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Primary Teachers' Perspectives on Using Artificial Intelligence Technology in English as a Second Language Teaching and Learning: A Systematic Review

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Abstract
Artificial Intelligence in Education (AIEd) is an emerging education field. This paper explicitly investigates the use of AI technology in language learning specifically in English as a Second Language (ESL). As a robust cloud-computing solution, AI-powered technology can be used to aid teaching and learning processes and improve language learning. While students' perspectives on AI-related research are prevalent, teachers' perspectives are not extensively discussed. In addition, studies on the effects of AI technology in ESL primary education, are understudied. Using two databases, namely Google Scholar and the Educational Resources Information Centre (ERIC), 12 articles related to the use of AI technology in ESL teaching and learning in primary schools were extracted out of 672, from 2019 to 2022 by using the PRISMA review methodology. Teachers' perspectives were discussed based on the effectiveness, convenience, motivation and challenges. It is found that teachers perceived the integration of AI technology positively due to its dynamic characteristics and effectiveness despite facing various challenges resulting in disadvantages associated with its use. This paper explores AI technology's impact on ESL primary education from the perspective of teachers as curriculum stakeholders. Future research should delve further into the challenges that impede the use of AI technology in ESL primary education. This is essential for sustaining the momentum of AI-powered education.
Keywords: Artificial Intelligence, AI in Education (AIEd), English as a Second Language, Primary Education, Teachers' Perspectives

Introduction

AI-driven technology has seen a breakthrough in application worldwide in parallel with the Fourth Industrial Revolution (IR 4.0). The digital age has opened up various eminent opportunities through big data. The massive data are generated through digital applications, tools, platforms, and people communications across the world (Luan, et al., 2020). AI is the machine ability to imitate humans' abilities. Luan, et al (2020) further adds machine learning is able to give solutions, predictions, and insights tailored to the individual's situation and

needs. The advancement of artificial intelligence (AI) technologies is prevalent and booming throughout all fields of life including education. Chen et al., (2020) opine that the advancement of AI technology has significantly impacted the educational setting where both teachers and learners are utilizing various applications and tools such as the tutor robots, adaptive learning systems, and smart tutoring systems. Teachers are able to select a wide array of educational AI technology based on the learners' learning needs.

AIEd has greatly impacted the current learners' language learning trends. According to Hameed and Hashim (2022), technology used in the teaching and learning process provides lots of benefits and increase the students' interest in learning. The advent of AI technology can be utilized to assist the educational process in myriad ways. Thus, in order to incorporate technology in English classrooms, the teacher's role is very important for it to be successful (Razak et al., 2018). AI technology has great potential that can contribute to students' achievements in language learning.

Despite the abundance of studies on AI technology, there are less studies on the impact of AI in English as a Second Language (ESL) primary education. Correspondingly, most studies discuss the impacts from the perspectives of the students, and less emphasis is given to teachers' perspectives. Studies showed that the teacher is the educational process's fundamental part (Barakina et al., 2021). This is because the effectiveness and the integration of technology in classrooms is highly influenced by teachers' attitudes and beliefs (Johnson et al., 2016). Hence, it is crucial to address the impacts in integrating AI technology in teaching and learning process from the teachers' perspectives as teachers are one of the main stakeholders in curriculum implementation at school. The findings of this review will further discuss the impact of using AI technology in language learning specifically for ESL learners in primary education from teachers' perspectives. The results from the reviewed articles will be discussed in detail followed by a conclusion to summarise the research objectives. Further explanations are discussed on the ESL primary teachers' perspectives on using AI technology in the English educational process.

Literature Review

A. Artificial Intelligence in Education (AIEd)

Big data has transformed AI into a powerful artificial neural network (UNESCO, 2020). Song and Wang (2022) pointed out that the significant contribution of AI in education is the result of the emergence of machine learning and big data over the past two decades. Gradually, the world is gearing up towards AI-powered education where learners are able to explore beyond borders, access resources openly, and choose their learning autonomy in adaptive learning. The application of AI technology also has garnered favourable reviews from many fields of study including language learning due to the dynamic, flexibility, and advantages to teachers and students. The students nowadays are the millennials called the 'digital natives' Prensky (2001) where they can easily get access to various technology and massive data and information. Technology has created a significant influence on individuals' learning experiences (Jaiswal & Arun, 2021). It caters to diverse students' needs and increases competitiveness in education globally (Talan, 2021). Kent (2021) further adds that AI technology is able to integrate real-time content to the learning pace, needs, and preferences. Thus, teachers are expected to equip themselves with technology literacy and ICT skills to

provide the students with better learning experiences and outcomes. The use of technology in education specifically, is inevitable and essential.

B. AI-powered Technology for English as a Second Language (ESL) learning

English has become a global language and widely used for communication level internationally (Visaltanachoti et al., 2021). In many countries like Malaysia, Sweden, and Denmark, English is learned as a second language. Due to the global market demand and economic spurt, the learning of English as a Second Language (ESL) learning is increasing (Rahman, 2020). Thus, in order to assist ESL learning effectively, AI technology can be utilized to enhance and improve the educational process of language skills. According to Yunus and Salehi (2012), integrating technology in the teaching of ESL is in trend in the current education field. According to Tsourapa (2018), as students are actively learning new knowledge and skills, technology such as the online tools and platforms, smart whiteboards, and the internet has become a requirement in ESL classrooms. There are many studies in the past related to the use and the potential of AI technologies in education and teaching of ESL such as virtual classrooms, language skill simulation, education games (Tajeddin & Alemi, 2020; Anak Yunus & Tan, 2021; Fahmi & Cahyono, 2021). Teachers also have been using AI for assessment purposes and to track students' performance (Miranty et al., 2021; Jong & Tan, 2021). The massive use of AI technology has seen a great shift in the current learners' language learning trends.

Aims of The Systematic Review

This study will highlight the application and the impact of AI technology, to enlighten the potential AI technology has as an educational assistant to enhance the English language learning experiences and outcomes. In order to identify and understand teachers' perspectives on the utilisation of AI technology in ESL and the impact on English teaching and learning in ESL primary school, this review was conducted to answer the research questions as followed.

1. What are teachers' perspectives on the impact of using AI technology in the teaching and learning of ESL in primary school?
2. What are the challenges faced by teachers in using AI technology in the teaching and learning of ESL in primary school?

Methods

This systematic literature review adheres to the method of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist. It consists of four phases, known as identification, screening, eligibility, and exclusion. PRISMA is selected as it improves transparency in systematic reviews. This paper will further explain teachers' perspectives on the impact of utilising AI technology in ESL primary classrooms.

A. Phase 1: Identification Phase

Two databases were used to collect the articles which were Google Scholar and the Educational Resources Information Centre (ERIC). The range of search was limited from the year 2019 to 2022. Google Scholar provides a convenient search for scholarly literature from many sources and disciplines. Meanwhile, ERIC provides education research and information

from a comprehensive digital library. The search string and keywords used to search for the articles are summarized in Table 1 below.

Table 1
Keywords and search string for article selection.

Databases	Search String/Keywords
Google Scholar	Artificial Intelligence tool AND ESL primary school, Artificial Intelligence Technology AND ESL primary teachers' perspectives
ERIC	Artificial Intelligence tool AND ESL primary school, Artificial Intelligence technology AND ESL primary learners, Educational technology AND ESL primary learners, Artificial Intelligence Technology AND ESL primary teachers' perspectives

*: Search String

B. Phase 2: Screening Phase

In the screening phase, any duplicates from both databases were eliminated. The remaining articles were screened again by title, abstract, and keywords to ensure that the articles fit the criteria needed by the researcher. In order to get a more precise search result, additional information which consists of the inclusion and exclusion criteria was included as guidelines to search for articles as seen in Table 2.

Table 2
Inclusion and exclusion criteria.

Criterion	Inclusion	Exclusion
Type of article	Journal articles	Book, book chapter, proceedings
Language	English	Non-English
Year	2019-2022	<2019
Peer review	Peer-reviewed	Non-peer-reviewed
Methodology	Mixed method	Quantitative, Qualitative
Perspective	Teachers	Students, parents

C. Phase 3: Inclusion and Inclusion Phase

The excluded articles included those that were not journaled articles and were from years before 2019. Other excluded criteria were Non-English-language articles and non-peer-reviewed articles. Other than that, any types of qualitative and quantitative research articles written based on students and parents' perspectives were also excluded. Figure 1 shows the entire research article selection process according to the PRISMA (2020) review methodology. All the research articles used are summarized in Table 3.

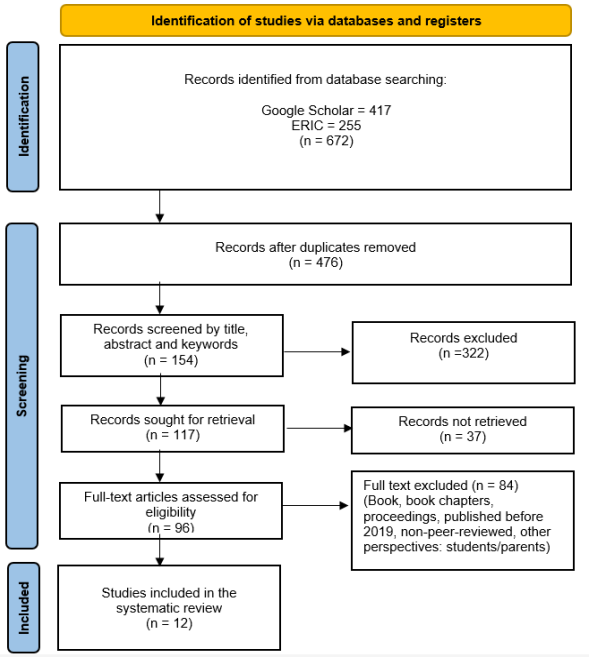


Figure 1. Flow of selection process of the research article (PRISMA, 2020)

Table 3
Summary of the selected studies.

Study	Database	Aim	Samples	Findings
Gu et al (2021)	ERIC	To explore the improvement of the English ability of elementary school students by the ABRA project	956 students in 24 classes from Grade 1 to Grade 3 of Ganyu Huajie Bilingual School in Lianyungang City, Jiangsu Province	The study results found that ABRA software teaching positively affects students' English, especially phoneme awareness.
Chai et al (2021)	ERIC	To measure behavioral intention to learn AI	682 primary school pupils	Positive behavioral intention
Ting & Tan (2021)	ERIC	To examine the effectiveness of Google Translate in English language vocabulary.	15 primary school pupils with low English language proficiency from rural schools	Google Translate enhances learners' English language vocabulary.

Yunus & Tan (2021)	ERIC	To explore the effects and influence of Quizizz in enhancing young Malaysian ESL learners learning of irregular English verbs.	30 primary school pupils	Quizizz is not only enhancing English irregular past verbs. spark interest and passion to learn English language.
Tzagkourni et al (2021)	ERIC	To explore the effect of ICT instructional approach to learn English Alphabet.	Second grade primary school Greek students	Enhance the learning of English alphabet letters.
Teng (2019)	ERIC	To investigate the effects of captioned videos on ESL primary school students' comprehension of video content.	182 primary school students	High English proficiency learners achieved better comprehension scores compared to leaners with lower level of English proficiency.
Sumakul et al (2022)	ERIC	To investigate how teachers perceive the use of AI in their EFL classrooms.	Four EFL teachers	Positive perceptions from teachers.
Chen & Chen (2019)		To examine English listening comprehension performance through VALRM using Youtube with a self-determined listening review	9 Grade 8 students aged 13–14 years old	Enhanced listening comprehension performance.

		mechanism (SDLRM).		
Tai & Chen (2021)	GOOGLE SCHOLAR	To investigate the impact of MVR on EFL learners' listening comprehension.	72 seventh graders	Enhance listening comprehension and memory retention
Jong & Tan (2021)	GOOGLE SCHOLAR	To assess students' writing skills.	70 level two teachers from national primary schools.	Relevant to the new pedagogical tool in writing assessment for the current generation of students.
Yuk & Yunus (2021)	ERIC	To investigate the effectiveness of an online peer-feedback strategy using Edmodo at the pre-writing stage to improve pupils' writing performance.	36 Primary 4 respondents from a Chinese-vernacular school.	Showed significant improvements in content quality of writing.
Taghizadeh & Yourdshahi (2019)	ERIC	To examine the attitude, knowledge, use, and challenges of English teachers of young learners to integrate technological tools into language classes.	95 English language teachers for young learners in language institutes and schools.	Limited computer facilities, teachers' lack of skills, and lack of support from schools and institutes were found to be the major challenges of using technology in young learners' classes

Results

In this section, the selected research articles will be further discussed. The selection process goes through three phases of selection process following the PRISMA review methodology.

12 research articles were selected to be used in this systematic review that fits the criteria of the respective studies. Based on the reviewed article, the teachers' perspectives on the impact of the application of AI technology on ESL teaching and learning in primary school were identified and categorized into three main aspects which are on effectiveness, convenience, and motivation. The 12 articles were summarized and tabulated according to the aspects as seen in Table 3.

Table 4
Teachers' Perspectives Aspects

Authors	Effectiveness	Convenience	Motivation	Challenges
Gu et al (2021)	✓	✓	✓	✓
Chai et al (2021)	✓	✓	✓	
Ting & Tan (2021)	✓	✓	✓	
Yunus & Tan (2021)	✓			
Tzagkourni et al (2021)	✓		✓	
Feng Teng (2019)	✓		✓	✓
Sumakul et al (2022)	✓	✓	✓	
Chen & Chen (2019)	✓		✓	
Tai & Chen (2021)	✓		✓	
Jong & Tan (2021)	✓	✓		✓
Yuk & Yunus (2021)	✓		✓	✓
Taghizadeh & Yourdshahi (2019)	✓		✓	✓

Table 5
Number of articles on teachers' perspective

Perspectives	Number of Research Articles
Effectiveness	12
Convenience	5
Motivation	10

Discussion

Teachers' perspectives on the impact of AI technology in teaching and learning of ESL will be discussed in this section to answer the research questions which are the teachers' perspectives on the impact of using AI technology in terms of effectiveness, convenience, motivation as well as the challenges teachers faced in using AI technology.

RQ1: What are teachers' perspectives on utilizing AI technology in primary ESL classrooms?

In order to answer the first research question, 12 articles were analysed and categorized to find the factors affecting the use of AI technology in ESL classrooms. Four main factors were identified which are in terms of effectiveness, the convenience of use, students' motivation toward learning and the challenges in implementation. All of these factors are discussed from teachers' perspectives.

A. Teachers' perspective on the Effectiveness of AI technology

The emergence of AI technologies has evolved education settings into AI-powered education and assisted teachers to produce better learning experiences and improved learning inputs and outcomes. Based on the review, all 12 studies discussed the effectiveness of AI technology in the teaching and learning of ESL primary education. This indicates that most teachers agreed that utilising AI technology in ESL teaching and learning is effective in myriad ways, given that it can help to create an engaging, exciting and active environment (Chai et al., 2021; Ting & Tan, 2021; Yunus & Tan, 2021; Sumakul et al., 2022; Tai & Chen 2021; Chen & Chen, 2019; Jong & Tan, 2021). AI technology possesses great potential to enhance and improve the quality of teaching and learning due to the big data, cloud computing functions, and machine learning that can be utilized to complement lessons. Studies also reported the effectiveness of AI technology in the ESL educational process (Gu et al., 2021; Chai et al., 2021; Ting & Tan, 2021; Yunus & Tan, 2021; Tzagkourni et al., 2021; Feng Teng, 2019; Sumakul et al., 2022; Tai & Chen 2021; Chen & Chen, 2019; Jong & Tan, 2021; Yuk & Yunus, 2021). It is proven that AI technology is useful in teaching and learning of language skills and areas such as listening (Ting & Tan, 2021; Chen & Chen, 2019), speaking (Sumakul et al., 2022), reading (Gu et al., 2021; Feng Teng, 2019) writing (Tai & Chen, 2021; Jong & Tan, 2021; Yuk & Yunus, 2021), grammar (Yunus & Tan, 2021), and vocabulary (Ting & Tan, 2021).

In addition, AI technology is also effective at promoting pupil-centered learning and peer assessment (Ting & Tan, 2021). In research conducted by Yuk and Yunus (2021), it was identified that using AI-based platforms in writing activities improved the content quality and provide better clarity in generating ideas for writing through peer feedbacks. Sumakul et al., (2022) also found that AI technology enhanced motibvation and boost their confidence in using English. It is discovered that teaching using AI technology can improve students' ability in learning English effectively (Gu et al., 2021).

Other than that, AI technology also helps to retain memory due to the versatility, access to authentic materials, and multimodal learning that attracts pupils' attention (Gu et al., 2021, Tai & Chen 2021). AI technology makes a great instructional tool (Tzagkourni et al., 2021) and conventional teaching aided with AI technology is able to enhance the cognitive capacity in pupils to achieve the learning objectives. The researchers discovered that the integration of AI technology had significantly enhanced and improved the learners' proficiency level. It can be deduced that the vast benefits of utilizing AI technology in the educational process showed that it is highly effective for both teachers and pupils.

B. Teachers' Perspective on the Convenience of Using AI technology

Due to the constant development of AI technology, over time, it has been developed with smart and feasible functionalities. AI technology has garnered positive reviews for its convenient, interesting, and innovative features (Gu et al., 2021; Chai et al., 2021; Jong & Tan, 2021). The convenience of use is important as a complex interface will cause anxiety and drawback in using technology. Studies showed that technology literacy highly influenced the intention of using technology and that lack of it may hamper the usage. In a finding by Jong and Tan (2021), the use of Padlet in writing was favourable due to the similarity of the application to that of sticky notes. It provided the teacher and pupils with a sense of familiarity and ease of use.

The feasibility to use the technology also encourages voluntary learning of language skills and facilitates the process (Ting & Tan, 2021). This is because prior knowledge of a particular system or application aids the learners to explore the learning materials which eventually leads to autonomous learning. When the pupils hold their learning autonomy, the teacher can act as a facilitator by providing the pupils with minimal supervision and the freedom to make decisions. AI technology can be regarded as a teacher assistant that complements teaching practices to provide the pupils for a better learning experience.

C. Teachers' Perspective on How AI Technology Motivates Pupils

As the current pupils are the millennials, the use of AI-powered technology is inevitable. They are exposed to and live with various technologies. Based on the review, it was evident that AI technology affected learners' attitudes toward learning. Teachers discovered that AI technology encouraged active participation and kept the pupils engaged in their learning process (Gu et al., 2021; Ting & Tan, 2021; Feng Teng, 2019; Sumakul et al., 2022). In a finding by Gu et al (2021) on phonemes learning showed that pupils were able to comprehend and retain important language content such as word memory links, syllables, and pronunciation of letters with minor errors with the help of technology used. This eventually generated positive attitudes and affected the pupils' learning perceptions toward the language learning process (Tai & Chen 2021; Chen & Chen, 2019; Jong & Tan, 2021). AI technology creates a dynamic and enjoyable learning process (Chai et al., 2021; Tai & Chen 2021) and this motivates them to indulge in the learning process.

AI technology sparks pupils' interest and motivation in English learning (Gu et al., 2021; Chai et al., 2021; Tzagkourni et al., 2021; Sumakul et al., 2022; Chen & Chen, 2019). Incorporating AI technology in the learning process strengthens the monotonous conventional class instructional strategies by creating excitement and boosting the pupils' confidence to participate in learning English (Tzagkourni et al., 2021; Sumakul et al., 2022). This is evident through a study by Gu et al (2021), where the pupils showed the willingness to improve their language abilities and presented syllable reflection and word pronunciation with significantly high sensitivity. The pupils also showed unprecedented mastery of the language skills learned. As the result, motivation helps to minimize the level of anxiety in language learning and pupils are more assertive and responsive towards the learning process.

RQ 2: What are the challenges faced in the application of AI technology in ESL primary classrooms?

D. Challenges in Utilising AI technology

A total of 5 out of 12 studies discussed the challenges in utilising AI technology in ESL. Among the challenges identified are class control, content distraction, teachers' burnout (Gu et al., 2021), learning gap between high and low proficiency pupils (Feng Teng, 2019), poor internet connection Jong & Tan (2021), lack of technology literacy and ICT skills (Yuk & Yunus, 2021; Taghizadeh & Yourdshahi, 2019), lack of infrastructure and support from the stakeholders and computer anxiety (Taghizadeh & Yourdshahi, 2019).

Based on the studies, it can be concluded that knowledge and skills in technology are the most common challenges in utilising AI technology. Teachers responded that this was because of a lack of exposure and training on technology. As a result, teachers find it difficult

to integrate technology in teaching and which can trigger computer anxiety (Taghizadeh & Yourdshahi, 2019). Teachers also were unable to commit to learning and adopting technology into their teaching due to the burnout from the workload (Gu et al., 2021). In the same study by Gu et al (2021) other challenges mentioned were in terms of class control and content distraction. Since AI technology comes in many forms such as tools, education platforms, and applications, the features attracted pupils' attention so much that it has the tendency to occupy them more with exploring the technology instead of focusing on the purpose and content of the lesson. This caused problems in class control when the pupils were too excited and triggered a commotion. Thus, teachers need to implement ground rules when using AI technology to keep the class in control and disciplined.

Most AI technologies need an internet connection to function. AI platforms and applications usually use real-time content. Hence, limited coverage will hinder accessibility to online AI applications such as Padlet, Quizizz, and other web-based applications and sites (Jong & Tan, 2021).

Another highlighted challenge was in pupils' level of proficiency (Feng Teng, 2019). There are many types of learners with different levels of intelligence and capabilities which affect their proficiency level. Feng Teng (2019) stated that the diverse pupils perceived the content and materials differently and it was reflected in how they responded to the assigned tasks. The objective of the lesson may not be achievable due to the difficulty in navigating the technology used. Given the technology inaptitude combined with the difficulty in learning English, this can actually lead to the learning gap between high and low proficiency ESL pupils.

Finally, lack of infrastructure such as laptops, computers and projectors may cause drawbacks in using AI technology as well. In order to give a sense of presence, pupils need to experience the AI materials themselves. However, limited infrastructures will not be able to cater to a big number of pupils at one time which is common in most classrooms. Teachers also stated that they are not fully equipped and supported technologically and pedagogically by the school and the stakeholders (Taghizadeh & Yourdshahi, 2019).

Conclusion

In conclusion, research articles has been reviewed and analysed related to the impacts of using AI technology in the teaching and learning of ESL in primary school from teachers' perspectives. Thus, the gap in the lack of information related to ESL teachers' perspectives in teaching and learning English has been fulfilled in this systematic review. The perspectives were discussed based on four aspects which are the effectiveness of using AI technology in ESL classrooms, the convenience of using the technology, the effect on pupils' motivation and the challenges in the implementation. The results show that teachers accept and embrace the integration of AI technology in the educational process as it provides both the teachers and learners with a wide array of advantages including improvement in language knowledge and language learning skills. It can be deduced from the reviewed articles that teachers perceive AI technology as an effective medium for ESL learning in primary school. AI technology has interesting, versatile features and offers multimodal learning experience to pupils. It can help teachers to reduce their workload and assist teachers to improve teaching practices and the learning inputs. It enables teachers to explain difficult concept and present the lessons according to the pupils' level of proficiency. AI technology also has the capacity to pique

pupils' interest and build motivation, encourage active participation, autonomous learning and collaboration in learning English.

However, teachers also faced challenges that might impact the integration of AI technology in their teaching and learning process. It can be deduced that the challenges vary depend on individual and situation. Some teachers pointed out external factors such as class control, content distraction, poor internet connection, pupils' level of proficiency and lack of infrastructure and support from the stakeholders whereas other teachers were affected by internal factors such as teachers' burnout, lack of technology literacy and ICT skills, and computer anxiety. Gradually, teachers are accepting the use of AI technology and its effectiveness. However, due to the various challenges, integrating the technology in the process might need some time to be implemented. Hence, it is important for all the stakeholders in education system to address the challenges and look further into the countermeasure to assist the teachers to incorporate AI technology in their lessons.

Challenges and Limitations

In order to further improve this topic, there were challenges and limitations that the researcher would like to improve on. This study only managed to review 12 research articles from two databases only which are Google Scholar and Eric. However, the researcher can look into research articles from other databases as well such as WoS and SCOPUS to strengthen the findings. Secondly, although the topic of ESL primary education and teachers' perspective make a great gap to be explored, it was undoubtedly quite difficult to find the related research articles. So, it is hoped that this systematic review is able to give more insight on this topic alongside with the current available findings. Other than that, initially the aims of this systematic review and the research questions are defined too broadly that the researcher was unable find the necessary gap to be discussed on. However, the researcher had done more reading and research on the topic and consulted opinions from experts for better clarification.

Implications and Recommendations

This systematic review has discussed on the current trend in education which is the AI-based education. In order to develop the understanding of AIEd, the teachers need to have a comprehensive understanding on the fundamental factors influencing the success of AIEd and one of the ways is to further explore on the applications of the AI technology as it is an integral part of AIEd. Despite the many advantageous benefits AI technology has for teachers and students, utilising and incorporating the technology are proven to be challenging to most. Teachers agreed that using AI technology serves its purpose as a teaching assistant due to the effectiveness and great impacts it has towards the teaching and learning process but the internal and external barriers challenges might hinder teachers to utilise AI technology and cause drawbacks in using AI technology instead. For future studies, the challenges on internal and external barriers that hinder the use of AI technology in ESL should be discussed further. This is crucial in order to sustain the dynamic of AI-powered education.

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