Artificial Intelligence Applications and Human-Machine Cooperative Translation Skills Among English Section Students

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ABSTRACT

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Year: ٢٠٢٥

Title: Artificial Intelligence Applications and Human-Machine Cooperative Translation Skills Among English Section Students

The current study aimed to investigate the use of artificial intelligence applications and human-machine cooperative translation skills among English section students. The researchers used the descriptive method in this study. The study participants were one hundred students enrolled in third year English section at the Faculty of Education, Benha University, Egypt. The instrument of the study included a questionnaire related to the use of artificial intelligence applications and human-machine cooperative translation skills. Results of the study revealed that the importance of using artificial intelligence applications and human-machine cooperative translation skills from the perspective of the English section students is high. The results also showed that there are various obstacles facing English section students while using AI applications in translation. Considering the above results, several recommendations were proposed, such as providing English section students with technical skills and knowledge to help them employ AI in translation and learning process.

Keywords: Artificial Intelligence Applications : Human-Machine Cooperative Translation Skills

المستخلص باللغة العربية

هدفت الدراسة الحالية إلى التعرف على واقع استخدام تطبيقات الذكاء الاصطناعي ومهارات الترجمة التعاونية والآلية لدى طلاب شعبة اللغة الإنجليزية. واستخدم الباحثون المنهج الوصفي في هذه الدراسة. وتكونت عينة الدراسة من مائة من طلاب الفرقة الثالثة شعبة اللغة الإنجليزية بكلية التربية بجامعة بنها. تضمنت أداة الدراسة استبيانًا يتعلق بواقع استخدام تطبيقات الذكاء الاصطناعي ومهارات الترجمة التعاونية والآلية. وأشارت نتائج الدراسة إلى أهمية استخدام تطبيقات الذكاء الاصطناعي ومهارات الترجمة التعاونية والآلية من وجهة نظر طلاب شعبة اللغة الإنجليزية بنسبة كبيرة . وأظهرت النتائج أيضًا أن هناك العديد من العقبات التي تواجه طلاب شعبة اللغة الإنجليزية أثناء استخدام تطبيقات الذكاء الاصطناعي في الترجمة. واقترحت الدراسة بعض التوصيات، مثل تزويد طلاب شعبة اللغة الإنجليزية بالمهارات والمعرفة التقنية لمساعدتهم على توظيف الذكاء الاصطناعي في الترجمة.

الكلمات المفتاحية :

تطبيقات الذكاء الإصطناعى – مهارات الترجمة التعاونية – الترجمة الآلية

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Introduction

Communication between various languages has become increasingly frequent and close. Translation, as one of the important means of cross-language communication, has become an indispensable skill for many people. The global demand for translation has more than doubled over the last ten years. There are simply not enough professional translators in the world today to cope with the growing amount of content.

Improving translation skills in the era of AI such as machine translation post-editing, critical thinking, and cultural intelligence requires steady practice, so students need to improve language competence daily in class and whenever possible (Nguyen & Ngo, 2021). Translators must have good reading, writing, memorization, fluency, and understanding of intentions and situations (Kobiakova & Shvachko, 2016). They must work with various information transfer processes in a digital environment (Enbaeva & Plastinina, 2021).

The ability of translators to accomplish high-quality human translation (HT) and human-machine (MT), cooperative translation can be improved through more targeted translation teaching (Liang & Liu, 2023). The study of translation education technology in the era of artificial intelligence refers to the theory and practice of designing, developing, using, managing, and evaluating the process of teaching and learning translation and related resources, covering all the technological means and methods adopted in translation education activities, aiming at optimizing the teaching of translation education (ZHANG & LYU, 2023).

Machine translation (MT) can be called a translation tool. It is a sub-field of computational linguistics or software providing a system that can predict the translation of words, texts, or speeches from one language to another language (Sinhal & Gupta, 2014; Mahardika, 2017). MT refers to fully automated software that can translate a source text in almost any language, into almost any target language of the user's choice. The last few years have seen MT quality increase to a level that some scholars claim is on par with human translation for certain texts and between certain languages .

According to Irfan (2017), machine translation (MT) means automatic translation; it is part of the field of Artificial Intelligence. Machine translation is a computer program designed to translate text from one language (source language) to another language (target language) without human intervention. Machine Translation aims to provide a system that translates the

source language text into the target language while ensuring that the translation conveys the same meaning as the original.

Various studies have already compared NMT and HT from various perspectives, primarily focusing on literary translation to identify the differences between the two approaches (Kuo, 2018; Frankenberg-Garcia, 2021; Hu and Li, 2023). Kuo (2018) examined the use of function words in machine-translated Chinese and original Chinese, discovering an overuse of function words in MT. Frankenberg-Garcia (2021) conducted a comparative lexical analysis of literary works translated by NMT and HT, revealing that HT exhibited greater explication, idiomaticity, register awareness, and risk aversion compared to NMT. In their comparison of Shakespearean plays translated by DeepL and human translators, Hu and Li (2023) identified a certain degree of creativity in MT.

More pertinent to our study is the work of Sheng and Kong (2023), who examined machine-translated Chinese political documents in contrast to human translation and found that NMT lacks the subjectivity and flexibility of professional translators. These previous studies have provided valuable insights into the characteristics of NMT and HT. However, given the emergence and widespread adoption of ChatGPT, it is essential to expand the scope of comparison to include ChatGPT, to stay up to date with the rapid advancements in AI-powered language technology. The educational challenge for translators is to teach students how to use new technologies and determine how and when the added value of human intuition, creativity, and ethics should be integrated (Massey & Ehrensberger-Dow, 2017).

Modern society is heavily affected and steered by technology, including various sophisticated artificial intelligence (AI) applications, some of which have surpassed human ability in executing bureaucratic and operational tasks. However, humans still excel in tasks that require higher-order thinking, based on the same cognitive excellence that has long ensured human dominance in the natural world (Moneus & Sahari, 2024).

AI has emerged as a contemporary subject of discourse within academic institutions, media outlets, and political spheres in the context of the ongoing Second Industrial Revolution. In recent years, AI development and discourse have significantly influenced various sectors, including academia, industry, media, and politics. A vast number of people now use smartphones and online machine translation apps to interact across language barriers, thus bridging cultural and linguistic divides (Moneus & Sahari, 2024).

AI is a field of study that focuses on addressing cognitive challenges akin to those solved by human intelligence by developing programs that mimic human thought processes. It aims to understand the nature of human intelligence, including its various structures and aspects. AI seeks to replicate human cognitive abilities in practical scenarios, enabling the simulation of specific skills such as speech recognition. These cognitive capabilities are then converted into computational formulas to solve problems and make decisions (Al-Twijri & Alghizzi, 2024).

AI analyzes large volumes of data to identify patterns and make judgments. This feature allows for the personalization of learning experiences. After evaluating each student's performance, preferences, and learning style, AI systems can customize the learning path, content, and pacing to suit their needs. Additionally, AI efficiently automates repetitive tasks, such as grading, allowing educators to focus on more complex tasks. Another distinctive feature of AI is its ability to adapt learning platforms based on the learner's level. This feature promotes efficient learning by adjusting task difficulty, thus providing challenges ideally suited to the learner's current skill level. In addition, AI can comprehend and generate human language to facilitate interactions and provide prompt feedback. Furthermore, AI makes educational materials more accessible by converting text to speech and speech to text while also recognizing visual materials. Lastly, AI proves highly effective in helping educators understand learners' performance and identify trends and insights to adjust the teaching process accordingly (Al-Twijri & Alghizzi, 2024).

Despite advancements, AI-powered MT systems still face challenges. These include difficulty in translating low-resource languages, handling idiomatic expressions and cultural nuances, and maintaining consistency in long texts (Naghdipour, 2023). Moreover, the opaque nature of NMT systems complicates the process of understanding and correcting errors (Rao, 2022).

Therefore, it is necessary to develop new teaching methods to improve students' language competence and lay a solid foundation for their future professional development (He, 2021). Moreover, the impact of technology must be reflected in education strategies to meet the requirements of a rapidly evolving market and equip students with the necessary knowledge and skills for professional careers in the digital era (Sayers et al., 2021).

AI-powered chatbots can open up new avenues for adaptive and personalized learning experiences, encouraging students to regularly engage in the learning environment (Wang &

Xue, 2024). AI-assisted tools enable EFL learners who feel reluctant or anxious to speak to teachers face-to-face to practice pronunciation and receive feedback from AI tools without worrying about challenges or embarrassment that may arise in a classroom setting (Huang & Zou, 2024).

AI-based translation software models have become widely available, including Google Translate, Bing, Microsoft Translator, DeepL, Reverso, Systran Translate, and Amazon Translate. Additionally, several computer-aided translation (CAT) tools exist, such as MemoQ, Trados, Smartcat, Lokalise, and Smartling.

Context of the Study

Human-Machine Cooperative Translation Skills refer to the ability of human translators to effectively collaborate with machine translation (MT) systems, such as Google Translate, DeepL, or AI-powered CAT (Computer-Assisted Translation) tools. This collaborative process integrates human expertise with AI to enhance translation quality, efficiency, and accuracy. By combining human linguistic proficiency and artificial intelligence, this approach improves translation accuracy, fluency, and cultural appropriateness while leveraging machine efficiency. While human-machine collaboration in translation enhances productivity, it also presents several challenges. MT systems struggle with understanding idioms, cultural nuances, and ambiguous expressions. Machines often translate word-for-word, failing to capture the intended meaning. Additionally, MT lacks deep contextual awareness, leading to lexical and semantic errors. Furthermore, MT lacks creativity, making it unsuitable for translating literary or marketing texts (OpenAI, 2025).

Considering the researchers' experience and a review of related studies (e.g., Abdellah, 2007; El-Khuly, 2008; El-Tantawi, 2011; Abu Al-Fadl, 2013; Abu-Elenein, 2015; El-Shafie, 2016; Marghany, 2016; Abdallah, 2018; Hussein, 2018; Roshdy, 2018; Ezzeldin, 2020; Sadaka, 2020; Haroon, 2021; & Samir, 2023), it has been observed that student teachers face difficulties in translation skills.

To document this issue, the researchers conducted interviews with fifty third year English section students, asking about their opinions on using Artificial Intelligence Applications in Human-Machine Cooperative Translation Skills. Some participants reported difficulties in using AI applications for translation between English and Arabic. These findings highlight the

need for greater investment in artificial intelligence applications and their role in enhancing Human-Machine Cooperative Translation Skills.

Statement of the Problem

Despite the importance of AI applications in human-machine cooperative translation skills, third-year EFL students at the Faculty of Education, Benha University, Egypt, struggle with using and interacting with AI translation applications. Thus, this study aims to investigate the current reality of artificial intelligence applications in the context of Human-Machine Cooperative Translation Skills from the perspective of third-year English section students.

Questions of the Study

Accordingly, the main question of the current study is defined as follows:

What is the reality of using artificial intelligence applications in Human-Machine Cooperative Translation Skills from the perspective of English section students?

This main question is further divided into the following sub-questions:

1. What is the importance of using artificial intelligence applications in Human-Machine Cooperative Translation Skills from the perspective of third year English section students?
2. What are the obstacles to using artificial intelligence applications in Human-Machine Cooperative Translation Skills from the perspective of third year English section students?

Review of Literature

Translation industry has undergone a significant transformation. With advancements in technology, such as translation memories and machine translation (O'Hagan, 2020), the profession has gradually shifted from a human-centered activity assisted by technology to an industry where human-machine cooperation has become standard practice, and machine-generated translations are increasingly important (Angelone et al., 2020). These transformations have had wide-ranging implications for various stakeholders, including language service providers, professionals, and freelancers, who have had to adapt to this evolving industry landscape. University authorities and translation instructors have also had to undertake this adaptation process, primarily to enhance the employability of trainee translators in a 21st-century, technology-driven market (Kenny, 2020; Schnell & Rodríguez,

2017). This process involves reshaping translation curricula (see Sawyer et al., 2019) by integrating technology-focused and employability-specific modules (see Rodríguez de Céspedes, 2017), rethinking the skill sets required for future translators (Hurtado Albir, 2017; Pym, 2013), and considering human perspectives on technology-driven changes (Kenny, 2017; Trojszczak, forth. 2022).

The term "machine translation" has largely been replaced by "online translation" (OT) or "online translation tools" (OTTs) (Asscher, 2022). Commonly used OTTs include Google Translate, Bing Microsoft Translator, DeepL Translator, ImTranslator, and Babylon. Some educators criticize OTTs for encouraging over-reliance on L1, impeding L2 learning, and facilitating academic dishonesty, despite their widespread use (Merschel & Munné, 2022).

As is the case in many other fields, where humans collaborate with machines to maximize productivity while minimizing time and cost, translators should embrace a similar approach. Post-editing (PE) is a crucial element of success in the translation industry, serving as a bridge between machine-generated solutions and the linguistic expertise that remains unique to human translators (Romaniuk-Cholewska, 2021). From another perspective, some localization agencies, private companies, and organizations already offer online PE training courses in multiple languages, combining theoretical and practical exercises to develop PE skills. These organizations also express a strong preference for hiring translators and interns with at least basic technical proficiency in PE (Arenas & Moorkens, 2019). This underscores the importance of PE training in higher education, particularly as a means of enhancing graduates' employability prospects. Given the rapid expansion of AI-driven language and translation applications, the integration of AI into translation education could help bridge the growing demand for skilled translators.

Machine translation (MT) has achieved remarkable advancements in recent years, driven by breakthroughs in deep learning and neural networks (Cho et al., 2014; Sutskever et al., 2014; Vaswani et al., 2017; Gu et al., 2019; Liu et al., 2020; Fan et al., 2021). Despite these technological strides, literary translation remains one of the most challenging domains for MT systems. Literary texts, characterized by their complex language, figurative expressions, cultural nuances, and unique stylistic elements, present substantial difficulties that machines struggle to address effectively (Voigt & Jurafsky, 2012). This complexity has led researchers to describe literary translation as "the last frontier of machine translation" (Klemin, 2024).

The widespread availability and real-time functionality of MT have expanded its use and influence beyond professional translation settings, making it an integral part of daily communication in multilingual societies. This shift carries significant social and ethical implications (Vieira et al., 2020). Liang and Liu (2023) identified three key advantages of human translation abilities: bilingual conversion proficiency, communicative competence, and linguistic expertise. They argue that enhancing these abilities through targeted translation instruction can improve both human translation quality and human-machine collaborative translation.

Various AI tools have been utilized in learning foreign languages, including automated writing evaluation systems, machine translation tools, intelligent learning management systems, chatbots, and virtual learning environments. However, few of these tools have been specifically designed to create interactive activities that enhance learners' motivation, engagement, and attitudes while reducing anxiety toward language learning. The AI-powered chatbot is among the most prevalent AI applications used to improve the affective factors of learning. It is a computer program equipped with AI capabilities to mimic human-like intelligence through text or voice. It provides an interaction experience to enrich users' knowledge. Numerous studies have shown that chatbots have been instrumental in developing EFL learners in different aspects of language domains such as grammar, vocabulary, and speaking skills. Furthermore, AI chatbots fostered learners' motivation, engagement, and positive attitudes toward learning EFL (AlTwijri & Alghizzi, 2024).

In the modern era, AI technology has made significant breakthroughs in education and teaching. AI technology is designed to simulate human intelligence and behavior (Yang, 2020). Its rapid development has driven innovation in English language teaching and learning methods. For years, teachers have relied on multimedia-based instruction, which, while engaging, often prioritizes pre-prepared courseware over real-time teacher-student interaction. As a result, students remain passive recipients of knowledge and exhibit low enthusiasm for learning (Yang, 2020).

AI has distinct advantages in language learning. It plays a crucial supporting role in both student learning and teacher teaching. Integrating artificial intelligence technology into English teaching can maximize these benefits while addressing the limitations of traditional classroom methods (Yang, 2020).In their study, Shafira & Nugroho (2023) investigate the

types of errors that are common in translations generated by automatic translation software like TikTok. They identified several types of errors, including missing words, incorrect word order, unknown words, and improper punctuation.

In the modern era, translation is no longer exclusive to human translators but can also be performed by machine translation systems, commonly referred to as "auto-translate." There are at least two elements that play a role in translation: the sender (source language) and the receiver (target language). Essentially, translation serves the same function as verbal communication, allowing information to be conveyed in text form. That is why they both need someone who can help them translate the language so that the recipient (Shafira & Nugroho, 2023) will understand the message. In modern times, MT has become widely available. MT refers to a system that translates text from a source language into a target language while attempting to maintain the original meaning (Irfan, 2017).

MT has many advantages, including time and cost efficiency and support for multiple languages. However, it may produce inaccurate translations when the source text contains errors or uses words that are not included in its built-in dictionary. The only way to improve these translations is to manually update the dictionary regularly. Many social media applications, such as Facebook, Instagram, YouTube, and Netflix, support automatic translation features via MT to facilitate communication in different languages. In addition to these applications, TikTok also includes an automatic translation feature powered by MT. TikTok is a social networking application and music video platform where users can create, edit, and share short video clips with filters and background music. The platform refers to its automatic subtitles as "auto-captions," allowing for quick translation between languages. Additionally, this feature can translate spoken words in TikTok content, which are then automatically transcribed by the application (Shafira & Nugroho, 2023).

With the advent of AI revolution, deep learning is injecting new vitality into MT technology. In the context of AI, teachers must explore new and effective teaching strategies to enhance translation instruction, which has become a growing concern for university educators in recent years. As society evolves, English proficiency is increasingly seen as a fundamental skill for professionals. English teaching in schools is no longer limited to exam preparation; it now focuses on developing students' comprehensive English abilities, enabling them to apply their knowledge in real-life situations (Kong, 2022).

Historically, human translation has been the dominant method of translation. However, with the advancement of computer technology and the rapid growth of the Internet, machine translation is becoming more prevalent. MT utilizes computational power to convert and transfer information between languages . The development of machine translation technology has moved from the research stage to the practical application stage. MT is also the main driver of the global evolution of translation industry (Kong, 2022).

AI technology has now reached a stage where multiple types of cross-integrated applications are spread across various fields, including those related to intelligent scoring technology based on image text recognition and natural language processing. AI has become an effective means of improving efficiency and technology in various industries and will also lead to significant changes. Moreover, the technology is also affecting the transformation of education and assessment concepts and models in all aspects (Kong, 2022).

Wang (2023) explores the practical prospects for using artificial intelligence technologies in professional English-speaking translator education. The results showed that the use of artificial intelligence technologies in educational practices could have a significant impact on the development of key competencies of future translators. Using a competency-based approach to interpreter training and considering the need to develop abilities, knowledge, and skills required for successful professional translation activity, the author developed the pedagogical concept of the online educational course Simultaneous and asynchronous translation in a digital environment.

In the past few years, China has focused more on English translation studies and tried to improve English translation education by enhancing virtual group interaction to collaborate on translation projects, introducing digital pedagogical tools (such as online educational communication platforms and mobile applications for machine translation) and emphasizing the study of post-editing techniques (Wang, 2023).

In the Chinese context, five new directions in translation education have emerged in the twenty-first century. First, with the introduction of constructivism, translation education has become student-centered rather than teacher centered. Secondly, when developing a training program for translation, labor market demands are considered. Thirdly, the process-oriented approach to teaching is being implemented. Fourth, disciplines such as corpus linguistics and English for Special Purposes provide new sources of inspiration for translation instruction.

Finally, new methods and technologies in the digital age play an important role in translation education in China (Liu et al., 2022).

Today, it is hard to imagine a translator performing their duties without using computer tools—from initial contact with clients to using word processors and a range of specialized translation programs (CAT tools such as Trados Studio, MemoQ, Wordfast, OmegaT, and Transit NXT Professional) and digital applications (Google Translate, Waygo, Baidu Translate, Naver Papago Translate, Microsoft Translator, etc.). Therefore, the impact of technology must be reflected in education strategies to meet the demands of a rapidly evolving market and equip students with the necessary knowledge and skills for professional activities in the digital era (Sayers et al., 2021).

AI tools like ChatGPT have demonstrated impressive technical capabilities, generating translations that rival or even surpass dedicated translation systems such as Google Translate and DeepL (Lee, 2023, cited in Mahdi & Sahari, 2024). The study conducted by Mahdi & Sahari (2024) makes a significant contribution by examining the multifaceted factors influencing the integration of artificial intelligence in translation. Their focus on attitude, anxiety, and critical thinking within the context of AI and MT provides valuable insights into the complex relationships shaping individuals' perceptions and decision-making processes.

In the new era, AI technology has made significant breakthroughs in education and teaching. The accuracy of AI-powered speech recognition technology, which is among the most advanced globally, has reached an exceptionally high level. This technology is widely used in various aspects of daily life, including language translation, speech synthesis, speech testing, speech conversion, and voiceprint recognition, all of which are closely related to language learning. In modern society, machines can not only interpret human speech but also provide meaningful feedback. While AI introduces new opportunities and breakthroughs in learning methods, it also presents challenges for education and teaching (Yang, 2020).

AI technology is a kind of technology that emulates human intelligence and behavior. Artificial intelligence includes two aspects: one is theoretical research, and the other is engineering research. The theoretical research of artificial intelligence aims to lay a theoretical foundation for the understanding of engineering research and to explore machine AI at the theoretical level. The engineering research of artificial intelligence mainly focuses on the product development and design of the systems and equipment of artificial intelligence.

Both theoretical research and engineering research are not independent; they are closely related and are committed to solving the following problems: (1) intelligent information storage and internal information processing ability; (2) intelligent symbol processing ability, realizing symbolic processing of information input and output, assignment comparison, etc.; and (3) intelligent cognitive processing ability, which endows artificial intelligence with problem-solving capabilities (Yang, 2020).

The rapid development of AI technology promotes the innovation of English learning and teaching methods. Teachers have been teaching with the help of multimedia for a long time. Although the classroom is vivid, this teaching method focuses on courseware explanation and often ignores the real-time interaction between teachers and students. Students still passively accept knowledge and have low enthusiasm for learning. The undifferentiated teaching under the unified teaching task cannot provide real-time feedback on students' knowledge mastery; students have little opportunity to learn to apply their knowledge, and teaching and learning cannot form a good cycle (Yang, 2020).

Using advanced AI technology has made personalized and accurate education possible. Based on big data, artificial intelligence can track and record various data points of learners, model, analyze, and evaluate learners, effectively intervene in learners' progress, and provide data support for teachers to improve teaching methods and strategies to truly fulfill the requirements of teaching. Artificial intelligence not only changes the way students input and output language, enabling language learning to penetrate their daily lives, but also plays a significant role in promoting the innovation and reform of the English teaching mode. It is of great significance to improve the quality of education by using AI technology more effectively in the complex language environment (Yang, 2020).

In the field of language learning, AI can demonstrate its unique advantages. It plays an important auxiliary role in students' learning and teachers' teaching. The application of artificial intelligence technology in English teaching can maximize its advantages and make up for the shortcomings of traditional classroom teaching. This study analyzes the application of artificial intelligence from four aspects of English listening, speaking, writing, and translation, and discusses its role in promoting the reform of English teaching (Yang, 2020).

Machine Translation (MT), notably Google Translate (GT), is now the most widely used technical tool in the classroom (Tsai, 2022). Google Translate is one of the most well-known

online translators and machine translation technologies used in the age of digital globalization (Shen & Bai, 2022). These technologies help reduce communication barriers across cultures by providing quick translations in a wide range of languages. These digital technologies have become potential aids in the field of education, especially in the study of English as a Foreign Language (EFL), and may be used in addition to conventional teaching strategies. However, there is ongoing discussion over the effectiveness of such technologies. This paper aims to explore the role and impact of online translators and machine translation in EFL learning.

When GT was first introduced in 2006, its algorithms were based on the frequency of word pairs, which occasionally resulted in translation errors (Urlaub & Dessein, 2022). The introduction of Google's Neural Machine Translation (GNMT) in 2016 significantly improved GT's translation quality, reducing errors by 60% compared to its predecessor, Phrase-Based Machine Translation (PBMT) (Andari, Sofyan, & Yusuf, 2022). GT offers features beneficial for language learning, such as instant translation pronunciation aid, access to authentic materials, grammar and syntax comparison, real-time conversation translation, image translation, and offline translation capabilities, despite its limitations, such as occasional inaccuracies and a lack of contextual understanding (Ammade, Ramadhani, & Rahman, 2023; Wang, Huang, Sun, & Zhang, 2023).

However, the machine translation mechanism relies on rigid grammatical rules. These systems often experience significant variations in comprehension during source text processing and have difficulties accurately capturing semantic features (Li & Hao, 2021). Neural machine translation uses an electronic network trained to identify input data and translate it into the desired output (Kanglang & Afzaal, 2021). For example, Google Translate offers three models: neural machine translation, phrase-based machine translation (PBMT), and AutoML translation, allowing users to dynamically translate processed languages using pre-trained machine learning models provided by Google. When a client requests translation through the API, the Google platform applies NMT methods (Kolhar & Alameen, 2021).

The enhanced functionality of Google Translate, which led to translations resembling human speech, assisted some students with low L2 proficiency in meeting the requirements of writing assignments, helping them pass the teachers' Google usage check and ultimately achieve high scores that they would not have received without Google Translate. This finding aligns with the conclusions of King (2019), Tsai (2022), Lee (2022), and Kenny (2023), who

argue that the criticism directed at Google Translate in the literature for producing unnatural and substandard translations was valid before integrating artificial intelligence technology into the backbone of Google Translate. They assert that the translations produced by Google Translate now match the quality of those produced by expert human translators.

There are also studies exploring the application of ChatGPT in translation tasks. One line of research focused on comparing the translation quality of advanced NMT engines and Chat-GPT using automated metrics and human evaluation (Raunak et al., 2023).Radford et al. (2019), for example, found that during the self-supervised pretraining of GPT-2, it implicitly learns to multitask (such as performing translation) from weak supervision signals in the pretraining corpus crawled from the web. Chowdhery et al. (2022) demonstrated early signs of artificial general intelligence (OpenAI, 2023; Bubeck et al., 2023). While machine translation gave birth to the foundational architecture of large language models (LLMs), pre-trained LLMs are also revolutionizing the learning paradigms in machine translation. Karpinska and Iyyer (2023) showed that when translating paragraph-level texts, ChatGPT produced fewer mistranslations, grammatical errors, and stylistic inconsistencies compared to Google Translate. These results demonstrate the strong capabilities of ChatGPT in certain translation tasks, particularly for high-resource language pairs and general text translation.

Both the calculation of Euclidean distance and t-SNE visualization demonstrated that ChatGPT-generated translations were closer to machine translation (MT), while human translation (HT) was distant from both. The longest distance was observed between MT and HT. A similar observation was found in Frankenberg-Garcia (2021), which offered a comprehensive analysis of the lexical differences between HT and NMT. The author found human translators to be superior in idiomaticity, the use of translation strategies, conveying registers, and handling communication breakdowns. Karpinska and Iyyer (2023) showed that paragraph-level translations by ChatGPT were more aligned with high-quality human translation, exhibiting reduced mistranslations, grammatical errors, and stylistic inconsistencies compared to Google Translate.

Translation is a cognitive process that necessitates the utilization of innovative solutions to tackle textual, social, and cultural challenges. The act of translating may be perceived as a problem-solving process in which the translator encounters issues from multiple sources and employs resources and methods to address them. Translation involves the thinking of translators, and critical thinking is extremely important from this perspective. It necessitates the capacity to analyze and evaluate information, make informed judgments, and draw reasoned conclusions.

Method

A. Participants

The participants of the study consisted of one hundred students .They were chosen from the third- year students enrolled in English section at Benha Faculty of Education, Egypt.

B. Design

The study used a descriptive research design. This design is suitable for the current study, achieving its objectives and reaching responses that contribute to describing the reality of using AI applications in human-machine cooperative translation skills from the perspective of English section students.

C. Instrument

The instrument of the study was a questionnaire prepared by the researchers to measure the use of artificial intelligence applications in human-machine cooperative translation skills from the perspective of English section students.

The questionnaire consisted of two sections:

A. The first section includes the basic information of the participants, specifically gender and grade for each of them.

B. The second section includes indicators to clarify the actual reality of artificial intelligence applications in human-machine cooperative translation skills from the perspective of English section students. This is clarified in two domains: the first domain is the importance of using AI applications, and the second domain addresses

the obstacles of using artificial intelligence applications in human-machine cooperative translation skills.

Determining the Validity of the Study Instrument

The questionnaire was submitted to jury members .They were asked to determine the validity of the instruments in terms of clear instructions, items and their suitability for the students' level. They indicated that the questionnaire was clear and suitable for students' levels and background knowledge. Therefore, the questionnaire was considered valid measure for the reality of artificial intelligence applications in human-machine cooperative translation skills (Face Validity).To ensure the content validity of the questionnaire , it was developed in the light of a systematic and accurate review of literature and previous studies. This accurate and systematic review determined the general form of the questionnaire . Therefore, the content of the questionnaire was representative of the skills that were intended to be measured. Thus, the questionnaire was valid and having a content validity.

Determining the Reliability of the Study Instrument

The reliability of the instrument was measured by using the test-retest method. The instrument was administered to a group of the third –year students enrolled in English section at Benha Faculty of Education. Then, it was administered to the same group again after two weeks. The Pearson correlation between the two administrations was (0.87) at the 0.01 level. Therefore, the instrument was reliable.

Results of the Study :

Results of the first question:

The first question states: What is the importance of using artificial intelligence applications in human-machine cooperative translation skills from the perspective of English section students? Table (1) clarifies the importance of AI applications in human-machine cooperative skills. The means and standard deviations are calculated as shown:

Table (1): The importance of using AI in human-machine cooperative Translation skills.

No	Statement Using AI in human-machine cooperative Translation skills helps English section students to:	Means	Standard Deviation	Degree of Approval
1	Enhance their translation Speed	٥,٠٦	١,٣٨	High
2	Enhance grammar, syntax, and contextual accuracy.	٤,٧٥	1.21	High
3	Reduce errors in translations.	٥,٠٦	١,٣٨	High
4	Enhance collaboration and participation.	٤,٥٥	١,٢٧	Medium
5	Make translations more accessible and cost-effective	516.	.١5٥	High
6	Facilitate voice translation, making communication more accessible.	٥,٠٨	١,٣٨	High
7	Analyze context and idioms, offering more natural translations.	٤,٧٧	1.2٢	High
	The First Domain as A Whole	**5.07**	**1.35**	High

Table 1 shows that the means for the first domain (the importance of using AI) was (mean =5.07, standard deviation =1.35); and the approval of it was at a high degree. The table also reveals that the statements (12-3-5-6-7) achieved the highest average approval.

Results of the Second Question:

The second question states: "What are the obstacles to using artificial intelligence applications in Human-Machine Cooperative Translation Skills from the perspective of English section students? Table (2) clarifies the obstacles to using artificial intelligence applications in human-machine cooperative translation skills from the perspective of English section students. Means and standard deviations were calculated for each statement of the second domain: “Obstacles to Using Artificial Intelligence Applications in Human-Machine Cooperative Translation Skills”.

Table 2: Obstacles to Using Artificial Intelligence Applications in Human-Machine Cooperative Translation Skills

No	Statement The obstacles English section students face in using AI applications in Human–Machine Cooperative translation skills:	Means	Standard Deviation	Degree of Approval
1	AI struggles with idioms, slang, and cultural nuances, often leading to unnatural translations.	٥,٠٣	١,٣٦	High
2	AI may misinterpret words with multiple meanings without proper context.	٤,٨٢	1.2٣	High
3	AI-generated translations can have errors, requiring human post-editing.	٥,٠٨	١,٣٨	High
4	AI translation tools may store and process sensitive information, leading to data privacy risks.	٥,٠٢	١,٣٦	High
5	Poor technical and technological support is provided to students.	٥,٠٥	١,٣٥	High
6	Fear of trying modern technical methods.	٥,٠٨	١,٣٨	High
7	Advanced AI translation tools can be expensive, limiting accessibility for smaller businesses or individual translators.	٤,٧٦	1.23	Medium
8	Continuous updates and maintenance require additional investment.	٥,٠٣	١,٣٦	High
	The second Domain as A Whole	**5.108**	**1.37**	High

Table (2) shows that the means for the second domain (Obstacles to Using Artificial Intelligence Applications in Human-Machine Cooperative Translation Skills) was (mean = 5.108, standard deviation = 1.37), indicating a high level of approval. The table also reveals that the statement "Fear of trying modern technical methods" achieved the highest average approval, reaching (mean = 5.08, standard deviation = 1.38), which indicates a high degree of approval for this statement.) .

Results Discussion and Interpretation:

The primary purpose of this study was to investigate the use of artificial intelligence applications and human-machine cooperative translation skills among English section students. The results of the study revealed that artificial intelligence applications proved to be statistically and educationally significant in human-machine cooperative translation skills among third year English section students at Faculty of Education, Benha University .

It also revealed that AI plays a crucial role in enhancing human-machine cooperative translation skills and improving accuracy, efficiency, and accessibility. AI applications have a significant role in increasing translation speed. Applications such as Google Translate and DeepL allow students to focus on refining the output. Moreover, AI tools enhance grammar, syntax, and contextual accuracy, reducing errors in translations. It can be noted that machine learning algorithms improve over time, learning from user corrections and specific industry terminologies, making AI-driven translations more reliable. AI-assisted translation reduces costs by automating routine translations, allowing translators to focus on high-value tasks like localization and cultural adaptation.

In addition, AI enables speech-to-text, text-to-speech, and image-based translations, making cross-language communication more accessible in real-time applications. AI tools assist human translators by suggesting better phrases, checking grammar, and improving consistency. AI-powered tools like CAT (Computer-Assisted Translation) software offer suggestions and auto-corrections, speeding up the human translation process.

It can be concluded that AI enhances human-machine cooperative translation by speeding up workflows, improving accuracy, and making translations more accessible and cost-effective. Instead of replacing human translators, AI serves as a powerful augmentation tool, ensuring higher quality and efficiency in multilingual communication.

It can be clarified that one of the obstacles to using AI applications is contextual and cultural limitations. AI struggles with idioms, slang, and cultural nuances, often leading to unnatural translations. It may misinterpret words with multiple meanings without proper context. Regarding accuracy and quality issues, AI-generated translations can contain errors, requiring human post-editing to ensure precise terminology, which AI may not always guarantee. The use of AI applications in translations lacks creativity, and human intuition cannot fully grasp tone, style, and emotional nuances, making creative translations difficult. For security and

privacy concerns, AI translation tools may store and process sensitive information, leading to data privacy risks. Moreover, advanced AI translation tools can be expensive, limiting accessibility for smaller businesses or individual translators. The lack of technical and technological support within schools and universities is also considered one of these obstacles.

Conclusions

The current study investigates the reality of artificial intelligence applications and human-machine cooperative translation skills among English section students. The results showed that the importance of using artificial intelligence in human-machine cooperation, from the perspective of English section students, was high.

The integration of artificial intelligence (AI) in translation has significantly enhanced human-machine cooperation, making language processing more efficient and accurate. AI applications, particularly in natural language processing (NLP) and machine learning (ML), have revolutionized the way translations are performed. This report explores how AI contributes to developing human-machine cooperative translation skills, along with the benefits, challenges, and prospects.

AI-powered translation applications utilize deep learning, neural networks, and big data to enhance language translation. Key AI-driven translation technologies include Neural Machine Translation (NMT) that uses deep learning to provide more natural and fluent translations (e.g., Google Translate, DeepL). Computer-Assisted Translation (CAT) Tools: Platforms such as SDL Trados and MemoQ assist human translators by suggesting accurate terms and maintaining consistency. Speech Recognition and Synthesis: AI-driven tools like Microsoft Translator and Google Assistant facilitate real-time voice translation.

AI applications play a transformative role in developing human-machine cooperative translation skills. While AI enhances speed, accuracy, and efficiency, human expertise remains vital in refining translations, ensuring cultural relevance, and addressing ethical concerns. The future lies in optimizing AI-human collaboration to achieve high-quality translations across diverse languages and industries.

Recommendations of the Study

In the light of previous results, the following recommendations are presented:

- English language teacher should be trained in using AI applications while teaching English language skills to their students at different educational stages.
- Curriculum designers should utilize AI application models when designing English language courses and overcoming any teaching or learning problems.
- Provide teachers with the technical skills and knowledge to employ AI applications in teaching the four English language skills: listening, speaking, reading, and writing.
- Conduct training courses for English section students on how to use AI applications generally and in translation specifically.

Suggestions for Further Research

- Based on the findings of the present research, the following implications for further research are suggested:-
- Using AI applications in English language learning among students at different educational stages.
- The influence of AI applications on the four language skills; listening, speaking, reading, and writing.
- The effect of using other models and approaches on enhancing human-machine cooperative translation skills.

Ethical Considerations

It is essential for any scientific study to adhere to certain ethical guidelines. When using scientific sources and articles, researchers should not copy phrases, concepts, or works of others. All ideas that belong to someone else have been properly referenced. Regarding participation, all participants were involved in the study with their consent. No voice or video recordings were made without the consent of the participants during the study.

References

AlTwijri , L. & Alghizzi, T.M. (2024). Investigating the integration of artificial intelligence in English as foreign language classes for enhancing learners' affective factors: A systematic review. *Heliyon, 10*, 1-12.

Ammade, S., Ramadhani, M. F., & Rahman, A. W. (2023). Google Translate as English learning tool assistance for Non-English departments students: Students' perception. Klasikal: *Journal of Education, Language Teaching and Science, 5*(1), 167–181.

Andari, A. Z., Sofyan, R., & Yusuf, M. (2022). The teachers' perception towards the use of Google Translate as a translation tool. *Radiant, 3*(1), 1–14.

Asiri, S. A. M. & Metwally, A. A. (2020). The impact of linguistic and cultural competence on translation quality: Pedagogical insights into translation problems. *Journal of Language Teaching and Research*, *11*(3), 509–520.

Asscher, O. (2022). The Explanatory Power of Descriptive Translation Studies in the Machine Translation Era. *Perspectives*. *32* (2), 261–277

Chang, C., Wu, M. M., & Kuo, T. G. (2018). Conference interpreting and knowledge acquisition: How professional interpreters tackle unfamiliar topics. *Interpreting, 20*(2), 204–231.

https://chatgpt.com/c/67d89da9-94c4-8012-bb44-cf84366dbbd9

Chen, G., Shuming M., Yun C. (2022). Towards making the most of multilingual pretraining for zero-shot neural machine translation. In Proc. of ACL.

Chen, Y., Tang, S. and Zhou, Z.H. (2022) Cultivating Translators' Critical Thinking Competence Based on a Flipped Classroom Mode. Open Access Library Journal, 9, 1–6.

Chen-li Kuo. 2019. Function words in statistical machine-translated Chinese and original Chinese: A study into the translationese of machine translation systems. *Digital Scholarship in the Humanities, 34*(4),752–771.

Chowdhery, A.; Narang, S.; Devlin, J.; Bosma, M.; Mishra, G.; Roberts, A.; Barham, P.; Chung, H. W.; Sutton, C.; Gehrmann, S.; et al. 2023. Palm: Scaling language modeling with pathways. *Journal of Machine Learning Research, 24*(240), 1–113.

Daems, J., Vandepitte S., Hartsuiker R.J. and Macken L. (2017). Identifying the machine translation error types with the greatest impact on post-editing effort. *Frontiers in Psychology*. *8,* 1–15.

Do-Carmo, F., Shterionov, D., Moorkens, J., Wagner, J., Hossari, M., Paquin, E., Way, A. (2021). A review of the state-of-the-art in automatic post-editing. *Machine Translation, 35,* 101–143.

Egan, G. (2017). The skilled helper. *A client-centered approach (2nd ed.)*. Hampshire, UK: Cengage.

Enbaeva, L.V., & Plastinina, N. (2021). Distance learning challenges in translation teaching: Mediation competence development. *Psychology of Environmentally Responsible Behavior, 25*(8).

Fares, A.S. (2024). *A task-based instruction program for developing translation skills and self-efficacy of EFL student teachers at the faculty of Education.* Unpublished doctoral dissertation, Benha University, Egypt.

Frankenberg-Garcia, A. (2021). Can a corpus-driven lexical analysis of human and machine translation unveil discourse features that set them apart? Target. *International Journal of Translation Studies, 34*.

Ghaemi, H., & Sadoughvanini, S. (2020). On the relationship between translation competence and higher-order thinking skills of novice translators. *Athens Journal of Philology*, *7*(4), 273–288.

Greischel, H., Zimmermann, J., Mazziotta, A., and Rohmann, A. (2021). Validation of a German version of the cultural intelligence scale. Int. J. *Intercult. Relat. 80,* 307–320.

Guerberof, A., & Moorkens, J. (2019). Machine translation and post-editing training as part of a master's program. Jostrans: *The Journal of Specialized Translation,* (31), 217–238.

Huang, F.& Zou, B. (2024). English speaking with artificial intelligence (AI): The roles of enjoyment, willingness to communicate with AI and innovativeness. *Computers in Human Behavior, 159*, 1-8.

Hurtado Albir, A. (2017). Translation and translation competence. *In A. Hurtado Albir (Ed.), Researching translation competence by PACTE group.* 3–33. *Amsterdam: John Benjamins Publishing*.

Irfan, M. (2017). *Machine Translation*. Available at https://www.researchgate.net/publication/320730405_Machine_Translation

Irfan, M. (2017). Machine Translation. Department of Computer Science, 1-2.

Kanglang, L., & Afzaal, M. (2021). Artificial Intelligence (AI) and translation teaching: A critical perspective on the transformation of education. *International Journal of Science Education*, *33*(1-3), 64–73.

Karpinska, M., & Iyyer, M. (2023). Large language models effectively leverage document-level context for literary translation, but critical errors persist. *ArXiv*.

Katherine M. King. (2019). Can Google Translate Be Taught to Translate Literature? A Case for Humanists to Collaborate in the Future of Machine Translation. *Translation Review 105* (1), 76–92.

Kenny, D. (2020). Technology and translator training. In M. O'Hagan (Ed.), *The Routledge handbook of translation and technology* (498-515). Routledge.

King, K. (2019). Can Google Translate be taught to translate literature? A case for humanists to collaborate in the future of machine translation. *Translation Review, 105*(1), 76–92.

Kobiakova, I. K., & Shvachko, S. O. (2016). Teaching translation: Objectives and methods. *Advanced Education, 5,* 9–13.

Kolhar, M., & Alameen, A. (2021). Artificial Intelligence-Based Language Translation Platform. *Intelligent Automation & Soft Computing, 28*(1).

Kong, L. (2022). Artificial Intelligence-Based Translation Technology in Translation Teaching. Computational Intelligence and Neuroscience, Article ID 6016752, 1-9. https://doi.org/10.1155/2022/6016752.

Lee, S. M. (2022). An investigation of machine translation output quality and the influencing factors of source texts. *ReCALL, 34*(1), 81–94.

Lee, T. K. (2023). Cited in Mahdi, H.S. & Sahari, Y.M. (2024). Exploring the relationship between critical thinking, attitude, and anxiety in shaping the adoption of artificial intelligence in translation among Saudi translators. *Journal of Pedagogical Research, 8* (2), 81-94.

Li H. (2022). Evaluation of translation technology textbooks from the perspective of the translator's technological competence. *JLT. 2*(5),1–5.

Li, J. (2022). Critical thinking of a translator: Expanding the practice of using and editing machine translation. *Thinking Skills and Creativity, 43*.

Li, X., Gao, Z., & Liao, H. (2023). The effect of critical thinking on translation technology competence among college students: the chain mediating role of academic self-efficacy and cultural intelligence. *Psychology Research and Behavior Management, 16,* 1233–1256.

Liang, J., & Liu, Y. (2023). Human intelligence advantages in translation competence: A corpus-based comparative study of human translation and machine translation. *Foreign Languages and Their Teaching,* (03), 74–84+147–148.

Liu, H. (2019). Teaching models of translation courses aiming at fostering critical thinking skills. *Int. Conf. Adv. Educ. Serv. Manag.* 3, 404–407.

Liu, Y., Gu, J., Goyal, N., Li, X., Edunov, S., Ghazvininejad, M., Lewis, M., and Zettlemoyer, L. (2020). "Multilingual Denoising Pre-training for Neural Machine Translation." *Transactions of the Association for Computational Linguistics*, 8, 726–742.

Luo, X. (2020). An Empirical Study of the Effect of Multimedia Information Technology on College English Teaching. *Randwick International of Education and Linguistics Science Journal*, *1*(1), 62–66.

Lv, S., Chen, C., Zheng, W., & Zhu, Y. (2022). The relationship between study engagement and critical thinking among higher vocational college students in China: a longitudinal study. *Psychology Research and Behavior Management, 15*, 2989–3002.

Madkour, M. (2018). The impact of culture and intercultural competence on the performance of students in translation. *In Proceedings of the 11th International RAIS Conference (November 19), ISSN 2578-8574*, 93–109.

Mahardika, R. (2017). The use of translation tools in EFL learning: Does machine translation have a positive impact on language learning? Pedagogy: *Journal of English Language Teaching. 5*(1), 49–56.

Mahdi, H.S. & Sahari, Y.M. (2024). Exploring the relationship between critical thinking, attitude, and anxiety in shaping the adoption of artificial intelligence in translation among Saudi translators. *Journal of Pedagogical Research, 8* (2), 81-94.

Malyuga, E. N., Krouglov, A., & Tomalin, B. (2018). Linguo-Cultural Competence as a Cornerstone of Translators‟ Performance in the Domain of Intercultural Business Communication. *XLinguae, 11*(2), 566–582.

Massey, G., & Ehrensberger-Dow, M. (2017). Machine learning: Implications for translator education. *Lebende Sprachen, 62*(2), 300–312.

Moneus, A.M.& Sahari, Y. (2024). Artificial intelligence and human translation: A contrastive study based on legal texts. *Heliyon,10*, 1-14.

Nguyen, H. U. N., & Duong, L. N. T. (2021). The Challenges of E-learning Through Microsoft Teams for EFL Students at Van Lang University in COVID-19. *Asia CALL Online Journal*, *12*(4), 18–29. Retrieved from

O'Hagan, M. (ed.) (2020). *The Routledge Handbook of Translation and Technology,*

Olalla-Soler, C. (2019). Using translation strategies to solve cultural translation problems. Differences between students and professional translators. *Perspectives 27* (3). 367–388.

Ping, K. (2009). Machine Translation. In Baker, M. & Saldanha, G. (Ed.). *Encyclopedia of Translation Studies*. (2nd ed.). New York: Routledge

Raunak, V., Menezes, A., Post, M., & Awadallah, H. H. (2023). *Do GPTs produce less literal translations?*

Raunak, V., Sharaf, A., Awadallah, H. H., & Menezes, A. (2023). *Leveraging GPT-4 for automatic translation post-editing*. arXiv:2305.14878

Rémillard, J. (2018). *Utilité et utilisation de la traduction automatique dans l'environnement de traduction: une évaluation axée sur les traducteurs professionnels* [*Doctoral dissertation, University of Ottawa*].

Remillard, J. T. (2018). Examining teachers' interactions with curriculum resources to uncover pedagogical design capacity. In L. Fan, L. Trouche, C. Qi, S. Rezat, & J. Visnovska (Eds.), Research on mathematics textbooks and teachers' *resources: Advances and Issues*, 69–88. *Springer International Publishing*.

Rico C, González Pastor D. *(2022).* The role of machine translation in translation education: a thematic analysis of translator educators' beliefs. *Trans Int.14*(1).

Romaniuk-Cholewska, D. (2021). Machine Translation Post-Editing (MTPE) from the Perspective of Translation Trainees: Implications for Translation Pedagogy. *the 18th Biennial Machine Translation Summit*, 200–210. The USA. Récupéré sur https://aclanthology.org/2021.mtsummit-up.15/

Saud, W. I. (2020). The relationship between critical thinking and translation ability of EFL undergraduate students. *Int. J. Soc. Sci. Educ. Stud.* 7, 19–28.

Sawyer, D. B., Austermühl, F., & Enríquez-Raído, V. (Eds.). (2019). *The evolving curriculum in interpreter and translator education. John Benjamins.*

Sayers, D., R. Sousa-Silva, S. Höhn et al. (2021). *The Dawn of the Human-Machine Era: A forecast of new and emerging language technologies*. Report for EU COST Action CA19102 'Language in The Human-Machine Era'.

Shafira, D.B. & Nugroho, R.A. (2023). Translation Error Types Analysis on TikTok Indonesian-English Auto-Translation Content.D. Djatmika et al. (eds.), Proceedings of the International Seminar SEMANTIKS & PRASASTI 2023 Theme: Language in the Workplace (PRASASTI 2023), Advances in Social Science, Education, and Humanities Research 797,45-51.

Shen, B., & Bai, B. (2022). Chinese university students' self-regulated writing strategy use and EFL writing performance: Influences of self-efficacy, gender, and major. *Applied Linguistics Review 15*(1). 161–188.

Shiraev E., Levy D. A. (2020). Cross-cultural psychology: Critical thinking and contemporary applications. 7th Edn. London: Routledge.

Shubina, I., and Kulakli, A. (2020). The research patterns of creativity and innovation: the period of 2010-2019. *Int. J. Emerg. Technol. Learn.* 15, 89–102.

Tétreault, S., Bétrisey, C., Brisset, C., Gulfi, A., Schaer, M., Leanza, Y., & Kühne, N. (2021). Intercultural experiences prior to the educational program: Occupational therapy and social work students. *Journal of Culture and Values in Education*, *4*(1), 15–33.

Tong, D. H., Loc, N. P., Uyen, B. P., and Son, T. H. (2020). Enhancing creative and critical thinking skills of students in mathematics classrooms: an experimental study of teaching the inequality in high schools. *Univ. J. Educ. Res.* 8, 477–489.

Trojszczak, M. (2022). Translator training meets machine translation. Selected challenges. In: Lewandowska-Tomaszczyk, Barbara–Trojszczak, Marcin (eds.): Language use, education, and professional contexts. Cham: Springer. 179–192.

Tsai, S.-C. (2022). Chinese students' perceptions of using Google translate as a translingual CALL tool in EFL writing. *Computer Assisted Language Learning, 35(*5-6*)*, 1250–1272.

Urlaub, P., & Dessein, E. (2022). Machine translation and foreign language education. *Frontiers in Artificial Intelligence, 5*, 936111.

Varzande, M., & Jadidi, E. (2015). The effect of translators' emotional intelligence on their translation quality. *English Language Teaching, 8*(8), 104.

Vieira, L. N. (2020a). Post-editing of machine translation. *In M. O'Hagan (ed.), The Routledge handbook of translation and technology* (319–335). Routledge

Wang, Y.& Xue, L. (2024). Using AI-driven chatbots to foster Chinese EFL students' academic engagement: An intervention study. *Computers in Human Behavior 159*, 1-8.

Wang, Y. Y., & Wang, Y. S. (2022). Development and validation of an artificial intelligence anxiety scale: *A*n initial application in predicting motivated learning behavior. *Interactive Learning Environments, 30*(4), 619–634.

Wang, Y. (2023). Artificial Intelligence Technologies in College English Translation Teaching. *Journal of Psycholinguistic Research, 52*,1525–1544

Winters, M., & Kenny, D. (2023). Mark My Keywords. In A. Rothwell, A. Way, & R. Youdale, *Computer-Assisted Literary Translation* (1st ed.), 69–88. Routledge.

Yang, G. (2020). The Application of Artificial Intelligence in English Teaching. *International Journal of Frontiers in Sociology, 2*(3), 76-81.

Yang, G. (2020). The Application of Artificial Intelligence in English Teaching. *International Journal of Frontiers in Sociology, 2*(3), 76-81.

Yang, Y., & Wang, X. (2023). Predicting student translators' performance in machine translation post-editing: interplay of self-regulation, critical thinking, and motivation. *Interactive Learning Environments, 31*(1), 340–354.

Yang, Y., and X. Wang. (2020). "Predicting Student Translators' Performance in Machine Translation Post-editing: Interplay of Self-regulation, Critical Thinking, and Motivation." *Interactive Learning Environments 1–15*.