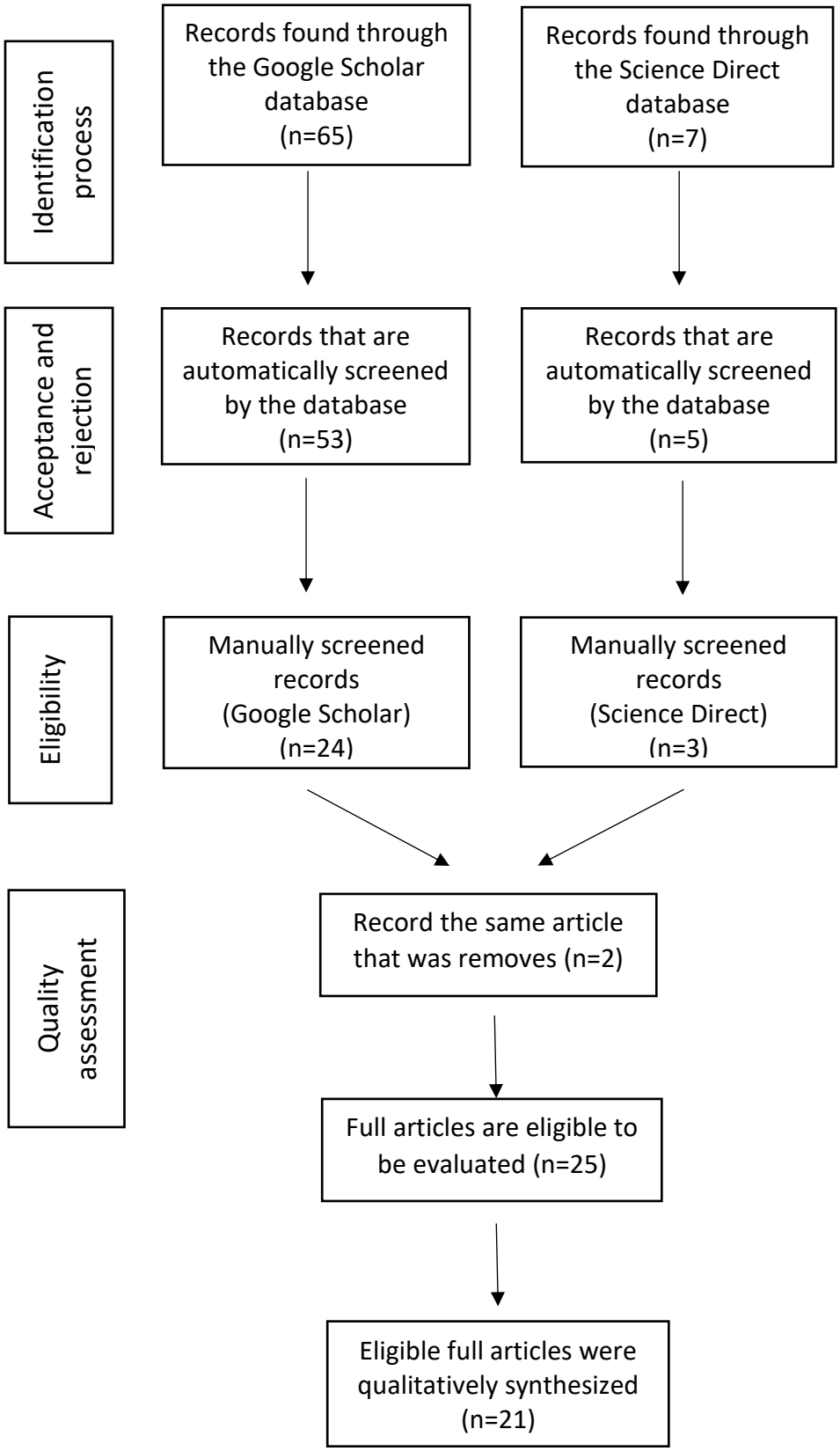

Figure 1 PRISMA Flowchart

Evaluation

Next, there are (n = 25) eligible full articles screened through article quality assessment from two reviewers in accordance with the recommendations of Petticrew and Roberts (2006) in the writing of Shaffril et al (2020) who suggested that at least two reviewers should review articles based on an agreed theme. The abstract of each article was reviewed and the evaluation was done based on the research questions that have been formed at the beginning of the study. Both evaluators are from this group of researchers themselves because these researchers understand the objective of this systematic literature highlight.

Referring to the evaluation method proposed by Kitchenham and Charters (2007), the researchers identified six quality evaluations for this systematic literature review. Among the evaluation questions for this systematic literature review are:

- QA1: Is the purpose of the study clearly stated?
- QA2: Are the interests and uses of the writing clearly presented?
- QA3: Is the research methodology established clearly?
- QA4: Is the conceptual approach clearly defined?
- QA5: Is the writing compared and measured with other similar writings?
- QA6: Are the limitations of writing clearly stated?

The evaluation schedule is presented as follows

Table 3

Results of article quality assessment

Research	Form of study	QA1	QA2	QA3	QA4	QA5	QA6	The number of criteria met	Included in the comments
Manna (2022)	Qualitative	/	/	X	/	/	/	5/6	/
Dwiyanti et al (2021)	Qualitative	/	/	/	/	/	X	5/6	/
Gokcen Yeni (2018)	Qualitative	/	/	/	/	/	/	6/6	/
Alfadil (2017)	Quantitative	/	/	/	/	/	/	6/6	/
Shah (2022)	Quantitative	/	/	/	/	/	/	6/6	/
Lombardi (2021)	Qualitative	/	X	X	/	X	X	2/6	X
Zhang et al(2021)	Quantitative	/	/	/	/	/	X	5/6	/
Rahman-Shams (2019)	Qualitative	/	/	/	/	/	/	6/6	/
Amin et al (2019)	Qualitative	/	/	/	/	/	/	6/6	/

Wijnen et al (2021)	Qualitative	/	/	X	/	/	/	5/6	/
Rheaume (2020)	Qualitative	/	/	X	/	/	/	5/6	/
Hunter (2017)	Qualitative	/	X	/	X	X	X	2/6	X
Jenkins (2021)	Qualitative	/	/	/	/	/	/	6/6	/
Freeman (2021)	Qualitative	/	/	/	/	/	/	6/6	/
Daley (2020)	Qualitative	/	X	/	/	/	/	5/6	/
Philippe et al (2020)	Qualitative	/	/	/	/	/	X	5/6	/
Kearney et al (2014)	Quantitative	/	/	/	/	/	X	4/6	/
Kultsum et al (2021)	Qualitative	/	/	/	/	X	X	4/6	/
Yildiz (2022)	Qualitative	/	/	X	/	/	/	5/6	/
Grey (2019)	Quantitative	/	/	/	/	/	/	6/6	/
Cain (2018)	Qualitative	/	X	/	X	X	/	3/6	X
Caminiti (2019)	Qualitative	/	/	/	/	/	/	6/6	/
Bastiaens & Marks (2012)	Qualitative and Quantitative	/	X	X	X	X	/	2/6	X
Adams (2020)	Qualitative	/	/	/	/	/	/	6/6	/
Erdogmus et al (2021)	Quantitative	/	/	/	/	/	X	5/6	/

Based on the evaluation, (n = 4) articles were rejected because they do not meet the quality evaluation criteria set.

Data Extracts and Analysis

This study uses a variety of research designs to include in the review such as quantitative, qualitative, and mixed methods design. According to Whittemore and Knafl (2005), the best way to synthesize or analyze diverse data is to use qualitative techniques or mixed methods that allow researchers to conduct repeated comparisons across primary data sources. This

study uses qualitative techniques to analyze the data. The researchers carefully read 25 articles mainly in the abstract, results and discussion sections. Observations on data abstracts were conducted based on the research questions. In this process, any data from the reviewed studies that are able to answer the research questions had been abstracted and included in the table. Next, the researchers conducted a thematic analysis that identifies themes and sub-themes based on efforts related to noting patterns and themes, grouping, calculation, noting similarities, and relationships that exist in the abstracted data (Braun and Clarke, 2006). Thematic analysis is considered the most appropriate in synthesizing a mixed research design (Flemming et al., 2018). It is explained as a descriptive method that reduces data in a flexible mode that combines with other data analysis techniques (Vaismoradi et al., 2013).

The first step in thematic analysis is generating themes. In one process, the researchers tried to identify patterns that exist among the abstract data of all reviewed articles. Any similar or related abstract data were collected in groups and finally, a total of three groups were created. The researcher then re-examined the three data groups and found six other subgroups. The next process involved reviewing the accuracy of these themes, whereby in this process the researchers re-examined all the main themes and sub-themes generated to ensure their usefulness to achieve accuracy in data representation. In this process, six subthemes were isolated – three subthemes under the theme of knowledge of technology, and three more under the theme of willingness to use technology. After the process was completed, the finalized pattern was identified as three main themes and six subthemes. After that, the researchers proceeded to the next stage by naming themes for each group and their sub-groups. The researchers started by naming the themes for the main group first before naming the themes for the sub-groups.

Theme development was done in a group consisting of the main author and a co-author with the theme of findings. During the development of the themes, the researchers discussed any ideas and thoughts that could be related to the interpretation of the data until the point of agreement on the adjustment of the developed themes and sub-themes. The developed themes and sub-themes were presented to experts who are skilled in qualitative research techniques. Then, the experts evaluated three themes and six sub-themes subjectively. These experts had agreed that the themes and sub-themes are appropriate and relevant to the results of the review.

Thus, as a result of the evaluation of the systematic literature review, there are (n =21) articles in the Google Scholar and Science Direct databases that have been qualitatively synthesized as displayed in Table 4 below.

Table 4
Eligible articles synthesized based on theme

No.	Authors	Knowledge	Readiness	Augmented reality perspective/related technology
1	Manna (2022)	Pedagogy	Attitude	The teacher's perception of reality improved in language teaching Italian as a foreign language
2	Dwiyanti et al (2021)	Technology	Usefulness	The potential of augmented reality in the learning of science subjects
3	Yeni (2018)	Technology	Skills	The teacher's perception of 21st century technology skills regarding foreign language
4	Alfadil (2017)	Pedagogy	Usefulness	The importance of implementing virtual reality
5	Shah (2022)	Technology, pedagogi & content	Skills	Technology, pedagogy and content knowledge of language teacher content
6	Zhang et al (2021)	Pedagogy	Attitude	Factors that influence teachers' attitudes towards the integration of student-centered technology
7	Rahman-Shams (2019)	Technology	Usefulness	Effects of virtual reality technology towards learning
8	Amin et al (2019)	Pedagogy	Skills	Examining teachers' perceptions of the use of applications as a tool for teaching English.
9	Wijnen et al (2021)	Technology	Attitude	Teachers' attitudes towards use technology.
10	Rheaume (2020)	Pedagogy	Passion	Institutionalizing blended and distance learning in language teaching
11	Jenkins (2021)	Technology	Skills	Implementation of the model of replacement, addition, modification and redefinition of primary school teachers in their teaching
12	Freeman (2021)	Technology	Skills	Perception, belief and practice about development professional in teaching
13	Daley (2020)	Pedagogy & content	Usefulness	Teachers' perception of narrative-based educational games

14	Philippe et al (2020)	Pedagogy	Skills	Teaching, learning and multimodal training in augmented reality
15	Kearney et al (2014)	Pedagogy	Usefulness	Investigating teacher acceptance against mobile pedagogy
16	Kultsum et al (2021)	Technology	Usefulness	Encourage teachers to increase their knowledge of the use of technology to support teaching
17	Yildiz (2022)	Pedagogy	Attitude	Identify the importance of digital use in developing training
18	Grey (2019)	Technology	Attitude	To identify teachers' perceptions of integration technology into the classroom
19	Caminiti (2019)	Technology	Skills	The teacher's role develops the use of technology in teaching and learning
20	Adams (2020)	Technology	Skills	Teacher's perception of use tools that can influence student
21	Erdogmus et al (2021)	Content	Skills	Improve teaching and interaction skills in language teaching

Result

The results of the analysis of all 21 articles have found 3 major themes to be explained, namely teachers' knowledge of augmented reality technology, teachers' willingness to use augmented reality technology, and augmented reality perspectives. To meet the objective requirements of the study, these themes are elaborated based on information found in previous studies that have been collected thematically. The theme of teachers' knowledge of augmented reality technology not only describes what teachers know about applications that have been studied, but also gives an overview of teachers' knowledge that can still be studied in depth. The aspect of the teacher's readiness for the study of knowledge against the application also outlines the readiness that dominates the choice of past researchers and also the readiness that is still relevant for the latest study. The findings of the augmented reality perspective show the choice of the augmented reality branch in previous studies. All of these themes provide an overview of the development of teachers' knowledge and readiness for teaching in the field of foreign languages, especially in using augmented reality technology.

Teachers' Knowledge of Augmented Reality Technology

Augmented reality technology refers to technology that combines the interaction between objects in the real world and computer-generated objects. Most studies of foreign language learning in the past proved that current technology, to some extent changes the technique and method used by teachers in delivering their lessons. Looking at the collection of 21 previous studies collected, all teachers' knowledge of teaching applications revolves around the knowledge of teachers who do not categorize their groups, but most information acquisition is explained more clearly in a form that is easy for readers to understand.

Of the 21 previous studies that revolved around teachers' knowledge of augmented reality technology, a total of 11 studies focused on technological knowledge. This finding shows that technology is one of the aspects of teachers' knowledge of technology that has received the attention of many recent researchers. Based on the study of Dwiyanti et al (2021), augmented reality has great potential to be used in the teaching of science subjects. Furthermore, according to Shah (2022); Caminiti (2019), teachers need to play a role in using technology as well as to ensure its effectiveness in teaching and learning. With the presence of teachers, the use of augmented reality technology has an impact on learning outcomes (Rahman-Shams, 2019). However, the study of Wijnen et al (2021) albeit not stating specific discussion on augmented reality, conformed that the use of technology is essential to improve and enrich the teaching and learning process. This is supported by Jenkins (2021) studies which mentioned that teachers need to explore current technology-based teaching practices in developing more creative teaching. However, Freeman (2021) study explained the need to understand the use of technology and its focus to better educate students to some extent creates practical problems for most teachers and there is a need to know how to develop and train them in relation to their willingness to use technology. The study of Kultsum et al (2021) also emphasized aspects of the role of institutions and teachers in teaching English as well as how schools are involved in the inclusion of technology in teaching and learning.

Nevertheless, Gray's study (2019) explained that there are challenges in developing technology use skills among teachers. Among them is their energy and time. However, despite the challenges that exist in using technology, it can provide understanding and comprehension from the teaching delivered by the teacher to the students. This statement is supported by Adams (2020) who identified that the use of mobile technology in teaching can make learning more effective and the learning atmosphere more interesting. Additionally, distance education is defined as different from technology-mediated classes because of the time and space between the instructor and the student. There are many terms of distance learning and different types of classes such as flipped and blended learning.

In addition to the above discussions, as many as 3 studies focused on content knowledge. Content knowledge refers to actual knowledge of the content of the subject being taught, knowledge of key facts and concepts in the field, and the relationship between them. It also includes the philosophy of foreign language teaching itself as well as teaching and learning resources. Based on Shah (2022), teaching by using modern method gives an opportunity to increase cross-cultural interaction. The study of Erdogmus et al (2021) focused on content, design, and findings components. In addition, Daley (2020) identified that there are a few teachers who are not clear about the content of augmented reality to be integrated in the curriculum.

In addition, as many as 10 previous studies focused on pedagogical knowledge. Pedagogical knowledge refers to teachers' knowledge about teaching and learning process, knowledge about students and learning, class management, assessment, and reflection. From the previous systematic literature review, Manna (2022) focused on pedagogical knowledge and challenges that teachers faced in developing pedagogical devices. In another study, Alfadil (2017) reviewed the adaptation of pedagogical strategies according to the context of students. With the use of technology, the aspect of pedagogy can be evaluated in education (Amin et al., 2019). A study by Kearney et al (2014) also focused on the acceptance of mobile pedagogy and how teachers use the distinctive pedagogical characteristics of mobile learning, namely collaboration, individuality, and realness. The study of Zhang et al (2021); Philippe et al (2020) also included various levels of education, discipline, and technology. Evaluation of

technology focuses on the theme of learning outcomes, affective elements, behavior, design, technological elements, pedagogy, presence, and institutional environment. Meanwhile, Yildiz's (2022) study identified that the use of technology can improve students' speaking and listening skills.

Teacher's Readiness to Use Augmented Reality Technology

The willingness of teachers to use technology is one of the important aspects to deal with changes towards more effective teaching and learning. In this section, the results are explained from the aspects of willingness to use, attitudes, skills, and interests. The concept of usefulness means work productivity, achievement, and effectiveness (Davis, 1989). It identifies with confidence that can give an idea how the behavior of a user applying a certain technology is affected. This concept also has a direct impact on the wishes or intentions of a person who uses more than its influence on a person's behavior or attitude.

Of the 21 previous studies that revolved around teachers' readiness to use augmented reality technology, 6 studies focused on the readiness of usability aspects. Among the studies are Rheaume (2020) that discussed on teachers' support in creating e-learning activities, while Daley (2020) study connected technology to the environment through storytelling. Next, the study of Dwiyanti et al (2021) focused on augmented reality technology as a new technology to solve problems and effective teaching strategies to teach students. Research by Kultsum et al (2021) also reviewed the level of acceptance of technology in education. With the help of the latest technology applications, students can provide instant feedback thereby allowing them to have ample opportunities to demonstrate their achievement. Next, Alfadil (2017) supported the implementation of learning using 'virtual reality'. This study is supported by Rahman-Shams (2019) where the paper discussed that 'virtual reality' technology gives benefits and effects to teaching and learning in this century.

Next, attitude refers to the form of thinking, feeling and response to individuals and groups. In other words, the concept of attitude can be used to explain the degree of consistency of a person's behavior because the individual's behavior is based on his/her attitude. Based on the last 6 studies, Wijnen et al (2021); Kearney et al (2014) have identified the attitude and acceptance of teachers in using technology in teaching. This study is supported by Zhang et al (2021) who also reviewed the factors that influence teachers' attitudes towards technology. Their study also showed a positive attitude towards the integration of augmented reality in foreign language teaching (Manna, 2022), in contrast to Yildiz (2022) which examined the importance of digital use in developing training. The study of Gray (2019), on the other hand focused on teachers' acceptance of technological change and its application in education.

In addition, the study of teachers' readiness also examined the aspects of skills. Skill readiness is defined as the willingness of users to adapt and use technology to achieve objectives especially in teaching. Among the 8 studies linked to the readiness of skills among teachers is Shah (2022) study on the need for teachers to have skills and expertise in content and pedagogical knowledge to integrate technology effectively. The study of Amin et al (2019) emphasized that teachers should be given the resources and training facilities to use technology in the classroom. This is supported by Yusria and Goodwin (2015) findings which mentioned that providing teachers with enough technology skills will increase teachers' confidence in the curriculum at school. Freeman (2021) also found that teachers' involvement in professional development will increase their motivation to use technology education, as well as having the skills to educate students in the 21st century. The study of Caminiti (2019)

also identified that the teaching framework provides teachers with the advanced skills needed to integrate technology into certain lessons as well as how the use of technology tools can affect learning (Adams, 2020). Meanwhile, Rahman-Shams (2019) confirmed that interaction in technology, pedagogy, and content can contribute to knowledge by teachers when applying this technology.

Augmented Reality Perspective in the Study of Foreign Language Teaching

According to Manna (2022), augmented reality provides an experience of interaction between humans and computers virtually in real time and conditions. With today's technological facilities, the application of augmented reality has been expanded into the education and teaching system in schools (Rahman-Shams, 2019) which allows schools and teachers to take the opportunity to make the teaching process more effective and enjoyable (Alfadil, 2017).

Among the augmented reality perspectives that have been mentioned a lot in previous studies is the role and potential of augmented reality technology in education (Manna, 2022). Augmented reality provides a combined interaction between real and virtual environments that cannot be done and achieved in other virtual environments. The uniqueness of augmented reality is the ability to generate virtual objects or information on the real-world environment (Philippe et al., 2020). For example, one of the ways to bridge the gap between the virtual world and the real world is through augmented reality books. A person reading an augmented reality book with the help of a web camera will be able to see three-dimensional animation directly from the pages of the book. Therefore, augmented reality books have great potential to provide students with an interactive learning environment. Augmented reality systems can help students describe abstract science concepts or phenomena that are difficult to see and observe such as astronomy, air flow, magnetic fields, or spatial relationships between chemical structures (Dwiyanti et al., 2021). It also helps the teaching process for subjects where students cannot do it in the real world.

Therefore, the advantages of augmented reality have the potential to help visualize abstract concepts, so it can directly improve students' understanding. Augmented reality is also often associated with a sense of presence and direct experience (Kearney et al., 2014) and immersion. Augmented reality can provide a mediated space that gives users the feeling of being in the same place as others. This sense of presence can also increase the users' sense of involvement among the user community itself.

Other than that, Kultsum et al (2021) although did not only focus on the study of augmented reality, mentioned that in an effort to design and develop technology, teachers should be encouraged to increase their knowledge in the use of technology to support teaching and learning. This finding is also supported by Caminiti (2019) which suggested that it is nevessary for teachers to develop the use of technology in teaching and learning. Adams (2020) identified the use of learning tools that can influence students while Gray (2019) reviewed the perception of teachers who participate in the integration of technology into the classroom.

Furthermore, the aspect of attitude is also identified in the perspective of technology even if it is not augmented reality technology in particular. For example, the study of Wijnen et al. (2021) which surveyed teachers' attitudes towards the use of technology while the study by Zhang et al (2021) studied the factors that influence teachers' attitudes towards student-centered technology integration. However, according to Jenkins (2021), there are many challenges to integrate technology and train the teachers to have 21st century technology

skills. Among the challenges is in adapting the teachers to the progress of the modernization era, especially in using more modern tools during their teaching. Apart from that, there are a few teachers who do not use technology in teaching because of the lack of knowledge in searching for the necessary data through the internet. This point is supported by Freeman (2021) which mentioned that skills in using technology are always influenced by practices and attitudes impacted by the current environment.

However, with augmented reality technology, teachers can improve two-way interaction skills between themselves, and students as proven in English language teaching studies (Amin et al., 2019; Erdogmug et al., 2021). Freeman (2021) also examined the evaluation of the use of technology and the effectiveness of learning using technology. In a study by Kearney et al (2014), the use of pedagogical methods in mobile teaching was identified. Pedagogy includes online learning, blended learning, distance learning, face-to-face, web-based learning, computer-aided instruction, individual learning, network learning, and interactive learning. Currently, mobile teaching or mobile learning using mobile learning tools such as mobile phones, laptops, tablets, and other delivery mechanisms are the main tools for e-learning (Caminiti, 2019). There are also factors that influence acceptance to use mobile learning tools according to (Zhang et al., 2021). Among them are human factors (performance expectations, effort, and attitude), organizational factors (social influence and top management support) and technological factors (conditions of facilities, security, and privacy and system quality). The summary of the research findings is as below.

Next, Table 5 below shows a summary of the study's findings:

Table 5

Summary of research findings for 21 selected systematic literature highlight articles

No.	Research	Title	Objectives	Methodology/Sample	Results
1	Manna (2022)	Teacher's Perception about Execution Augmented Reality for Teaching Italian Language as a Foreign Language: A Pilot Study	To explore perception of language teachers Italy when involved in their process form and implement augmented reality application	Observation and partial interviews structured to 13 of teachers' language	Pilot studies show augmented reality has potential to increase student motivation. However, initial findings emphasize the need for long-term training which is ongoing for teachers and the need for open source and

					platforms specifically designed especially for teachers' language.
2	Dwiyanti et al (2021)	Investigate teachers' perception of augmented reality as an interactive media for learning science	For knowing teacher's perception to augmented reality as an interactive media learning science that can stimulate students' desire and enthusiasm especially in the era of learning Covid-19 where learning is limited.	Questionnaire to 10 secondary school teachers.	Findings show that the intermediate level used in science learning, knowledge of augmented reality, has an average score of 70 with excellent category, 83 with an excellent category, 62 with a good category and 80 with an excellent category. By applying augmented reality to science learning, it is able to foster students' enthusiasm and motivation to create an effective learning environment.
3	Yeni (2018)	Effects of training century skills 21st	To show whether	Quasi-experiment as well as interviews	The results of the study

		against teacher's perception foreign language about educational technology efficiency development material.	designed material form 21st century skills teacher training and teacher development professional increase perception programme foreign language about educational technology and competence development their material.	structured involving 33 teachers.	show exercise that skills are found to be useful for developing teachers' perceptions of educational technology and efficiency the development of their teaching materials against the vanity of the century of the 21st.
4	Alfadil (2017)	Game effectiveness augmented reality in acquisition foreign language vocabulary.	To build a role augmented reality game in enhancing foreign language vocabulary skills students.	Quasi-experiment on 64 students randomly divided into group experiment and control.	Findings from the independent students who use augmented reality games have good vocabulary acquisition achievements compared to using traditional methods.
5	Shah (2022)	Technology, pedagogy and knowledge content (TPACK) for the teacher's foreign language for students' adults	To determine any relationship between three factor model TPACK and the effects of age and gender foreign	Questionnaire to 426 teachers' foreign language who teaches adult students.	The results of the t-test show that foreign language teachers have a good level of technology,

			language teacher who teaches in education level secondary.		pedagogy and content knowledge for using technology.
6	Zhang et al (2021)	Investigate factors which affecting teaching technology information and communication inner teacher integrate a behaviour in the direction of renewal “student centered learning” using structural equation models.	Investigate factors which affecting transformation continuous method teaching technology information and teacher communication.	Questionnaire to 795 teachers in primary and secondary schools.	We will find the social environment impact no directly on behaviour towards the application of the technology mediation of teacher efficacy and expected results. Both types direct self-efficacy influence behaviour student-centered ICT application compared to the behaviour of the application teacher-centered ICT. Behaviour student-centered ICT applications have a significant impact on application behaviour teacher-centered.

7	Rahman-Shams (2019)	Effect 3D Augmented reality technology towards learning: Qualitative Research	To explore the teacher's using augmented reality and its effect experience education.	Questionnaire and interviews against 21 of experienced have teachers teach 2 year or more.	The findings of the study show that of views of 3D tools can make 21st century learning more effective where teacher knowledge is obtained through student collaboration.
8	Amin et al (2019)	Exploring use of the application as teaching aids for teaching and learning English as a foreign language: An action study towards teacher's perception	To explore teacher's perception of the use of technology as learning aid. To improve teaching methods.	Survey and observation towards several teachers.	Study shows that technology very good to apply in class and teachers agree to integrate more technology usage in their teaching.
9	Wijnen et al (2021)	Teacher's attitude Primary school towards technology usage and boost skills high level thinking on student: A study on literature research	To get description of that factor form an attitude school teacher low against usage technology for stimulate thinking thoughts high level	Observation towards 78 articles and document	The study found that there are 9 factors related to the teacher's attitude primary school against the use of technology in their teaching and 4 factors related to

					the teacher's attitude primary school against stimulate higher level thinking.
10	Rheaume (2020)	Institutionalization learning deep long distance teaching language in research university	Study how language department, mostly from the Faculty of Arts in a research university can integrate distance learning in teaching language.	Observation against 6 teachers department language	The results show that there is a need to balance organizational culture in the department language. Even if it doesn't seem like it the comfort expressed by the faculty in the current organizational culture, the department that not been yet able to adapt to 20th century institutional 21 context.
11	Jenkins (2021)	Execution replacement and model school teacher low as well redefinition modification in among teachers	To explore practice teacher's teaching based current technology based on model replacement, addition,	Observation and interviews of 12 primary school teachers.	Results found a review of models and methods for improve teachers' teaching practices to be at a better

			modifications and model redefinition.		level. This study also encourages change positive social by providing opportunities professional development technology-based for teachers in local district that encourage them to use technology resources for student engagement and transform student learning.
12	Freeman (2021)	The teachers at New Orleans; perception belief and practice about progress professional in technology	Identify teacher experience and perception against needs and experience progress professionals as well activity instructional and technology education.	Interviews 10 teachers in secondary school in New Orleans, Louisiana.	The study found the perception, teachers' beliefs and practices have connections in professional development that increase motivation for using technology education, skills for educate students for the 21st

					century and knowledge. Progress professional enable teachers to develop new skills in addition to honing their old skills.
13	Daley (2020)	Teacher, games and sandbox: Case studies collective about teacher's perception against games education-based storytelling	To investigate teacher's perception about narration based educational game. To identify how teacher motivated to involve students in their class.	Semi-structured interview towards 13 teachers and document analysis (example: plan teaching journal entries, project).	Emphasizing qualitative findings teacher's perception of how personal influence them. The teachers also showed that role, cooperation and choice are three components that lead to motivation and involvement. Finally, teachers states that the game not implemente d based storytelling because it conveys content explicit education with traditional, paper-based assessments

					such as the test choice may not be accurate for learning assessment.
14	Philippe et al (2020)	Teaching various methods, learning and training in augmented reality: A review and case studies	For emphasize application teaching and training that mule based on reality healed as pedagogical strategies designed, mapped and described through elements and design features 'virtual reality' which different.	Observation towards 11 case studies industry	The results of the study found reality the technology is overgrown good that can be used for collaborative or individual activities by distance of physically on any process step learning that is knowledge, practice, feedback the assessment. In addition, between 3 types of tools main based on augmented reality is: game for example mostly for soft skills training, the simulation mostly for learning and collaboratio n reality overflows to understand

					innovation content and for facilitate interaction between distant students.
15	Kearney et al (2014)	Investigate acceptance teacher against pedagogy mobile	For investigation how is the teacher using features pedagogy learning mobile: cooperation, personality and real	Survey towards 107 teachers' school	Finding shows perception teachers against the use technology is high but aspects of online collaboration, networking and student relationships which is evaluated to be found to be lower than expected, given the technique presentation of the language improved and opportunity flexible learning that provided by mobile technology. Ease of teaching tools available is as an influencing

					factor adoption of mobile pedagogy.
16	Kultsum et al (2021)	Participation technology in teaching and English learning: A case study at Madsarah Aliyah in Indonesia	To survey how school take advantage of teaching process and learning English and how school connect technology in teaching and system learning.	Interviews of 16 teachers	The study found simple technology transfer is important to support teachers and students in accessing learning resources. However, both the school provides the different to use mobile technology. Madrasah Aliyah that has the lowest loading shows the level of mobile device low usage because the school is not have a guidebook adequate expansion. Meanwhile, Madrasah Aliyah who have a achievements that well tend to use the technology

					to improve the system learning.
17	Yildiz (2022)	Teacher education digital process transformation in Cyprus North: Study situation analysis	To know definitely the level of teacher education and teacher competence in the process digital transformation.	Observation documents and survey literature	The study found that the teachers have seriousness and ability in the digitalization process which is effective in ensuring the quality in education is always at a good level.
18	Grey (2019)	Teacher's perception private school North Carolina against execution 'bring your own device' as experience life: A study phenomenon	To understand teacher's perception private school North Carolina against implementation programme 'bring your own device' as experience life	Journal, survey and interviews educator regularly individual from school private North Carolina	Based on the study, teachers find students give positive response to the 'bring your own device' programme. In addition, the teacher is supportive professional development which it is indispensable in educators. Teachers too agrees that online courses training are held for free for specific subjects seen as very

					important and useful to students. Increased concentration in class has a very positive effect to the student experience.
19	Caminiti (2019)	Research phenomenon about the teacher which joins 1:1 appliance computer	To survey teacher experience who participate in the 1:1 programme appliance computer that provides every student with a laptop.	Interviews partially structured to several teachers.	This study explains that classroom teachers have constraints to technology, changes in their pedagogy, and improvement in professional development related to technological devices and software. Overall, the participants in this study have a positive experience with the device computing programme.
20	Adams (2020)	Usage and school teacher management secondary against digital equipment in	To explore method teachers, use digital equipment as a learning tool	Survey, interviews semi structured against 16 teachers and observation class.	This study found that teachers use digital devices in a way that

		room level: Study case comparison	as an instruction, a teacher's method manage usage devices and means teacher's perception against device use for learning student affecting. This device method is used in teaching.		they can encourage students to exploring the curriculum, student involvement in learning found to increase and satisfying.
21	Erdogmus et al (2021)	Scale formulation technology for teacher (TFS): Development and validation	To develop validity and reliability scale formation technology for measure knowledge technology. The content which component main knowledge technology pedagogy content.	Survey towards 672 teachers working at the Malaysian Ministry of Education and 84 teachers who are studying at which university located in Black Sea Region, Turkey.	As a result of the validity and reliability analysis, the scale has a 4-factor structure for example 'content developmen t, 'problem solving' and 'creativity' under the main heading production and thinking productive. Although the reliability value of the overall scale is .972, the respective factor values are .972, .973, .937 and .850.

Discussion of the Study

Through teachers' knowledge of augmented reality technology, teachers' willingness to use augmented reality technology and foreign language teaching from an augmented reality perspective, the development trend of AR technology can be seen. The teacher's knowledge that has been explored may continue to be studied more widely so that the information can be added. In line with other available technologies, teachers' willingness to use various technologies also varies according to the progress and development of current technology. Therefore, more studies can be expected on the knowledge and readiness of teachers from a technology perspective, especially augmented reality technology itself.

From the systematic literature review, the presence of augmented reality technology reinforces existing conventional learning approaches. Although this technology has long been applied in other fields, it has also been applied in teaching foreign languages such as teaching Turkish (Alyousify & Mstafa, 2022) and English (Huertas-Abril et al., 2021). Augmented reality technology has sophisticated and interesting features that allow users to interact in real time with three-dimensional virtual objects as if they are holding the real objects. Not only the use of AR technology will attract the attention of teachers, but it is also believed that this technology will attract students' interest during the teaching and learning process. This point is proven in the findings of Rahman-Shams (2019); Manna (2022); Dwiyanti et al (2021) that three-dimensional type of tool can make 21st century learning to be more effective where teachers' knowledge is gained through collaboration with students. Among the 3 main types of tools based on augmented reality are games which are mostly for soft skills training, simulations which are mostly for learning, and augmented reality collaboration to understand the content of innovation and to facilitate interaction between distant students (Philippe et al., 2020).

In addition, Zhang (2021) explained that the use of augmented reality to be integrated into the curriculum is still unclear and no studies have been made on how the use of augmented reality can improve students' speaking and listening ability in foreign language learning. His study also found that the use of augmented reality still has many improvements to be made and is still considered as difficult to use by teachers because its development is more about the use of augmented reality for the public, and commercial concept. This point is proven from the study of Freeman (2021) that the perception, belief, and practices have a relationship in professional development that increases the motivation to use educational technology as well as to have knowledge and skills to educate students in the 21st century. Therefore, this professional development allows teachers to develop new skills while honing their old skills.

However, Bolado (2017) study found contrary result in the use of augmented reality application in the teaching of Spanish language. Although augmented reality technology is recognized to be easy to use, there are a few teachers who may find it difficult to produce their own augmented reality applications for teaching and learning. Therefore, the need for an augmented reality authoring tool that is simple, user-friendly, and less technical according to the needs of teachers is important to enable the development of the optimal use of this technology in education, especially in Malaysia. Apart from that, studies from literature highlights such as Amin et al (2019) found that technology is very good to be applied in the classroom provided that teachers agree to integrate more technology use in their teaching. This shows that teachers have seriousness and ability in the digitalization process which is effective in ensuring that the quality in education is always at a good level (Yildiz, 2022).

Thus, with the knowledge and readiness of teachers towards this technology, it can help teachers take advantage of augmented reality technology in teaching and learning (Bolado, 2017). A variety of styles and creative teaching allows access to information through different devices, thus resulting the teachers to produce different materials for different situations. The findings of Zhang et al (2021) proved that the social environment has an indirect effect on teachers' behavior towards technology application through teachers' competency and expected results. Both types of self-efficacy directly influence student-centered ICT application behavior compared to teacher-centered ICT application behavior. Student-centered ICT application behavior has a significant impact on teacher-centered ICT application behavior.

Developments in the field of teaching and learning of foreign languages mainly allow teachers to develop new skills in addition to honing and improving skills in the classroom. As mentioned in the study of Wei et al (2021), there are no teaching media that are better than the rest, as the teaching media have their own advantages in representing objects, facts, ideas, processes, human activities, character models, spatial relationships or in the development of motor skills. According to Perry (2015); Alyousify & Mstafa (2022), the combination of several strategies in the use of teaching media is very helpful in achieving more effective teaching objectives. Therefore, with the knowledge of the advantages and uniqueness of augmented reality technology, the method is found to be interactive and interesting in foreign language teaching. Thus, Shah (2022) proved in his findings that the results of the t-test show that foreign language teachers have a good level of technology, pedagogy, and content knowledge to use technology in teaching.

Recommendation for Further Study

The findings of this systematic literature review on the study of foreign language teaching by using augmented reality suggest that future researchers can also conduct studies on augmented reality technology in teaching other foreign languages too. This systematic literature review has also shown that aspects such as teachers' knowledge and willingness to use augmented reality technology greatly help teachers to have skills in using technology to meet the goals of Industrial Revolution 4.0. In addition, the researchers also suggest that the study of augmented reality should also be applied to Arabic subjects in order to attract the interest of teachers to apply technology in the teaching of Arabic.

In addition, this study also recommends a separate search for articles in journals related to education and learning. By limiting the review to education and learning journals, the results are hoped to be more relevant, focused, accurate and in line with the education of the issue being studied. Therefore, this study can be used not only as a reference, but also opens space and suggestions for the next researchers to conduct a better systematic literature review or a wider scope, for example a more diverse journal database and more significant research questions.

Conclusion

This systematic literature review selected past studies that revolve around foreign language teaching, especially from the perspective of augmented reality. A total of 21 previous studies have passed the screening of the PRISMA protocol and were selected according to a systematic methodology. This collection of studies based on the systematic literature review method provides a review from a significant angle such as teachers' knowledge of augmented reality that has been studied, teachers' willingness to use augmented reality, and the

perspective of augmented reality in the context of foreign language teaching. The teacher's knowledge that has been studied in the study of foreign language teaching found in the highlights of the systematic literature is technology, pedagogy, and content knowledge. Next, teachers' willingness to use augmented reality technology is also dominated by aspects of usefulness, attitude, and skills. The perspective of augmented reality in the study of foreign language teaching in this systematic literature highlight is seen to be dominated by the aspect of technological capability, potential, and a critical view of technology acceptance. The systematic literature highlights of foreign language teaching from the perspective of augmented reality do not only provide an overview and reference to the field of language but can also be a starting point for research from the perspective of related fields such as other technology studies.

Theoretical and Contextual Contribution

From the aspect of theoretical contribution, augmented reality technology is important to improve teachers' existing knowledge of technology. This is because teachers can find solutions toward student problems who are weak in learning. Besides, from the aspect of contextual contribution, augmented reality technology plays an important role in education. This can be seen when augmented reality technology is able to help teachers for effective teaching and learning purposes. In fact, augmented reality technology has the potential to be teaching aid with an attractive 3D design, helping to explain difficult concepts to students and making it easy for students to understand the explanation that teacher wants to convey. Therefore, teachers need to have the skills to use augmented reality technology in line with the progress of industrial revolution 4.0 to apply in teaching and learning.

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