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AI and Human Collaboration in Translation

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ABSTRACT

The advancement of artificial intelligence (AI) technology has brought notable transformations to the translation field, particularly within language learning contexts. This study seeks to examine the effectiveness of human–AI collaboration in enhancing middle school students' translation abilities. Employing a descriptive qualitative design, the research involved 23 eighth-grade students from Catholic Saint Francis Xavier Middle School, Tarakan. Data were gathered through interviews, observations, questionnaires, and pre-test and post-tests. The findings revealed a considerable improvement in students' translation performance, as the average pretest score of 66.59 increased to 82.31 in the posttest. The partnership between AI and teachers proved effective in helping students grasp language structures, enrich their vocabulary, and produce more contextually accurate translations. Teachers functioned as facilitators and interpreters of translation outcomes, while AI operated as a rapid feedback provider and linguistic resource. These results reinforce the human-in-the-loop framework, which highlights the essential role of collaboration between human and artificial intelligence. The study also discovered that implementing AI–human collaboration enhanced students' motivation, accountability, and active engagement during the learning process. Overall, this research affirms that integrating AI and human input in translation serves as an effective and innovative educational model in the digital era, offering the potential to develop both students' linguistic competence and technological literacy

Keywords: artificial intelligence; human-AI collaboration; translation; English language learning; educational technology

INTRODUCTION

The rapid advancement of artificial intelligence (AI) has transformed numerous sectors, including translation and language education. Within translation studies, the emergence of AI-powered systems such as Neural Machine Translation (NMT) has significantly improved translation accuracy. Despite these developments, AI still encounters challenges in grasping contextual nuances, idiomatic expressions, and the cultural essence embedded in source texts. Consequently, a new paradigm has emerged that underscores the necessity of collaboration between humans and AI to generate translations that are not only efficient and swift but also contextually accurate and meaningful (Pulido, 2024; Moneus & Sahari, 2024).

Pulido (2024) explains that the future of translation lies not in the replacement of human translators by machines, but in the integration of both capabilities through what is known as human-in-the loop translation. In this collaborative framework, AI serves as an intelligent assistant that produces an initial draft, while human translators refine and adjust it for stylistic, semantic, and contextual precision. This model maintains linguistic quality while optimizing time and productivity. Supporting this notion, Wolfestone Group (2025) predicts that by 2025, human-AI collaboration will mark a major turning point in the translation industry, with AI ensuring terminological consistency and speed, and humans contributing naturalness and contextual depth through post-editing and semantic evaluation.

Moneus and Sahari (2024) found that while AI enhances the efficiency of legal text translation, human input remains indispensable to maintain terminological and contextual accuracy. Similarly, Alkodimi, Alqahtani, and Al-Wasy (2024) note that AI can support literary translation particularly in back-translation processes but the emotional resonance and aesthetic quality of the text depend heavily on human interpretation. Weisz et al. (2021) also emphasize that in various forms of human-AI collaboration, including code translation, the objective is not flawless automation but a balanced synergy between technological precision and human adaptability.

Latif and Arshad (2025) strengthen this perspective through comparative linguistic studies that highlight the importance of contextual sensitivity in translation. They propose a dynamic model of synergy in which AI and human translators interactively work to produce outputs that are more adaptive to both linguistic and cultural dimensions of the source text.

Parallel to these innovations, the field of language education has begun adopting AI-based tools to enhance learning outcomes, particularly in translation training. Afif, Mistar, and Karimullah (2020) observed that secondary English teachers employed online platforms to facilitate virtual learning during the pandemic, though they continued to face challenges related to student engagement and comprehension. Similarly, Afifah and Fikri (2023) argue that the effectiveness of language learning whether conducted online or offline depends on maintaining equilibrium between technological support and active human participation.

Moreover, Mustofa, Ahmadi, and Karimullah (2020) stress the necessity of embedding character education within e-learning to ensure that technological adoption does not erode humanistic values. This argument resonates with the human-AI collaboration paradigm, in which technological advancement must remain aligned with ethical and moral principles. In a related study, Yazid and Dzulfikri (2024) discovered that while AI-powered chatbots such as ChatGPT can enhance writing efficiency, they still lack depth in contextual understanding and originality. Thus, human supervision remains essential for maintaining authenticity and reliability.

Likewise, research by Zakiyuddin, Mustofa, and Yunus (2022) demonstrates that computer-assisted learning fosters deeper comprehension when applied collaboratively and reflectively. This aligns with the principles of AI-human cooperation in translation, which emphasize the user's critical engagement with technology rather than passive dependence on it.

In conclusion, the partnership between AI and humans represents a transformative evolution in both translation practices and language education. While AI contributes speed, consistency, and analytical power, human translators offer contextual insight, cultural awareness, and creative interpretation. The integration of these strengths not only revolutionizes professional translation workflows but also enriches pedagogical practices in the digital era. Therefore, future translation research and pedagogy should focus on developing balanced collaborative frameworks that harmonize artificial and human intelligence to produce translations that are ethically sound, contextually accurate, and meaningfully human.

METHOD

This study adopts a descriptive qualitative research design aimed at providing an in-depth understanding of how collaboration between artificial intelligence (AI) and humans functions within the translation process. The qualitative approach was considered appropriate as it enables the researcher to explore participants' authentic experiences and perceptions in their natural learning environment, thereby capturing the complexity and contextual richness of the phenomenon under study (Creswell, 2014; Miles, Huberman, & Saldaña, 2018).

The participants of this research comprised 23 students from Catholic Saint Francis Xavier Middle School in Tarakan, who were intentionally selected through purposive sampling. This sampling strategy was employed to ensure that only students meeting specific criteria such as active participation in translation-related activities and regular use of AI tools in English learning were included in the study (Etikan, Musa, & Alkassim, 2016).

To obtain comprehensive data, the study employed two main instruments: tests and semi-structured interviews. The pretest and posttest were designed to measure students' translation competence before and after the integration of AI support, while the interviews aimed to explore their experiences, perceptions, and challenges encountered during the AI-assisted translation activities (Kvale & Brinkmann, 2015). The semi-structured interview format allowed flexibility in probing deeper into participants' responses while maintaining focus on key research questions.

The data collection process consisted of three sequential phases. First, a pretest was administered to assess the participants' initial translation abilities. Second, students engaged in human–AI collaborative translation tasks, where they interacted with AI translation tools under teacher supervision. Finally, a posttest and follow-up interviews were conducted to identify any changes in students' translation performance and to capture their reflections on the collaborative process. The entire procedure spanned a period of four weeks, during which the researcher collaborated closely with the English teacher to ensure consistency and validity in implementation.

The collected data were analyzed using the qualitative descriptive analysis framework developed by Miles, Huberman, and Saldaña (2018). The analysis followed three interrelated steps: data reduction, which involved organizing and simplifying raw data; data display, which presented the information systematically; and conclusion drawing and verification, where emerging patterns and insights were interpreted. Quantitative results from the pretest and posttest were analyzed descriptively to identify score variations before and after the AI-assisted intervention. Meanwhile, the interview data underwent a coding and thematic analysis process to identify recurring ideas and categories that reflect the effectiveness and dynamics of human–AI collaboration in translation (Braun & Clarke, 2006).

FINDINGS

The findings of this study reveal that integrating artificial intelligence (AI) with human guidance in the translation process significantly enhances students' English proficiency, particularly in comprehension and translation accuracy. The test results from 23 eighth-grade students at Catholic Saint Francis Xavier Middle School, Tarakan, showed a clear improvement in students' performance after engaging in AI-assisted learning. The average pretest score of 66.59 increased to 82.31 on the posttest, reflecting a substantial enhancement in their understanding of grammatical structures, sentence organization, and contextual meaning in English translation. These results support the assertions of Pulido (2024) and Wolfestone (2025), who argue that collaborative interaction between humans and AI improves translation performance by combining the analytical reasoning of humans with the computational efficiency of machines.

Observational data during the learning process also revealed notable positive behavioral changes among students. Improvements were observed in discipline, accountability, cooperation, and active participation. Based on the observation checklist, most students achieved scores above 70 across all evaluation aspects, indicating consistent engagement throughout the learning activities. Contrary to concerns that technology might reduce learner involvement, the integration of AI-based tools appeared to increase motivation and confidence in completing translation tasks. Teachers were found to play a pivotal role in this process, guiding students in distinguishing between literal machine-generated translation and contextually appropriate human interpretation.

Interview data further substantiated these findings. The majority of students expressed that using AI-assisted translation tools facilitated their understanding of unfamiliar vocabulary, improved sentence formation, and enhanced their efficiency in completing translation exercises. However, they also acknowledged that teacher supervision remained crucial in validating and refining AI-generated results to ensure linguistic and contextual accuracy. One participant emphasized that teacher feedback helped them avoid over-reliance on AI systems and instead view them as complementary learning aids. This reinforces the notion that AI serves best as a supportive instrument, while teachers function as mentors and evaluators who maintain the quality and relevance of translation output.

Questionnaire responses complemented the qualitative data from observations and interviews. Most students reported positive experiences with the integration of AI and teacher collaboration in English learning. They highlighted that AI-assisted translation activities clarified meaning, expanded vocabulary, and made classroom practice more interactive. Many participants also expressed a willingness to explore AI applications outside the classroom, noting that instant feedback from the system enhanced their learning autonomy and self-assessment capabilities.

Overall, the results demonstrate that the synergy between AI systems and human tutors fosters a more dynamic and effective learning environment. AI provides instant examples and linguistic resources that accelerate comprehension, while teachers ensure contextual accuracy and encourage critical engagement with technology. These outcomes echo the findings of Weisz et al. (2021), who stress the necessity of human intervention in refining, validating, and contextualizing AI-generated outputs to align with pedagogical goals.

In general, this study underscores that human–AI collaboration not only improves translation competence but also promotes higher levels of student motivation, engagement, and reflection. This conclusion aligns with Latif and Arshad (2025), who found that translation outcomes are more contextually accurate and linguistically balanced when humans and AI work cooperatively rather than independently. Thus, the results of this study affirm the growing potential of human–AI collaboration in modern English language education, particularly in cultivating adaptive, reflective, and technologically responsive translation skills essential for 21st-century learning.

DISCUSSION

The findings of this study reveal that collaboration between artificial intelligence (AI) and humans has a substantial positive influence on students' translation performance. The improvement in the mean score from 66.59 in the pretest to 82.31 in the posttest illustrates that integrating technology with human guidance results in a more effective, efficient, and meaningful learning process. The utilization of AI helps students comprehend linguistic structures and semantic relationships more rapidly, while the teacher's role remains essential in guiding, correcting, and contextualizing translation outcomes to ensure their accuracy and appropriateness. These results reaffirm that AI should not be perceived as a replacement for human intelligence but as a collaborative partner that enhances learners' cognitive, linguistic, and analytical capabilities. This aligns with Pulido's (2024) argument that the future of translation will be shaped by a synergistic partnership between humans and machines rather than a competitive or substitutional relationship.

From a theoretical standpoint, the findings of this study strengthen the human-in-the-loop framework introduced by Weisz et al. (2021), which asserts that AI systems reach their highest potential when humans remain actively engaged in monitoring, assessing, and refining machine-generated outputs. In translation learning, this dynamic manifests as students using AI to receive instant feedback, explore sentence patterns, and broaden their vocabulary, while teachers ensure that the translated texts maintain contextual and stylistic relevance. This human–AI interaction fosters a reflective learning environment where students not only analyze the machine's output but also cultivate critical thinking and evaluative judgment to refine their own translations.

Practically, the study offers valuable implications for English language pedagogy and translation studies. The integration of AI into translation tasks was observed to increase students' engagement, motivation, and autonomy. Observation and interview data revealed that students exhibited higher levels of discipline, collaboration, and responsibility during the learning sessions. They reported feeling more confident when completing translation assignments due to the dual support provided by AI-generated feedback and teacher guidance. These findings correspond with the study of Latif and Arshad (2025), which demonstrated that human–AI collaboration enhances contextual precision and fosters an adaptive learning experience through rapid, interactive feedback mechanisms.

Moreover, the findings suggest that the collaborative use of AI and human input encourages a more dynamic, student-centered, and inquiry-based learning atmosphere. Teachers take on the role

of facilitators and mentors, helping students critically interpret AI-generated translations, correct semantic inaccuracies, and apply ethical considerations in the use of technology. Consequently, the learning process extends beyond the accuracy of the final translation product to encompass deeper cognitive processes analysis, reflection, and self-evaluation. This pedagogical model exemplifies the concept of cooperative intelligence proposed by Wolfestone (2025), in which humans contribute contextual reasoning and value-based judgment, while AI contributes computational efficiency and expansive linguistic data processing.

The results also align with the professional translation findings of Moneus and Sahari (2024), who reported that although AI excels in handling terminological consistency and structural precision, the quality and cultural appropriateness of the final output still depend on human oversight. Similarly, in educational contexts, while AI supports learners in understanding grammatical and lexical features, interpretive and reflective competencies are developed primarily through human guidance and social interaction.

Broadly speaking, this study contributes to a deeper understanding of the pedagogical integration of artificial intelligence in education. The human–AI collaboration in translation demonstrates that technological success in learning is determined not solely by the sophistication of AI systems but by the human capacity to use them creatively, ethically, and critically. This approach suggests that contemporary language education should not only emphasize linguistic proficiency but also cultivate digital literacy, reflective awareness, and adaptive intelligence in technology-mediated contexts.

In conclusion, the results underscore that human–AI collaboration represents a modern and effective pedagogical strategy that enhances translation accuracy while enriching students' ways of thinking, interacting, and learning. When integrated thoughtfully, AI becomes a meaningful educational tool that complements human intelligence anchored in cultural understanding, contextual sensitivity, and ethical reasoning. Consistent with the perspectives of Pulido (2024) and Latif and Arshad (2025), the future of translation and language learning depends on the ability of humans and AI to function symbiotically, creating reflective, collaborative, and technologically empowered learning environments.

CONCLUSION

This study concludes that collaboration between artificial intelligence (AI) and humans plays a vital role in enhancing students' translation competence. The integration of technological tools with human guidance generates a learning process that is not only more efficient and accurate but also more reflective and engaging. AI facilitates faster language comprehension and provides instant feedback that helps students identify linguistic patterns and improve translation fluency. Meanwhile, teachers contribute contextual understanding, interpret meaning, and ensure semantic precision and cultural appropriateness. Therefore, the effectiveness of the translation process does not rely solely on machine intelligence but rather on the synergy between human reasoning and the analytical capabilities of AI.

Beyond improving translation outcomes, this collaborative approach has proven to strengthen students' motivation, responsibility, and engagement in the learning process. The findings revealed that students became more active participants, showing greater confidence and initiative when working with AI-assisted translation tools. This suggests that when technology is used critically and guided by human interaction, it can function as a powerful pedagogical instrument that supports learner autonomy and reflective practice. Such results align with the current educational paradigm that emphasizes learner-centered approaches supported by digital innovation.

Nevertheless, several limitations must be acknowledged. First, the study involved a relatively small sample of 23 students from a single institution, which restricts the generalizability of the findings to broader educational contexts. Second, the focus of this research was limited to general text translation; it did not encompass specialized forms such as academic, literary, or technical texts, which may require distinct collaborative strategies between AI and human participants. Third, the

study relied on a single AI translation tool, and the use of multiple or more advanced platforms might yield varied outcomes.

To build upon these findings, future research is recommended to include larger and more diverse participant groups across different educational levels and institutional settings. Subsequent studies could also explore comparative analyses of multiple AI translation platforms to evaluate their pedagogical effectiveness and usability. Furthermore, research on the ethical dimensions, data reliability, and academic integrity of AI-assisted translation is crucial to ensure that its implementation in education remains responsible, transparent, and aligned with pedagogical goals.

In summary, this study affirms that human–AI collaboration represents an emerging paradigm in language education and translation learning. The synergy between human cognition and artificial intelligence not only improves linguistic proficiency but also nurtures critical digital literacy and reflective awareness. As education continues to evolve in the digital era, this model highlights the importance of combining technological innovation with human insight to create balanced, ethical, and meaningful learning experiences.

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