

The impact of artificial intelligence on English learning among Chinese undergraduates

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Abstract. With the introduction of artificial intelligence (AI) into education, China's English education in the university has also been affected. The COVID-19 pandemic accelerated the application of AI tools in education. This study investigates the practical use of AI tools in English learning among Chinese undergraduates before, during, and after the pandemic. Students' perspectives were collected through questionnaires. And its data was analyzed by using frequency analysis and multiple response analysis in SPSS. Teachers' perspectives were gathered through interview. The study explored their views, attitudes and experience with AI-assisted learning tools such as online learning platforms, generative AI, machine translation tools and speech recognition software. The findings revealed that the integration of AI into English learning has produced positive outcomes in practical application. Students have actively embraced AI-assisted English learning, with AI tools meeting diverse learning needs, significantly improving learning efficiency, and personalizing learning resources. Some teachers also recommend students to use AI tools to assist their learning as needed. Although teachers and students generally holding a positive attitude towards AI-assisted English learning, they all express concerns about the ethical use and over-reliance on AI. Future research should focus on establishing ethical guidelines for AI use, strengthening regulation and innovating technologies for AI tools.

Keywords: AI; English Learning; Education; Chinese Undergraduates

1. Background

1.1. The development of AI

The integration of AI into education is not a recent concept. It has a considerable history within the research community. Early achievements laid the groundwork for the emergence of AI applications in education [1]. In 1930, J. Petersong devised a device for automatic grading and immediate feedback, later known as Chemo-Card. This device marked the early application of intelligent technology in education. Later, the term "artificial intelligence" originated from a 1956 conference at Dartmouth College in the United States. It laid the foundation for the integration of AI and education.

1.2. Formal integration of AI and education

In 1960, the world's first computer-assisted instruction system, PLATO, emerged. It marks the official integration of AI and education into practical application. In 1973, Hartley and Sleeman proposed the fundamental framework for Intelligent Tutoring Systems (ITS). The application of theory and practice in the integration of AI in education has gradually improved. Nowadays, China also implements ITS system in many educational aspects. For example, the Intelligent Teaching Agents serves as teachers or partners to facilitate instruction [2].

During the 1990s, the third wave of AI shows that AI is gradually expanding its applications to educational scenarios. For example, Jaime Carbonell developed SCHOLAR, a student-oriented teaching program that provided instant feedback on learners' response quality [3]. This instant feedback also provides Chinese university students with more efficient English learning experience. By using natural language processing technology, learning platforms can evaluate students' grammar and vocabulary usage, and provides personalized feedbacks. For example, Pigai, an AI-driven writing assessment tool which can automatically give advice and scores to the essay [4]. This kind of tools can enhance students' English learning efficiency by instantly correct students' errors and give constructive feedbacks.

1.3. Achieve significant success

Since its introduction into education, AI's potential and value have been widely validated. It has been achieving significant success and promising prospects. In April 2020, the Organisation for Economic Co-operation and Development (OECD) released the report "Trustworthy AI in Education: Prospects and Challenges." It elaborated on AI's applications and development in education. In addition, countries worldwide prioritize AI's role in advancing education, with initiatives like Germany's Industry 4.0 plan, the U.S.'s National AI Strategy. Consequently, AI's integration into education has become a hot topic globally, propelling innovation and reform at an unpredictable pace [5].

1.4. The integration of AI and English learning in China

Similarly, China keeps pace with the development by formulating various policies. For instance, the Education Information 2.0 Action Plan aims to integrate AI into personalized teaching [6]. Additionally, the State Council established the China Education Modernization 2035 [7]. It aims to promote the wide application and innovation integration of AI in education.

The changing trend of college English teaching and learning mode is deeply influenced by AI. Artificial intelligence is an important carrier of foreign language learning resources and a tool for foreign language learning. The integration of AI into university English education has already been implemented. For instance, in some universities, a blended teaching model for English listening and speaking uses AI assistance in instruction [8]. AI and VR are also being used to support self-learning in English among some university students [9].

Moreover, AI-assisted English teaching in the university shows several positive compared with traditional ones. Research indicates that students who received English instruction with the assistance of AI achieved significantly better scores than those who didn't [10]. Another study shows that intelligent chat app provides economical and personalized conversation for university students to learn English. With the help of intelligent chat app, they overcome self-doubt and shyness to some extent [11].

Therefore, the integration of AI in education shows a lot of advantages. Utilizing AI technology in university English teaching can enhance students' autonomy and improve their English proficiency [12]. Additionally, it provides personalized learning experiences, boosts motivation and engagement, and offers real-time feedback and improvement opportunities [13]. With the support of big data and cloud computing analysis, the English instruction in the university refines students' learning paths and strengthened their practical skills [14]. The development of AI in education has not only promoted the English learning efficiency, but also changed the modes of teaching and learning in Chinese universities.

This paper explores the extent to which AI tools are used by Chinese English major undergraduates and evaluates their effectiveness in enhancing learning outcomes. It employs both questionnaires and interviews to investigate the impact of artificial intelligence on English language learning from the perspectives of students and teachers, focusing on three aspects: pre-pandemic scenario, the pandemic period, and post-pandemic scenario. Furthermore, it will delve into the challenges faced, strategies for effective AI integration, as well as future outlook and recommendations.

2. Research question

Compared to traditional English learning process, AI tools offer many benefits for students. For example, they support students in improving their vocabulary memory by providing technical assistance [15]. This process offers an enjoyable learning experience for memorizing words [16]. Thus, AI is likely to impact Chinese undergraduate students' English learning process positively by improving their learning experience and outcomes.

However, the extent to the use of AI tools by teachers and students in the actual English learning process remain under fully explored. Therefore, this study poses two central research questions:

1. How do teachers and students perceive the role of AI in improving English learning from pre-pandemic to post-pandemic period?
2. What are the preference and respective opinions of teachers and students?
3. How AI uniquely addresses some learning challenges compared with traditional methods?

By exploring these perspectives, this research aims to identify key barriers and enablers for more effective AI integration.

3. Research objectives

China's "Classes Suspended but Learning Continues" policy during the COVID-19 pandemic made online learning a mainstream mode of instruction, which had been explored for years in many schools across the country [17]. The pandemic rapidly shifted students and teachers' English education model from traditional ones to digital ones. They adopted various AI learning tools actively or passively. Therefore, examining the use of AI before, during and after the pandemic allows us to observe the general

trends in teachers' and students' perceptions, usage and willingness to adopt AI tools, as well as understand the advantages and disadvantages of integrating AI into the English learning process.

Studies have shown that students frequently use Massive Open Online Courses (MOOCs), generative AI, machine translation tools and speech recognition technologies to support English learning [18-21]. Thus, this study focuses on the following AI tools:

1. Online learning platforms (e.g., MOOCs, Chaoxing). These platforms refer to websites or apps that provide rich shared course. They allow students to arrange their learning schedules independently.
2. Generative AI (e.g., ChatGPT, ERNIE Bot). These chatbot utilize Natural Language Processing technology to interact with users. They can generate rich conversational content to meet complex learning needs.
3. Machine translation tools (e.g., Baidu Translate, Youdao Translate). These applications use AI to translate between languages in real time. They offer features like pronunciation, example sentences and synonym suggestions. They assist users in learning and mastering foreign languages.
4. Speech recognition software (e.g., Dear Translator, iFlytek Listening and Speaking). These programs are used for speech input, real-time translation or converting spoken language into written text. For example, learners can practice pronunciation, record spoken notes or perform instant translation between Chinese and English.

This study not only gathers students' perspectives through questionnaires, but also capture teachers' viewpoints through interviews. The aim of this study is to address two core issues. First, the existing researches mostly give attention to theoretical aspects instead of practical ones. It is still under fully explored about how effectively AI supported their actual learning, students and teachers' willingness to use AI tools and the specific types of AI they use. Second, the study tends to provide a comprehensive understanding of the impact of AI on Chinese undergraduates' English learning by conducting a thorough investigation into students' perspectives with the supplements of teachers' opinions. This offers help to provide empirical evidence to support the practical integration of AI into English learning by identifying the potential benefits and limitations of these tools.

4. Research significance

In the context of China's educational innovation and reform, the Ministry of Education's General Office issued a document. It emphasized the importance of leveraging digital technologies, such as AI, to enhance teaching quality. It urged institutions to "implement the policy in accordance with practical conditions" [22]. The policy indicates the necessity and importance of integrating AI into education currently. Education authorities hope that AI can improve teaching quality and students' outcomes through policy guidance. While English is an essential international language, different majors among various universities incorporate it as a compulsory course. Under this circumstance, AI-assisted English learning has become a critical research area. For example, Shanghai International Studies University established the Smart Education Key Laboratory to reflect a response to the policy on November 26, 2021. It aims to promote the deep integration of emerging technologies like AI in foreign language education [23].

This study is a product of such reform. It examines the extent and effectiveness of AI-assisted English learning among Chinese undergraduates, considering students' willingness, teachers' attitudes and the advantages and disadvantages of various AI tools.

This study not only provides empirical support for policy-makers and English teachers in higher education, but also offers insights for students and AI tool developers. For policymakers, by referring to the feedbacks given by the teachers and students, they can develop more targeted educational policies and encourage the proper integration of AI tools into education. For example, they can offer appropriate training to support teachers and students in using AI tools. By understanding how university students apply AI in their English studies, teachers can identify the most popular AI tools and their actual learning effectiveness. This can assist teachers in optimizing their instructional practices. For instance, machine translation tools are widely used by students. This demonstrates their practicality and effectiveness. Teachers can incorporate intelligent machine translation tools into the learning process to provide personalized guidance for the students. By encouraging students to familiarize themselves with new vocabulary and pronunciation in advance, teachers can improve students' learning efficiency. Additionally, this study shows various AI tools and their effectiveness, which can help students choose the most suitable ones to help their learning. Moreover, this study explores the actual effectiveness and limitations of AI tools and gathers feedback from both teachers and students regarding these tools. This feedback can offer insights for AI tool developers, helping them refine existing technologies and develop tools that better suit to Chinese university students' English learning needs. For example, developers could create more accurate and authoritative learning systems to enhance students' learning experience and outcomes.

5. A literature review

With the rapid development of technology, AI gradually plays a central role in education [24]. Stakeholders pay much attention to the application and research of AI in education [25]. Especially in China, as English is a compulsory subject, the application of AI in English becomes even more important [26]. AI has made English learning more diverse and flexible [27]. Also, generative AI tools like ChatGPT provide students with personalized learning support and timely feedback [28]. Consequently, AI will continue to play an important role in creating effective learning environments [29]. Using digital technology such as AI is the key driver

for leading education into a new era [30]. However, the practical application of AI in education is still in its infancy. The data used for AI in education are still inadequate, and the integration of AI with practical teaching and learning methods remains an ongoing exploration [31]. This study aims to investigate the impact of the practical application of AI on English learning among Chinese undergraduates.

5.1. AI-assisted learning for students

Students benefit from using AI-assisted learning tools. Marc Prensky referred to the generation that grew up with information technology as "Digital Natives." This generation has developed a digital lifestyle and mindset, and will actively explore creative applications of technology [32]. AI can reduce language learning anxiety [33], effectively improve students' pronunciation skills [34], creativity [35], engagement, autonomy in learning [36] and grades [33]. For example, researches have shown that smartphones can enhance college students' engagement in English speaking classes [37]. Also, researches have indicated that students using AI to assist their learning outperform those who don't across various aspects [33]. Thus, today's students actively seek to use AI to assist their English learning. Also, AI has a positive impact on improving their engagement, autonomy and outcomes.

5.2. The integration of AI into education in China and other countries

Traditional teaching and learning are gradually evolving into intelligent ones. China has introduced policies to promote the integration of AI into education. In February 2022, in the Notice from the General Office of the Ministry of Education on Publishing the First Batch of Pilot List for Virtual Teaching and Research Room Construction, "University Virtual Course Teaching and Research Office" is listed [38]. It overcomes time and space limitations, and provides high-quality and practical resources [39]. Virtual reality enhance learning by allowing learners to engage in real-life language communication scenarios [40]. AI-driven tools such as smart tutoring systems, chatbots and virtual reality are used to improve the learning experience [36]. Therefore, AI tools integrated into education provide learners with convenient and high-quality resources to achieve better learning outcomes theoretically.

Countries around the world are also actively promoting the integration of AI into education. For example, teachers from Spain and the UK holds positive attitude towards AI-assisted teaching technology [41]; university teachers believe that AI can help teaching and learning in Indonesia [35]; countries like Canada, Chile and South Korea adopts AI-powered educational robots to monitor student performance [42].

5.3. AI integration in education by companies

Various companies are driving the transformation of education by incorporating AI into their platforms. These intelligent education platforms use AI as the core technology to optimize traditional educational process and enhance the quality of education [43]. Intelligent education robots like UBTECH and LESH1, intelligent evaluation apps like iFLYTEK, and intelligent autonomous online learning platforms like MOOC are changing the way of teaching and learning[44]. AI-driven apps such as Deep Tutor and Auto Tutor are learner-centered AI tools that assess language learners' abilities and provide personalized content to improve learning experience [45]. "AI Class Director" by New Oriental Group, "Mo Jing" by Tomorrow Advancing Life and "Squirrel AI" by YiXue use technologies such as facial and voice recognition to track and analyze students' learning progress in real-time and provide personalized learning reports [46]. Therefore, AI learning tools can provide personalized assessment and feedback, which fosters high-quality, individualized and autonomous learning.

5.4. Challenges in AI integration

Although AI can provide assistance in English teaching, it also brings new challenges. Firstly, some schools lack infrastructure and have limited teacher training. Sufficient technology and resources are required to address these challenges [47]. For example, a survey of teachers from Spain and the UK found that their knowledge of AI-assisted teaching was generally low, leading to underutilization of these technologies [41]. Although AI tools show the potential to transform education, a lack of teacher preparedness and school infrastructure may hinder their widespread adoption.

Secondly, while AI tools may offer effective language proficiency assessments, they cannot be solely relied on as they are unable to accurately evaluate language complexity and context like human [36].

Furthermore, the ethical use of AI in education is becoming a growing concern. Schools at all levels worldwide prohibit students from using ChatGPT due to concerns about its potential misuse for plagiarism or cheating [42]. There is a need to ensure ethical and fair use of AI [36].

Lastly, further exploration is required to understand the potential of AI in promoting language skills such as cultural understanding and intercultural communication, as well as its impact on students from different linguistic and cultural backgrounds [36]. Only by doing so can AI-assisted English education be better implemented.

5.5. Conclusion

Although the challenges still exist, the integration of AI into English learning among university students has already begun and will continue to shape the future of education. Students are trying to use AI-assisted learning tools; governments in China and other countries are promoting the integration of AI into education; companies are aligning with this trend by incorporating AI into their platforms and software. Although there are challenges in adopting AI for learning, it has the potential to foster personalized learning outcomes and positively influence English learning.

The integration of AI on English education has been widely discussed theoretically, but researches about practical application remains limited. As previously mentioned, much research has been conducted on the theoretical potential of AI to enhance learning outcomes, but there is a lack of empirical studies, especially in the context of Chinese higher education. There is also limited research on teachers' attitudes toward students' use of AI, the tools students prefer to use, their perceptions, and whether their learning experiences benefit from AI. This study aims to explore the practical impact of AI on English learning among Chinese undergraduates from the perspective of student usage with the supplement of teachers' viewpoints.

6. Methods and materials

Concurrently, several frontline English teachers shared their profound insights on this topic through interviews. The outbreak of the pandemic further accelerated the integration of AI into education. It compelled teachers and students to rapidly adapt and extensively apply AI tools to cater to the demands of online teaching and learning.

6.1. Participants

6.1.1. Questionnaire for students

The questionnaire was employed as an empirical research tool to collect data. This questionnaire is designed primarily for Chinese undergraduates, particularly those who have experienced both pre-pandemic and post-pandemic English learning. It aims to investigate their use of AI-assisted learning tools. The goal of the questionnaire is to systematically understand the role and impact of artificial intelligence in the English learning process of undergraduate students.

This questionnaire includes both single-choice and multiple-choice questions and is divided into four main sections. The first section gathers basic information, including gender, the time when the respondent started learning English and when they experienced the COVID-19 pandemic. The second section aims to compare the use of AI in English learning before and after the pandemic. The third section focuses on the use of AI in English learning during the university years. These questions explore students' attitudes toward AI, the difficulties they encounter and the current role of AI in their learning. The fourth section investigates students' willingness to use AI for English learning in the future and their reasons for doing so.

The questionnaire samples four classes from the third-year level of a university in China. The questionnaire was administered to the student of these four classes in a university in China. Out of the 88 questionnaires distributed, 53 were returned and 44 of these were considered valid, yielding a response rate of approximately 60% and a valid response rate of 83%. The valid response includes 10 males and 34 females (Figure 1). All of them have learned English for many years before the pandemic (Table 1). And they all have experienced the pandemic before they entering the university (Figure 2), The detailed breakdown is as follows:

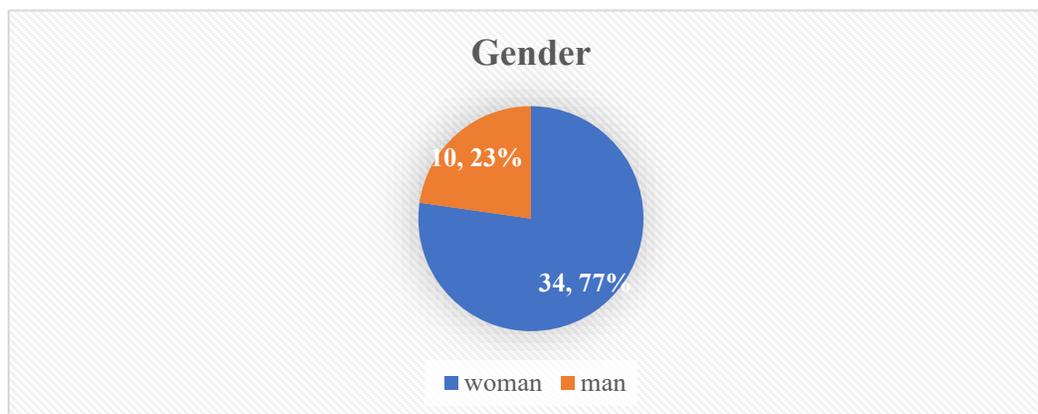
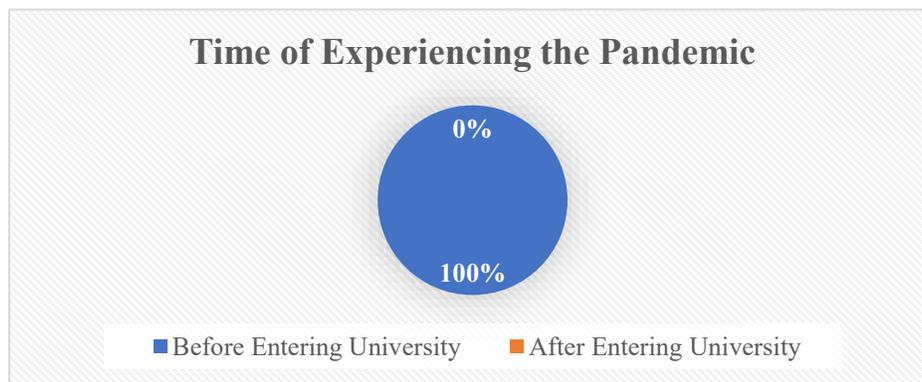


Figure 1. Gender

Table 1. the time to start learning English

Questionnaires Population Information	type	frequency	Percentage	Valid Percentage	Cumulative Percentage
The time to start learning English	Seventh Grade	17	38.6	38.6	38.6
	Sixth Grade	3	6.8	6.8	45.5
	Second Grade	2	4.5	4.5	50.0
	Third Grade	16	36.4	36.4	86.4
	Fourth Grade	1	2.3	2.3	88.6
	First Grade	5	11.4	11.4	100.0
total		44	100.0	100.0	

**Figure 2.** Time of Experiencing the Pandemic

The reasons for selecting this group include the following:

For one thing, after two years of English studies, third-year English majors have accumulated extensive learning experiences through various English courses. Throughout their learning journey, they have often proactively or been required to utilize artificial intelligence as a tool for English learning. Having developed certain habits and insights in their studies, they possess a deeper understanding of the issues.

For another, with the popularity of online teaching and AI tools during the pandemic, students have to rely on them for two years. It means that they are able to use them proficiently. Therefore, this group can provide more detailed and authentic feedback.

6.1.2. Interviews for teachers

This study incorporates teachers' interviews to supplement students' perspectives. By exploring teachers' recognition, experiences and views, it contributes to a comprehensive understanding of the role of AI in English. This approach facilitates a deeper insight into the current usage situation and its future potential.

The interview questions use open-ended formats to gather rich qualitative data. Each interview lasts about 20 minutes. The questions can be divided into three categories. The first category focuses on teachers' recognition and experiences with AI tools, such as their familiarity and recommendations. The second one explores the specific experiences where teachers encourage students to use AI during their learning, including the time they recognized AI's potential to assist students and the strategies they employed to promote their use. The third one addresses teachers' perspectives on the future of AI-assisted English learning, including future trends.

The interview randomly selects university English teachers of various ages and teaching specializations. This random selection helps reduce bias and make sure a more representative result. Moreover, the age diversity contributes to a wider range of perspectives. Additionally, selecting teachers who teaching various aspects of English allows for a broader understanding of how AI tools be used in various contexts.

6.2. Data processing

Firstly, the valid questionnaires were screened through manual examination. Questionnaires with excessively short completion times or missing answers were excluded to filter out invalid responses and ensure the validity of the survey. Secondly, this study used SPSS (Social Science Statistics Package) for statistical data analysis. The obtained results were analyzed using SPSS statistical analysis software, including frequency analysis and multiple response analysis. Frequency analysis can generate detailed frequency distribution tables, making data characteristics and distributions intuitive. Multiple response analysis is used to analyze and interpret multiple-choice or open-ended answer data collected in surveys or research.

7. Results

7.1. Pre-Pandemic scenario

Prior to the pandemic, both teachers and students almost exclusively employed traditional methods for English instruction. At that time, the students surveyed had not yet begun their university studies. From the teachers' perspective, teachers held varying attitudes towards the integration of AI tools in teaching.

7.1.1. *The underutilization of AI teaching tools*

Before the pandemic, teachers rarely recommended students to use artificial intelligence to assist in their English learning. Tom, an older teacher, indicated that perhaps due to his age, he leaned towards traditional teaching methods and held a conservative attitude towards the integration of emerging technologies. Prior to the pandemic, he did not particularly recommend the use of AI tools to his students. On a macro level, Claire, who has been teaching English debate for a long time, mentioned that before the pandemic, the overall social popularization and application of AI teaching tools were not widespread, which to some extent hindered their promotion in teaching.

7.1.2. *Low student acceptance*

Although the school required students to use certain AI tools, few students prefer them. Specifically, at the practical teaching level, Daisy, who has been engaged in English translation and listening teaching for a long time, noted that although platforms such as "Lange," "Rain Classroom," and "Chaoxing" were available in schools, students were not very motivated to use them. Instead, they preferred to access learning materials through social media platforms like QQ groups due to their convenience, which was highly favored.

Therefore, prior to the pandemic, students and teachers were more inclined to use traditional educational methods for English learning. The application of AI tools was relatively limited, and student acceptance was not high, with social media like QQ becoming the preferred channel for students to share materials among themselves.

7.2. The pandemic period

During the pandemic times, significant shifts emerged in the way students approached English language learning. The most significant change is the accelerated popularization and application of online teaching and AI tools. This transformation is not only reflected in teaching methods, but also profoundly affects students' study habits and learning effect. The arrival of the pandemic has mainly brought about two significant changes: firstly, it has accelerated the digital transformation of the education sector, promoting the widespread application of online teaching and AI tools; secondly, it has enhanced the acceptance and dependence of teachers and students on intelligent learning tools.

7.2.1. *Changes in students' learning styles*

Students have explored to more AI-powered learning tools. According to the questionnaires results, all students had experienced the pandemic prior to entering university and continued to do so during their university years. All students reported that they began to utilize AI tools for English learning more frequently after entering university. When asked about the reasons, many students cited factors such as "discovering more AI tools to assist English learning during the pandemic," "accessing and being allowed to use relevant devices (e.g., computers, mobile phones)," "providing convenient learning pathways," recommendations from teachers/classmates, and "an increased need to acquire related knowledge" (Figure 3). The specific details are outlined in the Figure below:

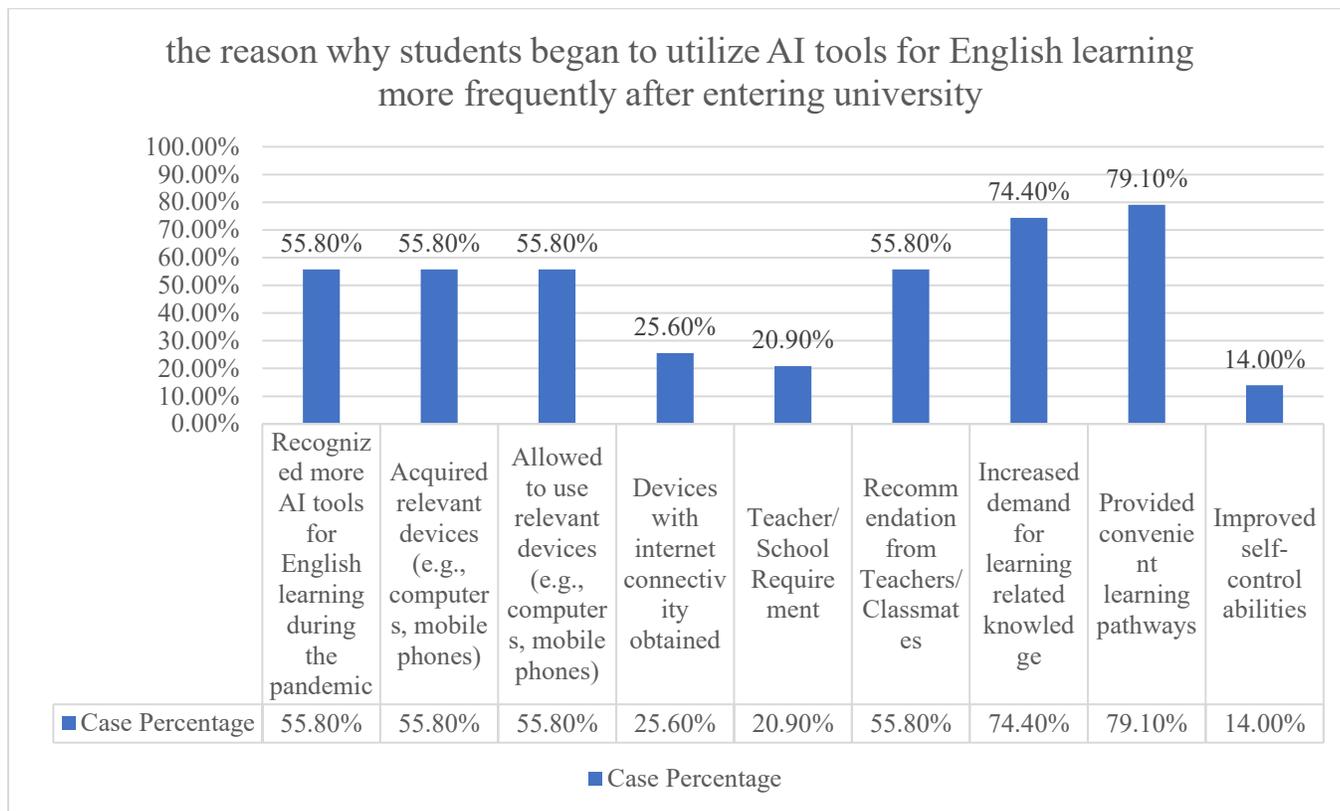


Figure 3. the reason why students began to utilize AI tools for English learning more frequently after entering university

It can be seen that during the pandemic, many students gained a deeper understanding of AI-assisted English learning. Many of them were introduced to these tools by teachers and classmates. And after obtaining relevant devices, AI-assisted English learning gained widespread acceptance and active usage among students due to its convenience and the increased demand for learning-related knowledge.

Also, students have increased their usage rate. Based on the analysis of multiple response frequency, it can be concluded that students tend to choose similar types of AI to assist their English learning. Almost all students have used online learning platforms, chatbots and automatic translation tools to support their English learning (Figure 4).

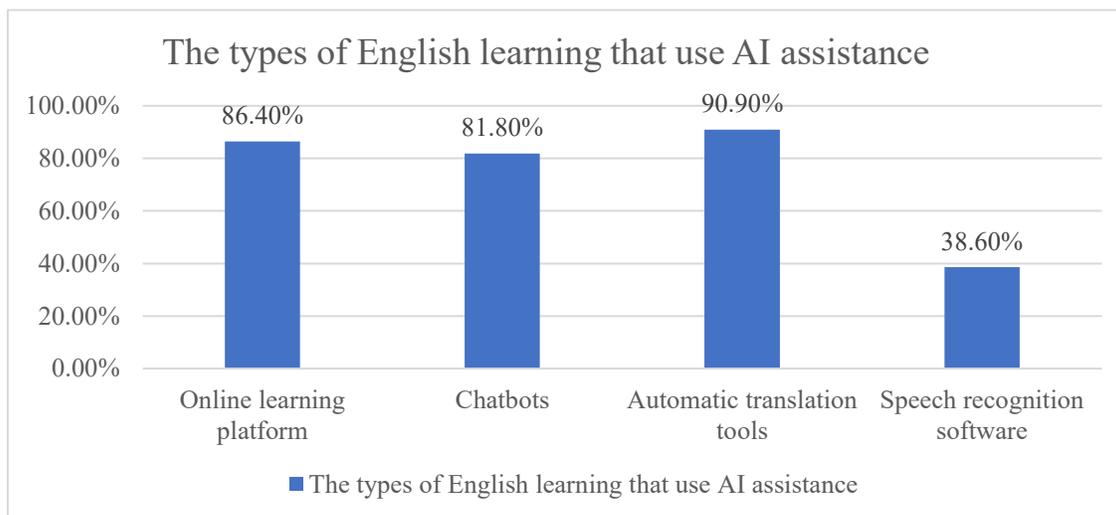


Figure 4. The types of English learning that use AI assistance

From this, it can be concluded that students are starting to rely more on AI-assisted English learning. This change is not only reflected in the use of tools, but also in the increasing acceptance and dependence of students on intelligent learning tools. Many students said that during the epidemic, they had come to realize more AI tools that assist in English learning, and after obtaining the relevant equipment, they actively adopted these tools to improve their learning effect.

Teachers also recognized the rapid transformation of the education sector under the influence of the pandemic. They acknowledged the potential and value of integrating AI tools into English teaching. The interviews with teachers also confirmed the application of AI tools for learning mentioned by students.

7.2.2. Changes in teachers' teaching methods

AI tools create a favorable educational environment. The transformation of teaching methods is particularly evident, which compels students to embrace AI-assisted learning. In the past, face-to-face classroom teaching was the mainstream, but the epidemic forced education to shift rapidly online. Teachers, such as Anna, a teacher who has been studying "Smart Education" for a long time, began to use online tools and artificial intelligence for teaching through platforms such as Tencent Meeting and Chaoxing Learning. These platforms not only support remote teaching, but also track student activity through data analysis, monitor the learning process, and create a near-real learning environment to ensure the teaching effect. She recounted an example from during the pandemic: "During the pandemic, I taught an interpretation course and was deeply impressed by the intensity of online interactions, which even exceeded my expectations. I remember a student who shared with me that the level of engagement in her class was also very high." From this, she concluded that active interaction in online teaching not only enhanced the classroom atmosphere, but also significantly promoted students' learning progress. Based on this, looking forward to the future, online teaching shows broad development potential and prospects.

In addition, teachers find that AI tools help enhance efficiency. Daisy recommends students to use AI tools such as ERNIE Bot and ChatGPT to assist in learning when facing tasks such as induction and summarization, based on the characteristics of the learning content. Claire also shared her experience of deepening reliance on online tools and AI. She mentioned that the pandemic prompted a large-scale shift of teaching activities online, facilitating the popularization of AI in teaching. Teachers and students began actively exploring and adopting AI-assisted learning platforms. She herself gradually relied on AI to improve her lesson preparation efficiency within about a year and a half after the pandemic began.

Moreover, students utilize AI-assisted learning according to the requirements. Influenced by current trends, students and teachers are required to use certain AI platforms. Thus, Although Tom's exposure to AI-assisted English learning is limited, he also indicated that he uses online learning platforms like MOOCs and Chaoxing in his work. He acknowledged, "Under the current trend, everyone is more or less affected by AI and uses it to some extent."

Hence, the education sector rapidly embraced online teaching and AI tools under the impetus of the pandemic. Initially, teachers and students were compelled to adopt online teaching and AI-powered online learning platforms due to the pandemic. However, practice has proven that as teachers and students became proficient in using these tools, they could effectively enhance the effectiveness of online teaching. It fosters greater interaction between students and teachers and facilitating learning progress. AI tools play a positive role in specific tasks such as summarizing and improving efficiency. It demonstrates the development potential of AI-assisted English learning.

7.3. Post-pandemic scenario

In the post-epidemic era, the use of artificial intelligence has undergone significant changes. Students' dependence on and acceptance of AI-assisted English learning have soared sharply. The restrictions on traditional offline learning methods have promoted the widespread application of online education platforms and AI technology, which have become an important bridge for students to continue learning. This change is not only reflected in the fact that students are starting to use more AI tools to assist in English learning, but also in the gradual deepening of their trust and reliance on these tools.

7.3.1. Students' utilization status

Firstly, students prefer AI-powered learning tools. When discussing whether students would continue to use AI-assisted English learning in the post-pandemic era, all students gave affirmative answers. Based on frequency analysis, the questionnaires results indicate that all students have begun to use AI more to assist their English learning. At the same time, a larger number of students tend to prefer using AI for English learning (Figure 5). It can thus be concluded that students have a high level of acceptance and popularity for AI-assisted English learning.

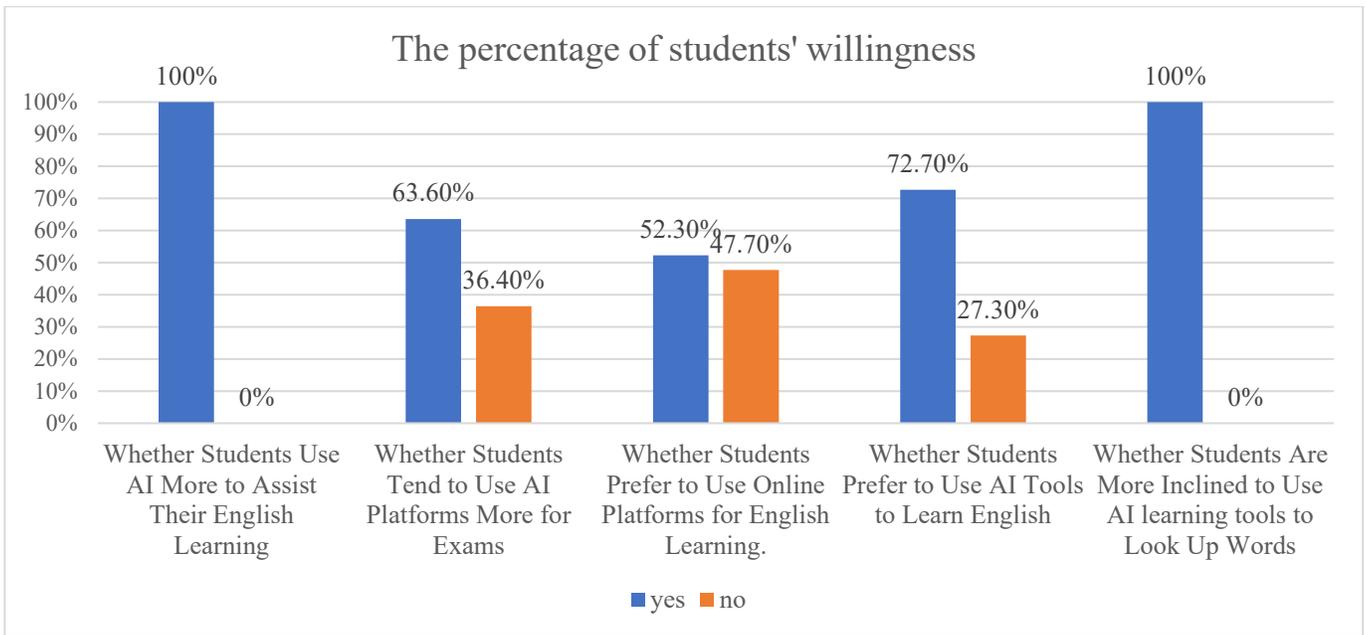


Figure 5. Whether students would continue to use AI-assisted English learning in the post-pandemic era

Secondly, AI tools provide Rich Learning Resources. An investigation into the purposes of questionnaires participants' use of AI-assisted English learning, combined with multiple response frequency analysis, shows that students use AI to assist their English learning in nearly the same aspects. Almost all students use AI to learn various aspects of English (Figure 6). This suggests that AI can meet students' needs for English learning from various perspectives. The detailed information is as follows:

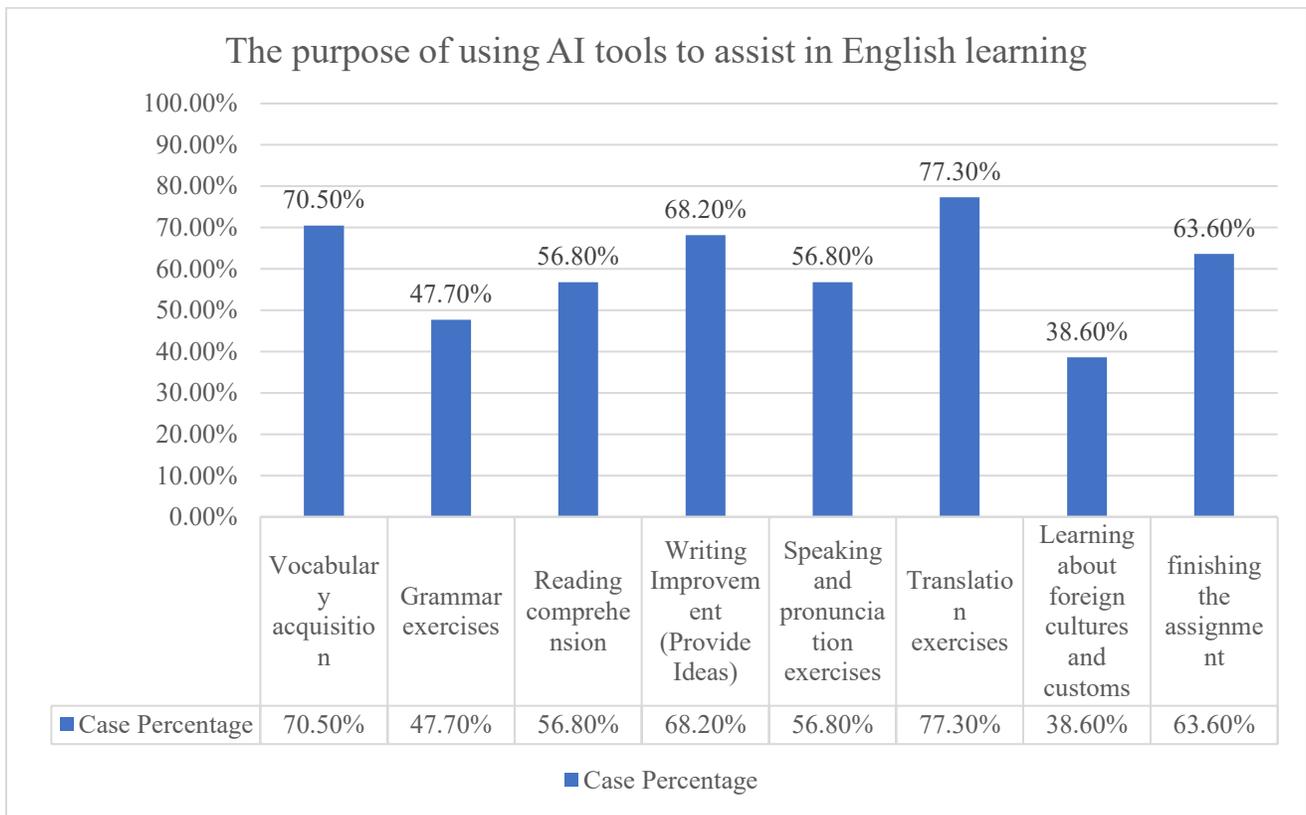


Figure 6. The purpose of using AI tools to assist in English learning

Additionally, AI tools provide an excellent learning experience and effective outcomes. Through multiple response frequency analysis, it can be learned that students have different opinions on the benefits of choosing AI to assist English learning. Among them, the vast majority of students believe that AI can facilitate students' access to English learning resources (Figure 7).

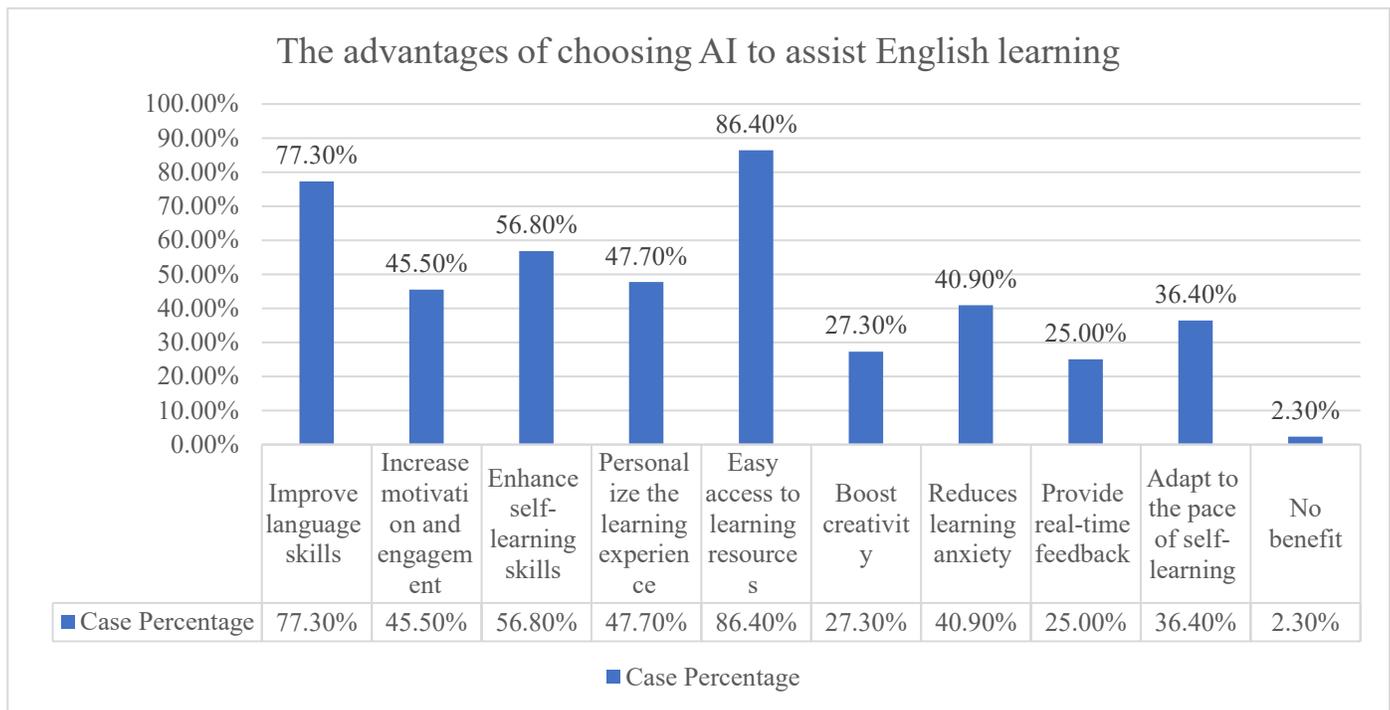


Figure 7. The advantages of choosing AI to assist English learning

Thus, the increased use of artificial intelligence has had a lasting impact on students' learning habits. For one thing, it greatly enriches the access to learning resources, enabling students to obtain personalized learning materials anytime, anywhere, according to their own learning pace and needs. On the other hand, the instant feedback function of AI also encourages students to participate more actively in the learning process, enhancing their language skills through continuous practice and immediate error correction. This new learning method promotes the enhancement of students' autonomous learning ability and cultivates their ability to think independently and solve problems.

7.3.2. Teachers' opinions

Echoing this sentiment, teachers continue to express their positive stance, all indicating their willingness to recommend AI-assisted English learning to students. Teachers generally recognize the immense potential of AI as an auxiliary tool while emphasizing the importance of prudent use and independent thinking. They unanimously agree that with the rapid advancements in technology, AI has brought unprecedented opportunities for transforming teaching and learning models. Teachers should actively embrace this trend and integrate AI into their teaching practices to enhance students' learning outcomes and efficiency.

AI tools offer a range of advantages. Teachers emphasize the transformations AI has brought to the education sector. Students' use of AI-assisted English learning is a response to transformations. Anna, focusing on the students' perspective, states, "Modern students possess a strong thirst for knowledge and learning capabilities. They aspire to engage with and master the latest technological tools. Therefore, university teachers should keep pace with the times, actively introduce new technologies to support teaching, and cater to students' learning needs. This is a professional attitude and sense of responsibility that a university teacher should possess. Consequently, I believe that in the post-pandemic era, we should actively embrace AI and other emerging technologies, integrate them into language teaching to enhance students' learning outcomes and drive innovation and development in teaching models." Claire highlights, "The advantage of AI lies in its ability to quickly extract and present vast amounts of information, with coherent sentences, which is currently difficult for humans to achieve."

However, there are also some challenges associated with students using AI-assisted English learning. Despite the numerous conveniences that AI brings to English learning, its use is also confronted with ongoing challenges and obstacles. The imperfection of technology may lead to information errors or misguidance. Teachers point out that AI's answers are not always accurate. Claire directly notes that despite AI's technological prowess, it lacks the unique thought processes of humans and still requires human judgment for verification. Daisy further adds that when it comes to content requiring dialectical thinking, AI's conclusions might

be inaccurate or one-sided due to relying solely on data and patterns from its learning process. Therefore, students should maintain independent thinking, critically evaluate AI's outputs, and avoid over-reliance.

7.4. Challenge

According to the data, the vast majority of students believe that using artificial intelligence can increase dependency, and that AI tools are not yet technologically mature, with technical malfunctions and instability being present (Figure 8).

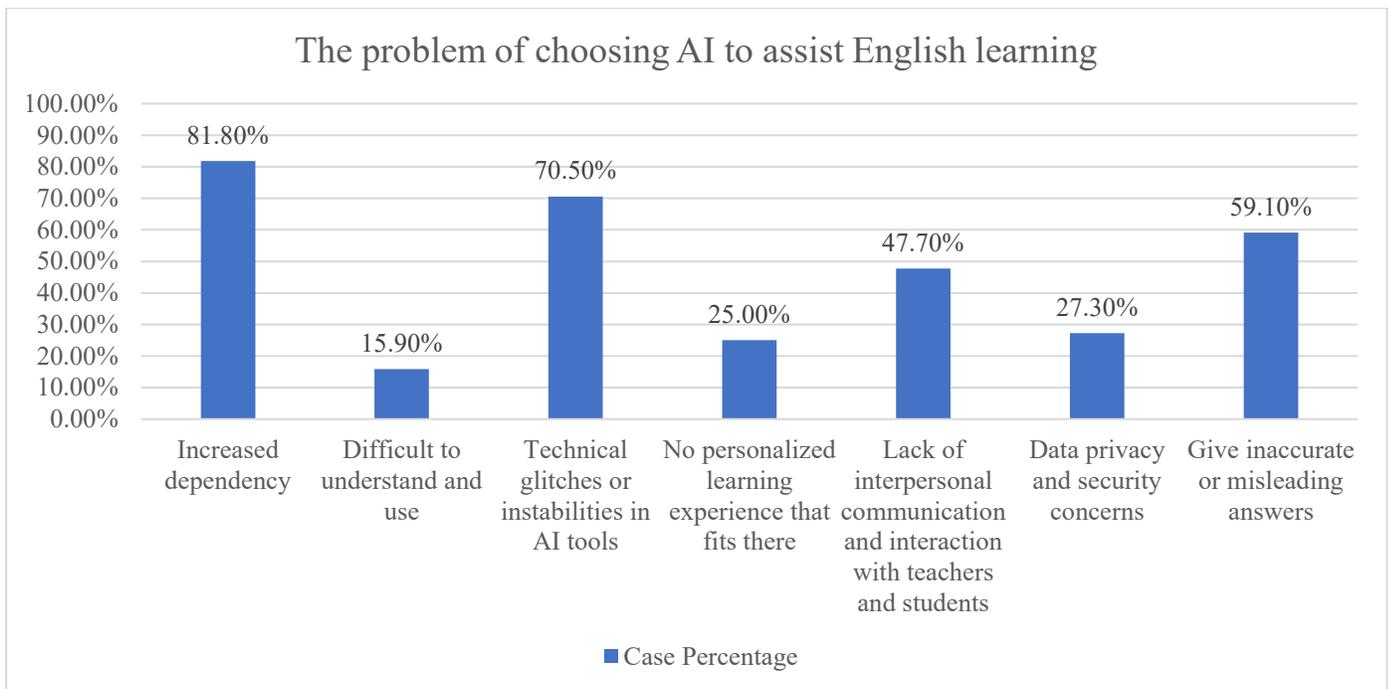


Figure 8. The problem of choosing AI to assist English learning

Similarly, teachers have also expressed concerns mirroring those of students. In the context of AI-assisted English learning, teachers generally share two core concerns: first, students' excessive reliance on AI tools. Second, the ethical use of AI.

7.4.1. Excessive reliance on AI tools

Firstly, teachers universally agree that students' excessive reliance on AI tools is a pressing issue. Anna pointed out two main reasons: "Firstly, students lack sufficient understanding of the immense impact brought about by AI. They fail to fully recognize the profound effects of this technological wave on human society and their own learning styles. They lack the necessary professional anxiety and have not taken proactive steps to address this potential crisis through learning. Secondly, some students rely too heavily on the convenience provided by AI. They neglect independent thinking and judgment." Claire observed a similar phenomenon: "Some students might excessively rely on AI, such as directly using it to answer questions instead of thinking for themselves." Daisy specifically mentioned the use of translation tools, arguing that "excessive reliance on such auxiliary tools does not significantly contribute to improving translation and interpretation skills."

7.4.2. The ethical use of AI

Secondly, teachers express profound concerns about the ethical use of AI. Anna attempted to guide students in considering and adhering to ethical norms for AI use by establishing a course on "AI Usage Norms and Ethics." She worried that students do not give sufficient attention to these norms and ethics. Claire used vivid analogies like "AI is like a rose with thorns" or "a desert hiding traps" to convey the message that "using AI for learning should not involve academic plagiarism or misconduct." She urged students to establish correct values and ethics. Daisy directly pointed out the potential for plagiarism and cheating enabled by AI and suggests strengthening moral education and supervisory measures. Although Mr. Tom had limited exposure to AI-assisted English teaching and does not prioritize AI, he emphasizes that teachers can directly review students' work to monitor whether they rely on AI to complete learning tasks.

The three teachers collectively highlight the potential issue of students' excessive reliance on AI tools, which may weaken their independent thinking and judgment. At the same time, they recognize the potential of AI in learning but emphasize the need for students to learn to use these tools responsibly to avoid potential negative consequences.

In summary, both students and teachers exhibit significant concerns in the face of the rise of AI-assisted English learning. Students primarily focus on the potential increase in dependence on AI tools and technological immaturity, along with the inconvenience caused by technical failures. Teachers, on the other hand, delve deeper into the ethical dimensions of AI use. They worry that students may fall into the trap of academic misconduct, such as plagiarism and cheating, due to a lack of sufficient moral awareness and normative guidance. This consensus suggests that while advancing AI-assisted learning, it is crucial to simultaneously strengthen the cultivation of students' independence and moral values to achieve a win-win situation between technological development and educational quality.

7.5. Strategies for effective AI integration

Through multiple corresponding frequency analysis, it can be seen that students believe that the areas where artificial intelligence can be improved are roughly the same, namely, starting from the authority and accuracy of content, interactivity and personalized learning experience, convenience and stability of technical operation, privacy and data protection (Figure 9).

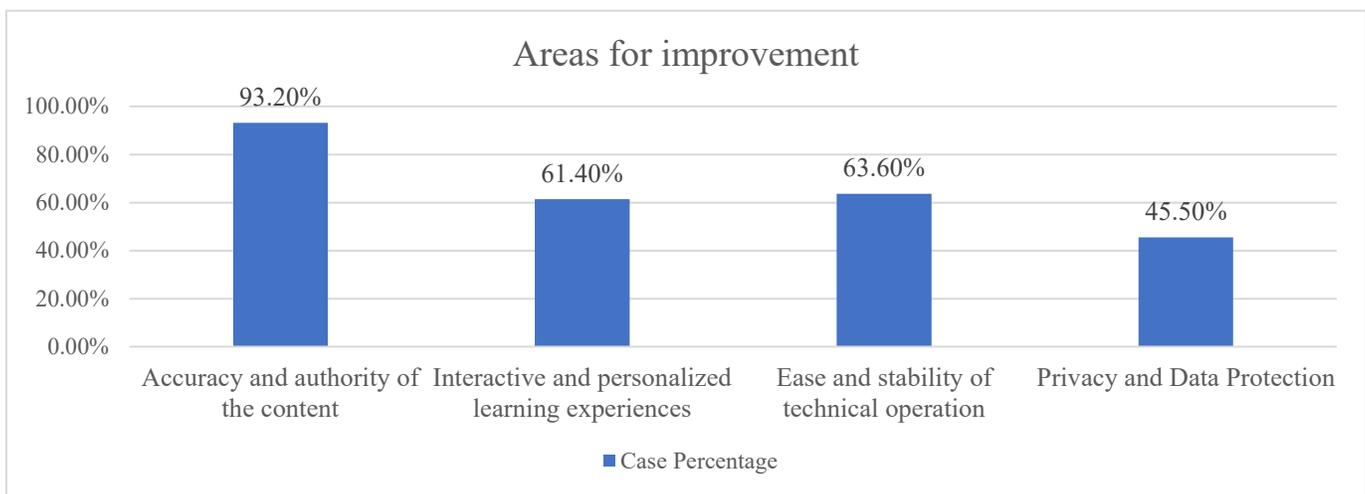


Figure 9. Areas for improvement

In exploring strategies to integrate artificial intelligence into Chinese undergraduate English language learning, teachers, though with varying emphases, unanimously underscored the pivotal role of educators and several core elements in this process. They concurred that teachers' psychological preparedness, profound understanding and application of AI, capacity for independent judgment and guidance, as well as fostering students' autonomous learning and critical thinking, are crucial to the successful integration of AI into English language teaching.

7.5.1. Teachers ensure rational use of AI in education

Firstly, teachers collectively emphasized the need for educators to be well-prepared to confront the challenges posed by new technologies. Anna particularly stressed, "Teachers need to have a deep understanding of and experience with AI, genuinely incorporating it into their teaching philosophy and methods." She further underscored, "Teachers must ensure that this integration benefits students and enhance their learning efficiency and interest, which is the true face of AI-supported education." Claire expressed that "teachers should be aware of both the advantages and disadvantages of AI in English education and decide on the extent of AI's use based on their own teaching philosophy and practical circumstances."

7.5.2. Teachers guide students to use AI correctly

Moreover, teachers highlighted the importance of guidance in using AI. Claire specifically noted that teachers should possess the ability to guide students in using AI correctly, recognizing both its conveniences and potential issues. Daisy, through concrete teaching practices such as AI applications in listening classes, emphasized, "We must make students understand when to use these tools and when to rely on their own abilities and judgment."

In conclusion, both students and teachers recognize the potential value of AI technology in English language learning while acknowledging the limitations and challenges of existing technologies, which require improvement and refinement. Students tend to offer specific suggestions for improvement from a user experience perspective, while teachers emphasize more from a teaching practice and educational leadership perspective, highlighting teachers' own capacity-building and crucial role in the integration of AI. Therefore, to promote AI-assisted English language learning, consideration must be given from multiple dimensions. Not only should progress in technology be focused on, but also teachers' understanding of AI technology and the cultivation of their professional competence.

7.6. Future outlook and recommendations

When discussing the future of AI-assisted English language learning for Chinese undergraduates, students tend to hold a more positive outlook, while teachers view it from both positive and negative angles. The rise of artificial intelligence represents not only a technological revolution but also a profound transformation of the education system, teaching methodologies, and even the role of students. In the face of this transformation, both students and teachers need to be fully prepared to actively embrace and lead the trend of this era.

7.6.1. Positive aspects

Based on the frequency analysis, the vast majority of students hold an objective view towards the future development of AI technology in English learning for Chinese undergraduates, which suggests that they believe AI will have a significant impact on English learning in the future (Figure 10).

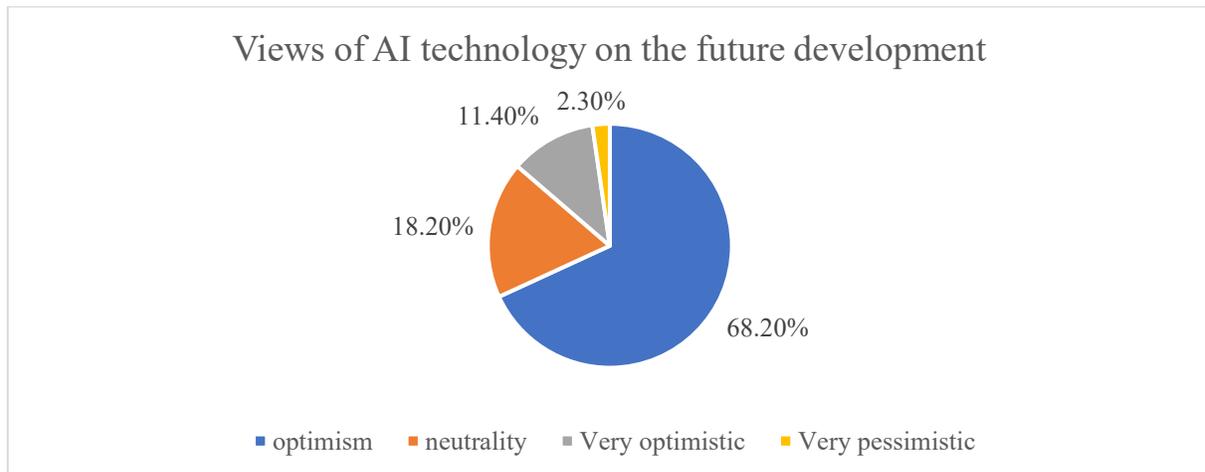


Figure 10. Views of AI technology on the future development of English learning for Chinese undergraduates

From a positive perspective, teachers collectively emphasize that artificial intelligence will not only enhance learning efficiency but also stimulate students' interest and motivation through providing abundant learning resources and personalized learning experiences.

Anna stressed from a macro level, "The future of artificial intelligence has arrived, and it is inevitably profoundly impacting our world. Both teachers and students need to become conscious learners, proactively adapting to and leading these changes." Tom echoed this positivity, "I believe AI has tremendous potential in assisting English language learning. It can not only help students improve their learning efficiency but also provide them with a broader range of learning resources. Undoubtedly, AI will play a crucial role in enhancing efficiency and offering these resources." Claire shared a similar sentiment, "I see a positive future trend for AI in English education, where it can serve as an auxiliary tool, benefiting students' learning." Daisy analyzed the positive impact from multiple angles, "AI can offer more efficient learning resources and personalized learning experiences, contributing to increased learning efficiency and interest among students."

7.6.2. Negative aspects

A significant concern is how students can use AI in an ethical and responsible manner without becoming overly dependent on it. Anna advocated for the establishment of robust ethical norms and moral guidelines to mitigate negative impacts. She further noted that the obsolescence of professions was not inevitable, but depended on individuals' capacity for continuous learning and self-

improvement. Thus, she urged people to maintain mental alertness and openness, embracing new things and viewing AI as an opportunity for personal growth and societal progress.

Tom, while acknowledging the preponderance of AI's positive impacts, also feared students might indulge in AI-derived forms of entertainment. Similarly, Claire voiced more direct concerns about AI potentially fostering passivity among students and replacing human thought. Also, Daisy delved into the problems arising from over-reliance on AI in the past: "If students became overly dependent on AI, they may have lost their ability and motivation for autonomous learning, even affecting their thinking and creativity." Three teachers expressed concerns about students potentially becoming overly reliant on AI. They emphasized that schools, educational institutions and teachers should play an active role in guiding and regulating the use of AI in English education to ensure its appropriate application.

All four teachers hold both positive and cautious views regarding the future of AI in undergraduate English education in China. They unanimously acknowledge AI's positive roles in enhancing learning efficiency, enriching learning resources, and promoting educational innovation. However, they also express concerns about potential ethical and moral issues, student addiction to entertainment, and declining autonomous learning abilities. To address these challenges, they emphasize the importance of establishing robust ethical norms, strengthening educational guidance, formulating clear policies, and fostering students' autonomous learning and critical thinking abilities. In summary, AI's future in English education is promising but requires concerted efforts from educators, schools, educational institutions, and students to ensure its healthy and sustainable development.

8. Limitations

This study utilized a questionnaire to survey students majoring in English at a university in China and conducted interviews with four faculty members from the same university. However, there are certain limitations to this research.

First, the study is constrained by its sample size. The relatively small sample cannot comprehensively represent the perspectives and experiences of all English major students or teachers across Chinese universities. Consequently, the generalizability of the findings is somewhat limited.

Second, there are limitations in the sample selection. The study focuses solely on third-year English major students. It excludes students from other years or different majors. This narrow focus may overlook varying perceptions and needs regarding the use of artificial intelligence at different stages of study and across different academic backgrounds.

Third, there are limitations related to the design of the questionnaire and interview questions. The design of these tools may not have fully covered all aspects and dimensions of the impact of artificial intelligence on the process of learning English, resulting in a limited scope of data collected.

9. Conclusion and future research

In summary, the comprehensive analysis of questionnaire data and interviews with teachers clearly demonstrate the widespread acceptance and remarkable popularity of artificial intelligence in assisting Chinese undergraduate students with their English language learning. Questionnaires results reveal that AI-assisted learning has indeed yielded positive outcomes in practical application. Students acknowledge that AI meets their varied English learning needs and demonstrate flexibility in using a range of AI tools. AI tools like ChatGPT, ERNIE Bot, and online platforms have significantly enriched and personalized learning resources, enhancing both efficiency and experience.

Teachers play a pivotal role in this process. They not only actively recommend AI-assisted English learning tools to students but also continuously explore the deep integration of AI into English teaching through their own teaching practices. The pandemic has accelerated the adoption of AI in education, heightening teachers' awareness of the potential of AI tools and integrating them into daily instruction to ensure learning continuity and foster innovative teaching models.

However, the widespread use of AI has also prompted concerns among both teachers and students regarding potential issues. Teachers have expressed concerns regarding the ethical and moral use of AI, as well as the issues of students becoming overly reliant on or addicted to AI. Teachers emphasize the importance of maintaining a prudent approach while embracing the conveniences offered by AI, and balance its supportive role with the irreplaceable nature of human teachers.

Looking ahead, as AI technology matures and educators delve deeper into its applications, AI is poised to play an even more significant role in English language learning, achieving a dual leap in learning efficiency and quality. However, this presupposes that we effectively address challenges related to ethics, autonomous learning ability cultivation, and ensure that technology serves the fundamental goals of education to foster the comprehensive development of students. For this purpose, educators should receive targeted training to help them integrate AI tools more effectively during the learning process. Policymakers should develop more practical and up-to-date policies based on actual usage conditions.

Therefore, future research can embark from the following aspects. Firstly, ethical norms and moral guidelines can be delved to establish for the application of artificial intelligence in the field of education. Secondly, investigation can be conducted on how to empower schools and teachers to adapt to and leverage AI-assisted teaching methods, as well as enhance guidance and supervision over students' use of AI technologies to prevent them from indulging in entertainment forms or misusing the technology. Lastly, data on the actual outcomes of students' English learning with AI assistance can be gathered to adjust teaching

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