BENEFITS AND CHALLENGES IN IMPLEMENTING ARTIFICIAL INTELLIGENCE FROM CHINESE EFL PRIMARY SCHOOL TEACHERS' ATTITUDE AND PERCEPTION

Lingjing Zhang
ORCID: 0009-0009-9223-1378
CHINA

ABSTRACT

Given the increasing integration of artificial intelligence (AI) in daily language education globally, exploring its applications within primary school English teaching is essential. The attitudes and perceptions of English as a Foreign Language (EFL) primary school teachers are crucial in the Asian context, as their attitudes and perceptions significantly impact the frequency and effectiveness of AI in language teaching and learning. The study's primary objective is to investigate the perception of the benefits and challenges of implementing AI in primary schools' English learning. A qualitative methodology was adopted, employing semi-structured interviews and questionnaires to collect multiple, in-depth perspectives of Chinese EFL teachers. Using the thematic and descriptive analysis method, the researcher conducted a content analysis of the data. Thematic analysis revealed eight key benefits: promoting learning interest and motivation, providing automated feedback, supporting personalized learning experiences, enhancing intellectual development, creating an engaging learning environment, improving speaking ability, fostering critical thinking, and encouraging self-learning. However, four main challenges were identified: barriers to technology skill development, equipment support and computer anxiety, inhibiting learning motivation, ethical considerations, and effects on vision. These insights imply that AI has significant potential to transform primary school English teaching by making EFL learning more engaging, personalized, and intellectually stimulating. To integrate AI and language teaching and learning effectively, providing adequate teacher training, ensuring robust technical support, and addressing ethical and health-related concerns are crucial.

Keywords: AI, EFL teachers' perception, primary school English teaching, challenges and benefits of AI

INTRODUCTION

Integrating AI into primary school English teaching represents a significant advancement in modern pedagogy, potentially revolutionizing educational practices. AI technologies can provide personalized learning experiences (Ayeni et al., 2024), enhance student engagement (Almusaed et al., 2023), and foster critical thinking skills (Kaggwa et al., 2024). Despite the benefits of AI, challenges remain, including maintaining student motivation (Moybeka et al., 2023), ensuring data privacy (Kaggwa et al., 2024), managing health impacts related to prolonged screen time, and overcoming infrastructure barriers (Drmac, 2022). This transformative potential has garnered global interest, with educators and policymakers increasingly exploring AI applications to optimize learning outcomes from an early age (Touretzky et al., 2019; Yau et al., 2023). In the context of Chinese primary schools, AI integration offers both unique opportunities and challenges. English teachers in China frequently face challenges, including managing large class sizes, restricted linguistic input and output opportunities, and a focus on test-oriented teaching (Zhu, 2024). AI has the potential to address common challenges faced by K-12 educators, such as providing individualized feedback and support to students (Murphy, 2019). By using AI to identify specific difficulties students encounter during problem-solving, offering step-by-step guidance while recognizing various student strategies, and maintaining diverse interpretations of student behavior, AI could function as a sophisticated, personalized tutor (Aleven et al., 2009). However, effective implementation requires addressing issues such as digital literacy, equitable access to technology, and the integration of AI into existing curricula. Understanding Chinese EFL teachers' attitudes and perceptions towards AI is crucial, as these perspectives significantly impact the integration and effectiveness of AI tools in language teaching, thereby affecting students' learning experiences and outcomes (Chiu et al., 2022).

This study makes a substantial contribution to the literature by addressing a critical gap in understanding AI integration within Chinese primary school contexts. While previous research has explored AI's general potential in education (Bozkurt et al., 2021; Chiu & Chai，2022; Renz & Hilbig，2021; Touretzky et al., 2019; Zawacki-Richter et al., 2019), it has often overlooked the specific perceptions of benefits and challenges faced by Chinese primary school teachers in utilizing AI for daily teaching. By employing semi-structured interviews and questionnaires, this research provides a comprehensive examination of how AI can enhance various aspects of English teaching. Specifically, it highlights how AI can promote learning interest and motivation, provide automated feedback, and support personalized learning experiences. Additionally, the study explores how AI can enhance intellectual development, create an engaging learning environment, improve speaking ability, foster critical thinking, and encourage self-learning. These insights offer a nuanced understanding of AI's practical applications and benefits, demonstrating its potential to significantly impact primary education.

In addition to highlighting AI's advantages, this study also identifies significant challenges that need to be addressed for effective implementation. These challenges include potential declines in student motivation, over-reliance on technology, and limitations related to training, financial resources, and hardware availability. Ethical concerns and health impacts, such as vision problems due to prolonged screen time, are also noted. By providing actionable recommendations for overcoming these obstacles, the research advances the discourse on AI-enhanced teaching practices. It offers valuable guidance for educators and policymakers, helping to develop strategies that optimize AI integration while mitigating associated risks, thereby contributing to a more informed and effective approach to AI in education.

LITERATURE REVIEW

The Trend of AI Applications in K-12 Education EFL Teaching

AI involves machines exhibiting human-like intelligence to perform tasks and continuously improve using the data they collect. Its applications enable intelligent automation and are increasingly prevalent daily (Duan et al., 2019). AI is considered a pivotal aspect of the fourth industrial revolution and is expected to significantly transform educational practices (Seldon & Abidoye, 2020). To remain competitive, learners must acquire AI knowledge and skills to navigate and thrive in an AI-integrated society (Chiu et al., 2022). While the significance of AI is well established in higher education through professional degree programs, it is also crucial to spark all students' interest in AI from a young age (Chiu et al., 2022; Delaine et al., 2016). As intelligent machines become more prevalent, providing all K-12 students with basic AI knowledge has become a key global strategy for educating the next generation (Chiu & Chai, 2020; Touretzky et al., 2019). Current research on K-12 AI education has concentrated on identifying the necessary AI content, skills, and tools for effective student learning (Sabuncuoglu, 2020). These studies have offered valuable information to academia, policymakers, and practitioners, particularly regarding the initial phase of introducing AI education.

AI can enhance learning by creating personalized learning environments and accelerating students' independent learning (Liang et al., 2023; Yong, 2020). It allows students to study at their own pace, receive feedback, and obtain assistance with minimal teacher intervention (Keerthiwansha, 2018). AI can help students feel more at ease when interacting with a machine, repeat tasks indefinitely, and practice language skills (Kim, 2019). It offers tailored learning experiences to meet individual needs (Gao, 2021), provides revision suggestions, and tracks students' progress (Zhou, 2019). AI " provides educators a new platform for creating an intelligent and personalized English teaching environment" (Li, 2017, p. 35). AI-based systems can support educators in numerous ways and alleviate their workload (Yong, 2020). This includes taking attendance via facial recognition, automatically evaluating students, correcting English pronunciation (Na, 2021), "tracking and recording students' expressions and behaviors" (Hou, 2021, p. 5), gathering resources, grading homework, and answering students' questions (Hou, 2020).

Numerous empirical studies have demonstrated the effectiveness of AI chatbots in the EFL field. Specifically, AI chatbots can enhance EFL learners' knowledge of grammar and vocabulary (Wang & Petrina, 2013) and improve their English application skills, such as oral communication, listening, reading, and high-quality argumentative writing (Hong et al., 2016; Kim et al., 2019; Guo et al., 2022). Additionally, research indicates that AI chatbots can boost students' motivation, self-confidence, and interest in learning (Kim et al., 2019). It is noteworthy that most studies focus on EFL performance when AI is integrated into instructional settings, such as using AI chatbots for scaffolding argumentative writing (Guo et al., 2022) and employing intelligent tutoring systems to enhance speaking ability (Mohammadzadeh & Sarkhosh, 2018). Sumakul et al., (2022a) suggested that AI could be effectively integrated into EFL courses, with their study participants providing positive feedback on the use of AI tools in classrooms. The findings indicated that incorporating AI could improve students' creativity, motivation, and problem-solving skills.

The Impact of AI in ELT

The impact of AI on the field of education is also gaining momentum, not least in the field of English language teaching (ELT). AI in ELT yielded positive results in optimizing English language skills, translation, assessment, recognition, attitude, and satisfaction (Sharadgah & Sa'di, 2022). For instance, Yong (2020) notes that ‘AI + big data’ has initiated a system for automatically correcting English compositions using a large corpus to address lexical items, collocations, and sentence structures.

AI also facilitates personalized one-on-one teaching and learning (Huang et al., 2021). AI systems can collect and analyze students' characteristics, automatically tailoring lessons to fit their needs and abilities (Gao, 2021; Wu, 2020). According to Huang et al. (2021), AI-driven systems can design personalized situational learning plans that cater to individual students' abilities. These systems provide customized learning activities, track student progress, create and evaluate tests, and offer necessary instructions. Leveraging big data, AI can record student data, model, analyze, and assess learners, and supply data support for teachers to adjust their teaching methods to meet educational requirements (Yang et al., 2020). Currently, the integration of AI into English teaching is still in its nascent stage in Chinese primary education, and there is an urgent need to explore collaborative models between artificial intelligence and teachers (Yang et al., 2020).

Teachers' Attitudes and Perspectives toward AI

As teachers and schools significantly influence the adoption and benefits of AI technology in society (Pörn et al., 2024), it is crucial to understand their perspectives on AI's potential and risks. Teacher reluctance to embrace new AI tools or teach AI-related subjects could prevent AI's full potential from being realized or limit its use to a select few in society (Pörn et al., 2024). Many students already use various AI tools, and younger individuals are generally more accepting of AI compared to older generations (Zhang & Dafoe, 2019; Shepman & Rodway, 2022). Thus, it is essential for teachers to utilize AI tools or at least be aware of their existence and capabilities to stay current with their students. Teachers' attitudes toward AI are, therefore, critical for its implementation in education. However, there are limited studies on this topic. For instance, Kim et al. (2019) found that Korean educators believe AI could transform both society and education. Most educators are open to using AI-based instructional platforms, which could offer personalized lessons, reduce administrative tasks for teachers, support struggling students, and enhance parent-teacher communication. Nazaretsky et al. (2021) noted that confirmation bias affects teachers' attitudes toward AI technology, as they are often hesitant to accept recommendations from AI that conflict with their existing knowledge about their students. Integrating AI education into both teaching and learning is necessary to prepare students for future societal roles. Many educators are willing to adopt AI-powered teaching platforms due to their potential benefits, including improved communication with parents, more personalized education, reduced administrative work, and support for students in need (Lee et al., 2024). In summary, the successful integration of AI in education may hinge on understanding and addressing teachers' attitudes and potential biases toward the technology.

METHOD

Research Design

To best serve the research objectives, a constructionist paradigm was adopted, utilizing a qualitative approach with semi-structured interviews to gather in-depth data (Cresswell, 2013). This approach aimed to capture the nuanced experiences and perspectives of participants within their natural settings (Marshall & Rossman, 2014). The research was conducted in southern China, offering a distinctive regional perspective on the perceptions of EFL primary school teachers across various public and private schools. The semi-structured interview guide focused on participants' experiences with AI integration, their perceptions of AI's impact on teaching practices, and the challenges they faced. Before interviews with participants, a pilot test of the interview protocol was conducted to improve the clarity of the interview approach and refine questions. Data saturation was determined by identifying repetitive themes and responses, with no new significant insights emerging towards the end of data collection. Follow-up questionnaires and member checks were performed to validate findings and ensure accuracy. Interviews were transcribed and translated with attention to maintaining the integrity of responses. Data was securely stored in encrypted folders, accessible only to the researcher, who held the password, thereby ensuring confidentiality and data integrity.

Participants

Seventeen Chinese primary school English teachers from public and private schools voluntarily participated in individual semi-structured interviews, providing informed consent without receiving financial compensation. The study employed a combination of purposive, convenience, and snowball sampling methods to achieve a diverse and pertinent sample. Purposive sampling is "used to select respondents that are most likely to yield appropriate and useful information" (Kelly, 2010, p. 317). This method helps to identify and select cases that will optimize the use of limited research resources (Palinkas et al., 2015). The researcher used this sampling method to invite Chinese primary school teachers who knew about AI tools. Convenience sampling also enabled initial recruitment through the researcher's WeChat network because it is easily accessible and available to the researcher, making it applicable to nearly any type of research (Golzar et al., 2022). In addition, snowball sampling assists researchers in reaching the target population (Naderifar et al., 2017), which expands the participant pool through referrals from these initial contacts. The recruitment process began with the researcher contacting primary school teachers via WeChat, inviting them to participate, and asking for recommendations from other suitable candidates from their professional networks.

Participants ranged in age from 28 to 50 years and had teaching experience of 5 to 20 years. Their educational backgrounds varied, with most holding bachelor's degrees, some having master's degrees, and a few with vocational secondary school training. The majority were based in urban areas within southern China, while a smaller proportion worked in rural regions. Interviews were primarily conducted in participants' homes and schools, with no interviews taking place in public settings.

Table 1. Demographic information of the participants

PSEUDONYMS	TEACHING EXPERIENCES	AGE	PUBLIC/PRIVATE SCHOOL	URBAN/RURAL
Janice	5	27	Public school	Urban
Nicole	9	31	Public school	Urban
Louise	3	26	Public school	Urban
Maria	12	39	Public school	Urban
Penny	12	38	Public school	Rural
Nina	15	40	Public school	Urban
Star	10	43	Public school	Rural
Linda	5	29	Public school	Urban
Jenny	15	40	Public school	Urban

Nancy	4	27	Public school	Urban
Tiffany	7	28	Private school	Urban
Freda	2	27	Private school	Urban
Fanny	1	22	Public school	Urban
Tina	4.5	27	Public school	Urban
Tom	15	40	Public school	Urban
David	15	48	Public school	Urban
Echo	10	32	Public school	Urban

Data Collection

Data were collected through seventeen individual semi-structured interviews, which followed a pilot study with three primary teachers aimed at validating the interview questions. Based on feedback from the pilot study, the responses highlight that while many teachers possess theoretical knowledge of AI, their practical experience varies. After the pilot study, the researcher revised the interview protocol to include a clear definition of AI. In addition, to ensure that all participants understood the context of the questions, teachers were shown relevant videos demonstrating the use of AI in English instruction before the interviews. Furthermore, several repetitive questions were adjusted to streamline the interview process. The preparation provided through the pilot study and explanatory materials helped ensure a clear understanding of the interview questions, facilitating a more accurate and insightful assessment of teachers' perspectives on AI integration in English teaching.

The semi-structured interview protocol included questions designed to explore participants' attitudes toward AI and perceptions of the benefits and challenges associated with AI in primary school English teaching (see Appendix A). Interview questions were derived from an extensive review of relevant literature and current language teaching practices. Interviews were conducted in the participant's native language to facilitate clear communication and accurate expression of their thoughts and experiences (Adeoye - Olatunde & Olenik, 2021), fostering a comfortable environment for participants to articulate their sentiments. During the interview, participants were allowed to express their thoughts and feelings on the areas of interest and their experiences with freedom (Wolgemuth et al., 2015). Participants attended interviews through Tencent Meeting, an online video-conferencing platform. All interviews were conducted during Spring 2024 and lasted approximately 25 minutes each. Following the interviews, a follow-up questionnaire was administered to assess further the teachers' familiarity with AI and practical engagement with AI tools in education.

Data Analysis

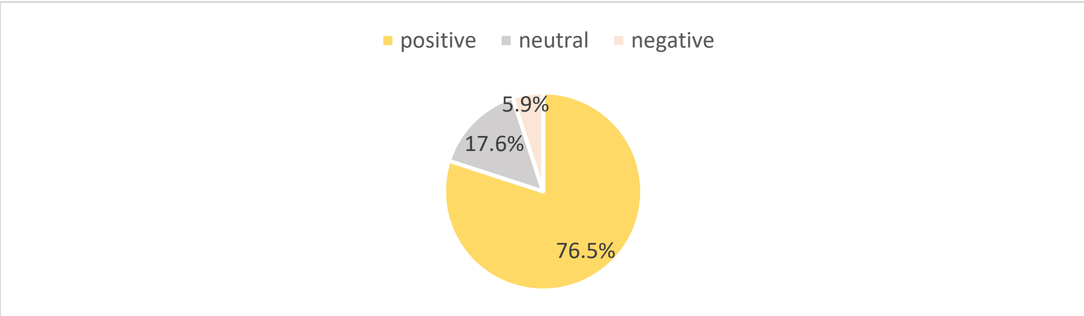
Thematic analysis was chosen for its ability to systematically uncover and interpret patterns of meaning within qualitative data (Braun & Clarke, 2017), allowing for a nuanced exploration of participants' perspectives on AI in primary school language teaching. Coding was conducted using both deductive, informed by prior literature, and inductive approaches, which emerged from the transcripts. The interviews were conducted online via Tencent Meeting, which provided automatic transcription of the audio recordings. Transcripts were manually proofread to ensure accuracy and fidelity to the participants' intended meanings. The researcher meticulously cross-checked the transcriptions with the original audio recordings to correct any discrepancies and ensure precision. Data analysis commenced with an initial round of coding to identify and organize recurring themes. After reaching data saturation, wherein no new themes emerged, a thematic framework was established. Subsequently, a second round of independent coding was conducted based on this framework. An inter-coder reliability of 89.4% was achieved by comparing the results of the two coding rounds. Throughout the coding process, categories were iteratively refined to capture newly identified themes, thereby ensuring the validity and reliability of the analysis (Bartek et al., 2017). The coding text was translated verbatim from the original language to ensure consistency and accuracy in the analysis. Themes were systematically categorized, and frequencies were calculated to highlight key benefits and challenges. Data was securely stored in encrypted folders, with access restricted to the researcher who held the password, thereby maintaining confidentiality and data integrity. The questionnaire analysis utilized descriptive statistics, with reports automatically generated by the online questionnaire platform, such as Sojump. These reports provided insights into teachers' basic information, their familiarity with AI, and the current stage of AI integration in their teaching practices.

FINDINGS

Teachers' Attitudes to AI as a Language Learning Tool

Seventeen participants expressed predominantly positive attitudes toward AI during interviews, as depicted in Figure 1, illustrating Chinese primary school teachers' attitudes.

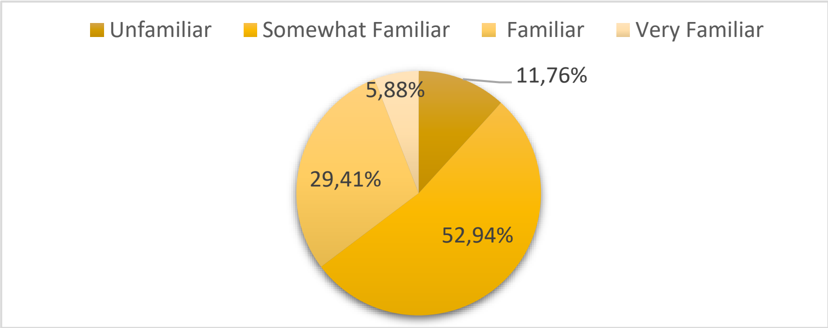
Figure 1. Chinese primary school EFL teachers' attitudes



Teachers' Familiarity with AI as a Teaching Tool

Figure 2 revealed varying levels of familiarity and practical experience among participants.

Figure 2. Chinese primary school EFL teachers' familiarity with AI tool



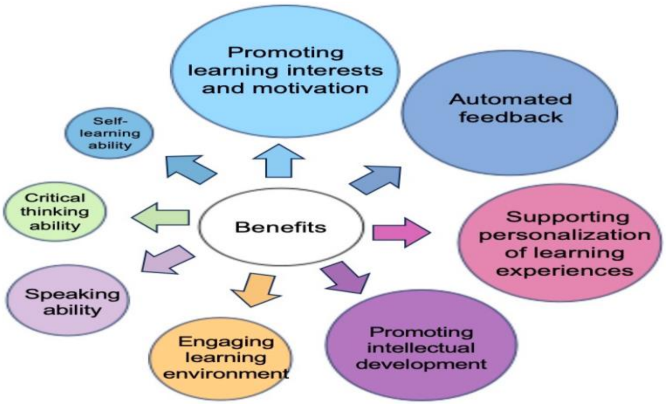
Regarding their engagement with AI, 41.18% of teachers had observed colleagues using AI and gained some understanding, while 58.82% had heard about AI but lacked practical experience. An additional 41.18% had seen AI tools used by other teachers online and understood the basic concepts, and another 41.18% had personally used AI tools and had some operational experience. Only 5.88% had received formal training and could operate AI tools proficiently.

In the follow-up questionnaire, participants highlighted various AI programs integrated into primary school English teaching, showcasing their practical applications. AI-powered language learning platforms, such as 'Duolingo', were praised for offering personalized learning experiences by tailoring lessons based on student performance and providing customized feedback. AI-based pronunciation tools like 'Liulishuo' [Personal AI English Teacher] were noted for their effectiveness in delivering immediate corrective feedback on pronunciation, which aids students in refining their speaking skills. Participants also emphasized the role of visual AI tools in boosting classroom engagement. Tools such as interactive whiteboards, intelligent learning apps, virtual reality (VR), and augmented reality (AR) were recognized for making lessons more engaging through animations, interactive games, and multimedia content. These visual tools capture students' interest and enhance their understanding and retention of language concepts by presenting information in a dynamic and stimulating manner.

Benefits of Implementing AI in Primary School English Learning

Participants' interviews highlighted the substantial benefits of integrating AI into primary school English teaching. AI enhances student engagement and motivation through interactive learning while also providing supplementary support to EFL learners via automated feedback and immersive technologies like virtual and augmented reality. These supports facilitate student personalization of learning experiences. Additionally, AI improves students' abilities through speaking skills, self-learning, and critical thinking, promising more effective and engaging learning experiences in English learning.

Figure 3. Benefits of AI in primary school language learning



Promoting learning interests and motivation for EFL students through the use of AI

The interviews revealed that AI significantly enhances student engagement and interest in EFL classrooms. Participants such as Janice noted AI's ability to make lessons more lively and captivating, while Penny highlighted its capacity to maintain student interest. Nicole emphasized the creation of a fun teaching environment, and Louise cited AI-designed games like word games that quickly engage young learners. These insights indicate that integrating AI into EFL education can foster a dynamic and interactive classroom atmosphere, thereby boosting enthusiasm and motivation among primary school students.

> Janice: "It's more lively...to capture the interest of the students".
> Penny: "It's going to make it more interesting for the students...the interactions in the classroom might be a little bit better".
> Nicole: "Fun teaching environment".
> Louise: "Some of the fun games that AI has designed just engage those little kids very quickly".

This finding aligns with existing research demonstrating AI's positive impact on students' interest and motivation in learning English (Ali et al., 2023; Chiu et al., 2023; Zhi & Wang, 2024). Consequently, incorporating AI into EFL teaching methods is viewed as a promising approach to enhancing student interest and participation, ultimately facilitating more effective language acquisition.

Providing supplementary support to EFL learners

Participants' perspectives on AI as the supplementary support role to EFL learners through three main themes: Automated feedback, creating engaging learning environments, and facilitating personalized learning experiences. These themes reveal the transformative potential of AI in EFL education, demonstrating how AI can provide precise and immediate feedback, create immersive and interactive learning experiences, and tailor learning to individual students' needs.

Automated feedback

Teachers highlighted AI's pivotal role in delivering immediate and precise feedback, significantly enhancing the English learning process. Fanny pointed out AI's ability to analyze students' learning data through technology, suggesting it can identify areas for improvement and monitor progress over time. Freda emphasized AI's capacity to provide instant results, which aids in reinforcing memory and comprehension through timely feedback.

> Fanny: "It can analyze students' learning data through technology".
> Freda: "Using AI, you might get some results on the spot, which helps reinforce your memory".

Lu (2019) and Timpe-Laughlin et al. (2020) have substantiated AI's efficacy in delivering precise individual feedback, underscoring its pivotal role in promoting effective learning through timely assessment (Uwaoma et al., 2023). AI has the potential to provide instantaneous feedback, foster ongoing self-directed learning, and enable students to promptly refine their learning approaches in real-time.

Engaging learning environment

The theme of using AI to develop immersive and engaging learning environments emerged during the discussions. Janice highlighted AI's use in animating historical figures like Qin Shi Huang, enhancing the realism of learning experiences. Jenny suggested integrating virtual reality (VR) and augmented reality (AR) to immerse students in practical scenarios, enhancing interactivity and learning engagement.

> Janice: "AI technology was used to have Qin Shi Huang speak to everyone through projection. It creates a more immersive feeling, making the topic more real".
> Jenny: "Combining virtual reality with augmented reality can let students practice English in an immersive environment".

According to Omar et al. (2024), AI plays a crucial role in developing virtual English environments for language learning. Integration of VR and AR technologies can revolutionize conventional learning environments, enhancing engagement and interactivity in educational experiences and thereby fostering deeper comprehension of subjects.

AI’s support for student personalization of learning experiences

Participants highlighted AI's potential to support personalized learning. Fanny noted AI's ability to analyze students' learning habits and progress, enabling customized learning plans tailored to individual paths. Jenny supported this view, emphasizing AI's role in adjusting teaching content based on student progress and offering personalized suggestions and corrections.

> Fanny: "AI can analyze students' learning habits and progress to customize learning plans that suit their own learning paths".
> Jenny: "Based on the student's learning progress, AI can adjust teaching content and provide

> personalized suggestions or corrections".

According to Albacete et al. (2019) and Tarus et al. (2018), AI's ability to provide personalized guidance and suggestions to students. By adapting learning experiences to fit individual learning paths, AI holds promise in effectively addressing diverse educational needs and preferences, thereby significantly improving overall educational outcomes. This finding illuminate AI's potential to transform EFL education, mainly through implementing automated feedback systems, immersive learning environments, and personalized learning experiences. The perspectives shared by participants underscore AI's pivotal role in fostering more efficient and tailored educational environments for EFL learners.

Improving students' abilities and intelligence

Interviewees in the study provided profound insights into how AI enriches students' skills and cognitive development across four pivotal areas: Speaking ability, self-learning capability, critical thinking skills, and promotion of intellectual development. These insights highlight AI's profound influence on modern education; equipping students with these skills is crucial in the globalized and digital era.

Speaking ability

Participants highlighted AI's significant role in enhancing spoken English proficiency, emphasizing its potential to improve pronunciation through practice and timely feedback. Jenny noted that AI supports students in practicing pronunciation effectively, offering corrective feedback promptly. Maria underscored AI's ability to enhance students' conversational skills by facilitating communication practice.

> Jenny: "It helps students to practice pronunciation and with timely feedback and correction".
> Maria: "Let the child pronounce his words, and his communication with people may be better".

These insights underscore AI's potential to enhance speaking abilities in English-language contexts, as evidenced by research (Sumakul et al., 2022b). AI-supported environments not only improve speaking skills but also foster an environment where students feel more willing and confident to communicate effectively (Ebadi & Ebadijalal, 2022). This dual impact highlights AI's role in promoting speaking skill development and communicative confidence among learners.

Self-learning ability

Teachers highlighted AI's capacity to enhance students' self-learning abilities in EFL education. Tiffany emphasized that AI enables students to independently apply concepts in their self-study routines, thereby fostering autonomous learning through practice and immediate feedback.

> Tiffany: "[Students] might apply it to their self-learning when [they use AI], so it is something that can develop [students] self-study skills".

AI promotes independent learning through intelligent data utilization and analysis of student behaviors (Shu & Xu, 2022). Moreover, AI-powered platforms provide personalized learning experiences that adapt to individual student needs, enhancing their capacity for self-directed study (Folgieri et al., 2024). These personalized approaches are crucial for fostering long-term academic success by empowering students to take ownership of their educational journey and cultivate critical thinking skills. This underscores AI's potential to support immediate learning outcomes and nurture lifelong learning abilities.

Critical thinking ability

Participants highlighted AI's role in enhancing students' critical thinking abilities. Tiffany noted that AI encourages students to consider multiple perspectives, fostering a nuanced understanding of topics. Nina added that AI promotes intellectual development by fostering dialectical thinking and helping students evaluate different arguments.

> Tiffany: "A more multifaceted way of considering things...students can get some critical thinking out of the AI's answers".
> Nina: "The promotion of his intellectual development would be in the area of dialectical thinking".

AI technologies support critical thinking by presenting complex problems and diverse viewpoints (Salvagno et al.,2023; Utami & Winarni, 2023). AI-driven tools often include interactive simulations and problem-solving exercises that challenge students to think critically and analytically. This process helps them develop the ability to assess information, form reasoned judgments, and make informed decisions. Consequently, AI enhances immediate learning outcomes and cultivates essential lifelong cognitive skills.

Promoting Intellectual Development

Teachers overwhelmingly agreed on AI's potential to enhance intellectual development. Nicole highlighted AI's capacity to stimulate intellectual growth, while Mark emphasized its role in fostering self-learning skills among primary school students. Nina further elaborated those improvements in problem-solving abilities and technological literacy contribute significantly to intellectual development.

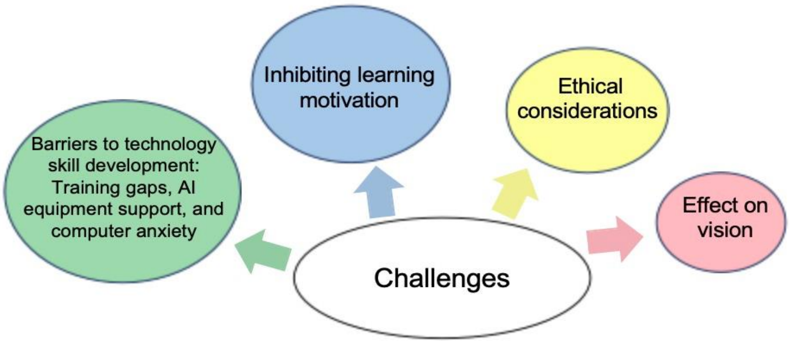
> Nicole: "I think it will promote his intellectual development".
> Mark: "I think that AI has the potential to enhance the intellectual development of primary school students...students can gradually develop their ability to learn on their own".
> Tina: "Self-learning skills as well as critical thinking problems, problem-solving skills and technical literacy aspects would be particularly effective".

AI may promote intellectual development by encouraging self-directed learning and enhancing critical thinking skills. By enabling students to engage actively with learning materials and develop problem-solving competencies, AI contributes to a holistic approach to education that prepares learners for future challenges and opportunities—equipping students with lifelong skills essential for intellectual growth and adaptation in an increasingly digital world.

Challenges of Implementing AI in Primary School English Education

AI in EFL classrooms offers both significant opportunities and notable challenges. While AI has the potential to enhance students' engagement, personalized learning experiences, and critical thinking skills, it also raises concerns regarding dependency and diminished learning motivation. Additionally, barriers such as insufficient training, financial support, and adequate hardware pose significant obstacles to effective AI deployment. Ethical considerations regarding data privacy and security further complicate AI's educational implementation. Moreover, the overuse of AI raises concerns about its impact on students' vision, particularly among younger learners. These findings highlight the complex implications of AI in language teaching, necessitating a balanced approach to its adoption and usage.

Figure 4. Challenges of AI in primary school language learning



Inhibiting learning motivation

Interviews with primary school EFL teachers reveal concerns about AI's impact on student motivation and independent learning in English classrooms. Penny noted that AI's popularity might reduce students' intrinsic motivation to learn English, making them dependent on technology. Nicole highlighted that some students might misuse AI for gaming, disrupting the educational environment. Linda observed that over-reliance on AI could impair students' independent thinking and essential learning skills.

> Penny: "If AI becomes more and more popular in the future, students just won't want to learn English attentively".
> Nicole: "Some students don't use the AI to complete the exercises, he might take the AI and play a game on the computer".
> Linda: "Students are overly reliant on artificial intelligence and lack the ability to think independently".

Classroom AI use may decrease student learning motivation. The integration of AI should be carefully managed to ensure it supports rather than hinders active learning and critical thinking. Monitoring AI use and incorporating activities that promote independent thinking are essential to prevent students from becoming passive learners. Future research should focus on pedagogical strategies that balance AI benefits with the development of intrinsic motivation and cognitive skills, creating an effective and balanced educational environment.

Barriers to Technology Skill Development: Training Gaps, AI Equipment Support, and Computer Anxiety

The development of AI in education encounters several significant challenges, as highlighted by the interviews. Nicole emphasized that students often lack professional training and familiarity with AI, which hampers its effective integration into learning environments. Maria pointed out the issue of inadequate monetary support, noting that schools frequently face funding shortages that limit their ability to invest in necessary AI infrastructure. Nina highlighted the lack of hardware support, stressing that existing school equipment often cannot keep pace with the requirements of advanced AI applications.

> Nicole: "Some students may [lack proficiency in AI technology]".
> Maria: "Schools are underfunded in terms of hardware...".
> Nina: "It's supposed to be the hardware; however, [lack of equipment support in schools]".

Financial constraints (Shao et al.,2022), insufficient equipment, and inadequate teavhing training are major obstacles to AI development in education. Addressing these challenges requires improved training, securing adequate funding, and upgrading hardware. Partnerships with technology providers could also bridge resource gaps. Overcoming these barriers is essential for AI's successful integration into education. Future efforts should focus on comprehensive strategies that address these needs to realize AI's benefits fully.

Ethical Considerations

The integration of AI in education raises significant ethical concerns, as noted in interviews with educators. Nicole highlighted issues of data privacy and security, while Penny and Mark expressed concerns about integrity and the protection of students' personal information.

> Nicole: "There are issues of data, privacy and security".
> Penny: "[AI] is involved in some integrity issues with some of the students".
> Mark: "[AI] needs to collect and analyze students' learning data. However, this also raises data privacy and security concerns and may make it easy for students' personal information to be compromised".

While AI technologies offer opportunities to enhance critical thinking through interactive learning experiences, these benefits necessitate careful consideration of ethical implications (Konidena, 2024; Horváth, 2022; Tatineni, 2019). Issues such as protecting student privacy and maintaining academic integrity are paramount. Collaborative efforts among teachers, policymakers, and technology providers are essential for establishing robust ethical guidelines that foster responsible AI integration in education. Addressing these ethical considerations is crucial not only for maximizing the educational benefits of AI but also for ensuring trust and safeguarding students' rights within educational environments.

Effects on Vision

The interviews underscored concerns over AI's potential impact on the vision of primary school children, prompting a call for proactive measures in educational settings. Janice and Penny noted a trend of younger students requiring corrective glasses due to prolonged AI exposure, highlighting the need for guidelines promoting balanced screen time and regular breaks.

> Penny: "I feel as though a lot of primary school kids now, that age that he wears glasses, are getting younger and younger".
> Janice: "Poor quality of glasses, students' lenses get thicker with continued use".

Previous studies have found that prolonged use of digital screens, particularly in conditions of dryness, poor lighting, or low brightness, exacerbates eyestrain, leading to sore, irritated eyes and difficulty focusing (Silva et al., 2016). Additionally, extended exposure to these light rays may damage retinal cells, potentially resulting in vision issues such as age-related macular degeneration (Vilela et al., 2015). Drmac (2022) emphasized the importance of managing the health impacts of prolonged screen time, particularly in the context of integrating AI with education. In this study, participants noted a concerning rise in digital eyestrain and early vision problems among primary school children due to increased screen time, highlighting the need for corrective eye-using habits at younger ages. These findings emphasize the importance of developing guidelines and policies to mitigate the adverse effects of AI on children's vision. Recommendations include creating guidelines for balanced screen time, integrating eye health education into curricula, conducting further research, promoting healthy screen use, and advocating for regular eye exams.

CONCLUSION

The findings from this study underscore both the potential and challenges associated with integrating AI into primary school English education in China. Chinese EFL primary school teachers demonstrate positive attitudes towards AI's capacity to enhance student engagement, support personalized learning, and develop critical thinking skills. However, concerns regarding student motivation, data privacy, health impacts, and infrastructural limitations pose significant challenges.

Proactive measures are essential to harness AI's benefits while addressing these challenges effectively. Educators and policymakers must prioritize establishing clear guidelines for AI use, providing comprehensive teacher training, and allocating sufficient resources to support AI integration in classrooms. Additionally, promoting balanced screen time and incorporating eye health education into curricula is crucial to ensuring responsible AI implementation in educational settings.

By addressing these considerations, stakeholders can maximize the educational potential of AI while safeguarding student well-being and upholding ethical standards. Future research should continue to explore innovative pedagogical approaches and technological advancements that support inclusive and effective AI-driven education, thereby fostering a generation of learners equipped to thrive in an increasingly digital and interconnected world.

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BIODATA and CONTACT ADDRESSES of the AUTHOR

Lingjing Zhang holds a Master's degree in Education Studies from the University of Glasgow. Currently, she is dedicated to exploring AI's impact on English language teaching. Her work focuses on leveraging AI to enhance teaching methodologies and improve language learning outcomes. Lingjing aims to advance English education for educators by integrating innovative AI solutions into traditional and modern educational frameworks. Her goal is to become a leading professor in higher education, contributing to the development of effective AI-driven English language teaching.

Research interests: AI & Second language acquisition, primary school education; teacher education

Lingjing Zhang
Address: Block 7, Area B, Guoxing City, Guoxing Avenue, Haikou City, Hainan Province, China
TEL: (+86)15595850009 |
E-mail: danchun0913@163.com