Systematic Review on the Role of Artificial Intelligence in Education

NoorAileen Ibrahim*[1], Ahmad Muhyiddin B Yusof[2], Sheema Liza Idris[3], Haslinda Md. Nazri[4], Farahidatul Akma Awaludin[5], Azurawati Zaidi[6], Nurul Munirah Azamri[7], and Nurdiyana Mohamad Yusof[8]

[1,3,7]Akademi Pengajian Bahasa Universiti Teknologi MARA (UiTM) Cawangan Perak, Seri Iskandar, 32610, Bandar Baru Seri Iskandar, Perak, Malaysia

[2]Akademi Pengajian Bahasa Pusat Asasi UiTM, Kampus Dengkil, 43800, Dengkil, Selangor, Malaysia

[4]Kolej Pengajian Seni Kreatif, Universiti Teknologi MARA Cawangan Perak, Seri Iskandar, 32610, Bandar Baru Seri Iskandar, Perak, Malaysia

[5,6,8]Akademi Pengajian Bahasa, Universiti Teknologi MARA (UiTM) Cawangan Perak, Kampus Tapah, 35400, Tapah Road, Perak, Malaysia.

***Corresponding Author**

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ABSTRACT

A systematic review was conducted to examine studies on the effects of Artificial Intelligence (AI) in higher education as a learning technology on ESL/EFL. To collect relevant data three databases, Scopus, Web of Science, and Google Scholar were explored. More than 200 studies on the topic under investigation between 2014 and 2025 were revealed after primary searches were conducted. However, 16 were retained for further analysis after analyzing abstracts and removing duplicates. To derive the benefits and issues of using AI in learning English a thematic analysis was conducted. The study revealed that AI has the potential to play a monumental role as a learning platform in improving the achievement of students while the only issues with using AI mainly revolved around external factors. Meanwhile, other aspects of AI usage in language learning, for instance different learning materials uploaded to it and whether different online learning platforms could yield similar results could be potential areas of research in the future.

Keywords: artificial intelligence, education, chatbot, systems, systematic literature review

INTRODUCTION

Modern education has been revolutionized by artificial intelligence (AI). Numerous teaching and learning activities have been supported by learning management and training systems which are dependent on AI algorithms and educational robots (Tang et al., 2023; Zhang & Aslan, 2021) . According to Zawacki-Richter et al. (2019) although certain AI tools have greatly assisted the T & L experience, prior studies indicate that early AI systems were limited in their ability to generate personalized learning content and thoroughly evaluate the performance related to complex cognitive processes. Wang (2021) stated that before the advent of generative AI in education, AI was mainly used to ease the tasks such as teaching and assessment tasks which comprise of intelligent learning systems and automatic scoring tools. Leh (2022) stated that Docebo, an AI-powered learning management system (LMS) possesses various AI capabilities to provide the necessary support for T & L activities which include personalized learning. In China, the national college entrance examination uses iFlyTek which provides intelligent assessment systems to cater to various grading scenarios (iFlyTek, 2024). According to Bicknell et al. (2023) Duolingo a popular language learning platform fully utilizes advance and sophisticated AI systems to further enhance the learning experience of foreign language learners. With the emergence of generative AI such as ChatGPT, the field of education has undergone a tremendous revolution (Costello, 2023). These AI tools are capable of handling complex tasks such as creative writing and programming. They are also

able to generate images and text which provides enhanced efficiency and flexibility in the development of personalized learning and content creation. Another powerful AI tool is DeepSeek which was released on January 10, 2025. The company also released its reasoning model, DeepSeek-R1, in late January 2025. According to Deng et.al (2025), several key factors, including innovative architectural designs, optimized training pipelines, and the strategic use of computational resources have contributed to the success of DeepSeek models. Educational institutions faced with resource shortages would greatly benefit from the high inference speed, low computational power consumption, strong task adaptability, and open-source features of DeepSeek.

It has become apparent that the past decade has seen the emergence of new technology. Technology has a tremendous impact on every aspect of life and particularly in the field of education which elevates the teaching & learning experience.

Much of the development experienced by society can be attributed to the role of technology and the way it greatly enhances the learning experience. As such, it is imperative to inculcate a mindset of embracing the use of technology and lifelong learning particularly learning to use new AI tools to assist and make life more efficient. Thus, it is crucial that the educators and the administrations realize this important requirement and start to take a concerted approach in ensuring that all learners regardless of background embrace the use of technology to be able to gain a competitive edge and become an invaluable asset to the nation shortly. It is a fact that AI is widely used in the workplace nowadays and knowing these AI tools will make individuals become employable in the future.

Hence, to gain a clearer picture of whether artificial intelligence plays a significant role in the field of education a systematic literature review will be conducted on the 16 research articles published by previous researchers. Based on the research question below, this study aims to determine the role of AI in the field of education. It is interesting to investigate whether AI does play a pivotal role in education and whether the use of AI has a significant influence on education and the learning process. acquisition process.

Hence, this study attempts to answer the following research question:

i. What are the benefits of AI in ESL/EFL learning?

According to Rainer et.al (2016) expert systems, neural networks (including machine learning and deep learning techniques), fuzzy logic, genetic algorithms, and intelligent agents are examples of AI technologies. According to scholars there are two categories of AI which comprise weak and strong AI (Wells, 2023). Weak AI can use algorithms to solve problems or reason for specific tasks, such as fraud detection and chess playing but does not have a full spectrum of human capabilities. However, strong AI possesses an array of human capabilities which comprise communication, reasoning, and emotional responses, and is capable of multiple tasks. Nevertheless, weak AI has been commercialised and currently developed. At present, to support teaching and learning activities comprising content preparation and dissemination, interactions and collaboration, and performance assessment AIED applications have been developed (Chassignol et al., 2018; Perrotta & Selwyn, 2020).

RESEARCH METHODOLOGY

This study employed the systematic literature review method. According to specific criteria as outlined by the research purpose mentioned above 16 articles from numerous journal databases were chosen for inclusion. Furthermore, it was decided that research from open-access peer-reviewed published texts or scholarly journals were going to be the used in this particular study. Besides that, the studies chosen were published between the years 2014 and 2025 limited to the past 11 years. Identifying the appropriate keywords that relate to the research was the initial stage of this systematic literature review. To generate a search using online databases such as ProQuest, Scopus, and Education Resources Information Centre (ERIC) were used to identify the required literature. After the identification of the corresponding studies was completed, a screening procedure was conducted based on the criteria that were already determined. To avoid any bias in the review process, the systematic review was conducted in an impartial manner devoid of bias.

Research Findings

Table 1 below is a summary of findings of this study.

Author & Year	AIED technology applications
1) Fryeret et.al, 2017	Personalized learning systems
2) Huang, Hew & Fryer, 2021	Personalized learning systems
3) Stohr, Ou & Malmstrom, 2024	Personalized learning systems
4) Xu and Wang, 2006	Personalized learning systems
5) Walkington Bernacki 2019	Personalized learning systems
6) Kose 2018	Personalized learning systems
7) Griol et.al. 2014	Personalized learning systems
8) Kelleher & Tierney, 2018	Personalized learning systems
9) Tang et.al, 2020	Personalized learning systems
10) Gubareva, R. and Lopes, R. P. 2020.	Intelligent Virtual Assistants
11) Sajja, R., Sermet, Y., Cikmaz, M., Cwiertny, D., & Demir, I. 2024.	Intelligent Virtual Assistants
12) Vieriu & Petrea, 2025	Intelligent Virtual Assistants
13) Mina et.al, 2023	Intelligent Virtual Assistants
14) Nivetha S S, Potu Purna Sai, Nivetha S 2024	Intelligent Virtual Assistants
15) Arpaci, 2019	Machine learning
16) Wei et.al, 2019	Machine learning

The findings of the research revealed that the majority of AIED technology applications mainly comprise of 3 categories which include personalized learning systems, virtual assistants and machine learning.

Personalized Learning Systems

According to Que, Zuhairi & Morcos (2024) the objective of personalized learning recommendation is to enhance learning motivation and effectiveness by efficiently identifying the characteristics of learners and suggesting suitable learning resources to specific learners. Tailoring educational experiences to individual student needs and preferences, leveraging technology to enhance learning outcomes are the primary aims of personalized learning systems. These systems utilize AI and data analysis to provide customized learning paths, personalized feedback, and targeted resources, potentially leading to increased engagement, motivation, and achievement by adapting to the different learning styles, pace, and knowledge levels of students. Personalized learning recommendation systems will develop algorithms that can recommend the appropriate learning materials based on the profiles and preferences of the individual learner.

The importance of adaptive learning systems was examined in a foundational study by Graf et al. (2009). Increased learner engagement to enhanced retention rates was revealed as the major findings of this study. In addition, the research by Johnson et al. (2013) revealed that student comprehension and performance were enhanced with the emergence of AI-driven virtual tutors. These virtual tutors can mimic human tutor responses, offering feedback and guidance to the current level of understanding and pace of learning of the student. Areas such as language learning have seen tremendous improvement based on the studies that show the benefit of AI-assisted personalized learning systems (Hasin et.al, 2025).

Intelligent Virtual Assistants

Intelligent conversational agents (CA) are more commonly known as Intelligent Virtual Assistants (IVA). These IVAs emerged from CA and have expanded their functionality by performing services or tasks (Bradeško & Mladenić, 2012). According to Kuhail et al. (2022) due to the capacity of these conversational agents (CA) to converse with humans and automate services, these CAs have experienced startling rise in popularity. To date, by using NLP (Natural Language Processing) and NLU (Natural Language Understanding) technologies, an intelligent virtual assistant (IVA) is able to generate a dynamic response as it understands the meaning and intent of the user query. These virtual assistants possess the ability to understand the context and hold conversations longer with the user as they can provide more personalized and relevant answers. Apple's Siri, Google Assistant

and Google Assistant are common examples of intelligent virtual assistants. Moreover, they can adapt to user habits and patterns and can be customized to individual preferences (Eisenbart, 2023).

Machine Learning

There is immense potential to personalize and improve student learning experiences by integrating AI and machine learning (Rudra, 2023). In recent years, there has been tremendous improvement in education due to this successful integration. By using algorithms, machine learning can learn from the existing data and improve over time. Through machine learning, it can improve its ability to understand and respond to users.

Machine learning can analyze the data in the system to produce patterns that show the main weakness of a student such as academic decline, risk of disciplinary action or facing a risk of dropping out. Another advantage of machine learning is the automatic grading system that is completely unbiased. This will present a more realistic overview of the performance of a student and save time for the teacher (Jagwani & Aloysius, 2019).

Human educators might be oblivious to certain factors but machine learning algorithms can analyze vast amounts of data and identify patterns and trends that may not be apparent to their human counterparts. Educational institutions can gather valuable insights about student achievement, learning styles, and behavior by leveraging on these algorithms. Consequently, teaching methods, curricula, and assessments can be tailored to cater to the specific needs and preferences of the students (Gupta et.al, (2023).

IMPLICATIONS FOR FUTURE RESEARCH

It is apparent that nobody can escape from AI but it is necessary that certain measures be implemented to ensure that AI is used in a constructive manner. Hence, it is best that a suitable course of action be taken by educators and administrators to ensure that students will reap the benefits of using AI and to acknowledge that AI is here to stay. The former should fully utilize various teaching methods which are complemented by the use of AI to make the learning experience more engaging. Furthermore, the practices and policies in place today must include AI to produce a more conducive learning environment. Consequently, with the use of AI the teaching and learning experience will be immensely enhanced.

CONCLUSION

The expanding role of AI in education has presented a positive impact on the educational outcomes and learning experiences of students as it provides limitless potential in improving the learning experience of all learners. However, to ensure that the full potential of AI is harnessed issues such as ethical considerations and data privacy must be adhered to. AI has endless advantages but it requires the concerted effort of all parties involved such as educators, policy makers, and students.

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