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Integrating AI-Based Machine Translation in Translation Pedagogy: Evidence from a Mixed-Methods Study in Vietnam

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Abstract

The rise of artificial intelligence (AI), neural machine translation (NMT), and large language models (LLMs) such as GPT*,* Gemini*, and* Claude *has transformed translation pedagogy worldwide. However, empirical research on how AI affects translator training in Vietnam remains scarce.*

This study adopts a mixed-methods design to examine AI adoption in translation classrooms, combining survey data from 93 students and five lecturers with semi-structured interviews. Quantitative data were analyzed through descriptive and comparative statistics, while qualitative findings were thematically coded.

Results indicate high readiness and positive attitudes among both students and teachers, yet AI applications remain fragmented and unsystematic. Tools such as ChatGPT, Google Translate, and DeepL enhance translation speed, vocabulary, and critical reflection but also pose risks of over-reliance, diminished linguistic sensitivity, and ethical issues. Four key determinants-digital competence, infrastructure, institutional policy, and academic integrity culture-shape effective implementation.

The study recommends a Pedagogically Guided AI Integration (PGAI) model to ensure responsible, sustainable adoption. It advances the concept of AI Literacy for Translators and contributes to the emerging framework of Translation Pedagogy 4.0 in the context of digital transformation.

Keywords

Artificial Intelligence, Neural Machine Translation, Translation Pedagogy, AI Literacy, Post-Editing, Responsible AI, Vietnam

1. Introduction

The rapid advancement of artificial intelligence (AI), particularly neural machine translation (NMT) and large language models (LLMs) such as *GPT*, *Gemini*, and *Claude*-has profoundly reshaped translation

pedagogy worldwide. Once confined to rule-based and statistical systems, machine translation now relies on deep-learning architectures capable of capturing complex semantic and contextual relationships across languages (Vaswani et al., 2017; Jurafsky & Martin, 2023). As a result, AI has evolved from being a purely technical aid to becoming a pedagogical agent that enhances teachers' ability to personalize instruction while offering learners immediate, data-driven feedback (Bozkurt et al., 2020; Krüger, 2024). Within the broader educational paradigm shift from *teacher-centered* to *AI-enhanced learner-centered* approaches, translation education has emerged as a pivotal domain for experimentation and reform. The integration of AI tools enables students not only to generate translations but also to analyze, critique, and post - edit machine - produced texts. Through this process, learners develop higher-order competences such as critical thinking, metacognitive awareness, and ethical reflection, abilities that align with twenty-first-century translator-training objectives (Liu & Liang, 2024; Morentsova, 2022). Nevertheless, this technological transformation brings with it pedagogical and ethical challenges, including over-reliance on automation, diminished linguistic creativity, and the risk of plagiarism (Kanglang, 2021).

In Vietnam, these global shifts coincide with national strategies that place AI at the heart of educational innovation. The National Digital Transformation Strategy (2020-2030) identifies AI as a key driver for innovation and productivity in higher education, while the Higher-Education Development Strategy (Ministry of Education and Training, 2021) highlights AI integration and digital pedagogy as pillars of modernization. Against this backdrop, exploring AI-supported translation pedagogy is both timely and essential for aligning translator-training programs in Vietnam with international standards and labor-market expectations.

Despite the proliferation of AI translation tools, their pedagogical application in Vietnam remains fragmented. Most translation courses continue to rely on conventional teacher-centered practices, with little methodological guidance for embedding AI into curriculum design, assessment, or reflective learning. The sporadic adoption of tools such as *ChatGPT*, *DeepL*, or *Trados* often occurs informally and without alignment to clear learning outcomes. Moreover, there is limited empirical evidence regarding how AI influences students' translation competence, post-editing literacy, or ethical awareness. While international research documents both positive effects-such as enhanced fluency and reduced anxiety-and potential risks, including automation dependency and academic dishonesty (Klimova et al., 2022; Krüger, 2024), comparable studies within Vietnamese universities remain scarce. The country's distinct infrastructural and cultural conditions necessitate localized investigation rather than the uncritical transfer of Western pedagogical models.

Existing literature on AI-assisted translation pedagogy in Vietnam remains largely exploratory, characterized by conceptual reflections or small-scale classroom observations. To date, no comprehensive mixed-methods study has systematically examined teachers' and students' readiness, perceptions, and practices in AI-enhanced translation training. Furthermore, there is no context-specific pedagogical model designed to integrate AI technologies into English-language programs in a sustainable and ethically responsible way. International frameworks such as the European Master's in Translation

(EMT, 2017) and the PACTE Group's Translation-Competence Model (2003) underscore the importance of developing *technological-AI competence* and *critical-ethical competence* as integral components of contemporary translator education. However, localized adaptations of these frameworks to Vietnam's higher-education context are virtually absent. Addressing this gap requires robust empirical evidence and theoretically grounded design principles for guided AI integration that are both pedagogically sound and culturally sensitive.

Against this background, the present study pursues three interrelated objectives. First, it seeks to evaluate the current state of AI application among translation students and lecturers in Vietnamese higher education. Second, it aims to identify key opportunities and challenges emerging from AI-supported teaching and learning practices. Third, it endeavors to propose a sustainable, pedagogically guided model for integrating AI into translation curricula that balances technological innovation with academic integrity and human creativity. Correspondingly, the study addresses four central research questions: (1) What are the levels of awareness and actual use of AI technologies among translation students and instructors? (2) How does AI affect translation learning, post-editing performance, and critical-thinking development? (3) What technical, pedagogical, and ethical barriers constrain effective AI integration? and (4) Which pedagogical framework can best support responsible and sustainable AI adoption in translation training?

By addressing these questions, this paper contributes both empirical evidence and conceptual insights to the evolving discourse on AI-assisted translation pedagogy. It situates Vietnam's translator education within global debates on *Translation Pedagogy 4.0* and *AI Literacy*, providing a theoretically informed and contextually grounded foundation for future policy development, curriculum innovation, and responsible AI use in higher education.

2. Literature Review

2.1 AI in Language and Translation Education

The rise of neural machine translation (NMT), natural language processing (NLP), and large language models (LLMs) has revolutionized how languages and translation are taught and learned. Since the introduction of attention-based deep-learning architectures (Vaswani et al., 2017; Jurafsky & Martin, 2023), NMT systems have evolved from statistical phrase-based models to self-learning systems capable of modeling contextual and semantic nuances across languages (Floridi & Chiriatti, 2020; Russell & Norvig, 2021). In the educational domain, these technologies have become essential components of the digital-learning ecosystem, enabling authentic, data-driven translation tasks and automated feedback that complement human instruction (Klimova et al., 2022; Duan et al., 2025).

Within this transformation, AI functions as a pedagogical agent rather than a mere computational instrument. Bozkurt et al. (2020) and Krüger (2024) describe AI as an intelligent co-participant that supports adaptive learning, scaffolding, and personalized error correction. Studies such as Yang (2022) and Ulitkin and Ivanova (2024) demonstrate that AI-driven translation environments foster greater

learner autonomy and engagement when combined with guided human oversight. Thus, AI is reshaping translator education through AI-enhanced experiential learning, where machine-generated outputs become stimuli for reflection, critique, and skill development rather than final products.

2.2 Translation Competence and AI Literacy

Modern translation studies conceptualize competence as a multidimensional construct encompassing linguistic, cultural, strategic, and technological components. The PACTE Model (2003) and the European Master's in Translation (EMT) framework (2017) remain foundational, identifying translation competence as the coordinated integration of linguistic-cultural, instrumental, and psycho-physiological sub-competences. Building upon these, Krüger (2024) introduces the concept of AI Literacy for Translators, which extends technological competence to include critical awareness of algorithmic mediation, data bias, and ethical implications.

In the digital-age context, translation competence now comprises at least three key dimensions: (1) linguistic-cultural competence, ensuring contextual accuracy and intercultural sensitivity (Byram, 1997; Spencer-Oatey, 2008); (2) technological-AI competence, reflecting the ability to use and evaluate NMT and computer-assisted translation (CAT) systems effectively (Mishra & Koehler, 2006; Ulitkin & Ivanova, 2024); and (3) critical-ethical competence, which equips translators to maintain human agency, quality control, and academic integrity in AI-mediated workflows. These evolving competences illustrate that translation pedagogy must move beyond tool training toward ethical, reflective, and hybrid human-AI collaboration.

2.3 AI-Assisted Translation Pedagogy

The integration of AI into translator education has given rise to diverse blended-learning and AI-enhanced classroom models. Empirical research demonstrates that combining AI tools with collaborative, constructivist learning strategies can enhance both performance and motivation (Kruk & Kałużna, 2024; González Davies, 2017). Within such environments, post-editing becomes a central pedagogical practice: students engage in error detection, style refinement, and cross-lingual comparison, thereby strengthening cognitive control and critical-thinking skills (Morentsova, 2022; Omar & Salih, 2024).

However, these benefits coexist with significant risks. Over-reliance on machine output can erode linguistic creativity, reduce contextual awareness, and encourage digital plagiarism or passive learning habits (Rybina et al., 2025). Kanglang (2021) warns that unregulated AI use may lead to a decline in translators' interpretive abilities and ethical accountability. Consequently, effective AI pedagogy requires structured guidance, balancing automation with reflective human evaluation-a principle often framed as *Pedagogically Guided AI Integration* (PGAI).

2.4 Legal and Ethical Guidelines

The global discourse on AI ethics underscores the need for responsible, human -centered innovation in education. UNESCO's *Recommendation on the Ethics of Artificial Intelligence* (2021) articulates universal principles of transparency, fairness, accountability, and human dignity in AI deployment across sectors, including education. Similarly, the OECD (2022) report *Artificial Intelligence in Education*

advocates for policy frameworks that foster responsible innovation while safeguarding learners' privacy and academic integrity. The European Union's AI Act (2023)-the world's first comprehensive legal framework for AI-adopts a *risk-based approach*, classifying AI applications by their potential harms and mandating transparency, data protection, and traceability.

Together, these instruments establish the ethical and regulatory foundation for AI-assisted translation pedagogy. They emphasize that integrating AI into translator training must not only advance technological proficiency but also uphold principles of equity, responsibility, and educational integrity. For developing countries like Vietnam, these global frameworks offer critical reference points for designing localized standards of Responsible AI in language and translation education.

3. Methodology

3.1 Research Design

This study adopted a mixed-methods research design combining quantitative and qualitative approaches to gain a comprehensive understanding of how artificial intelligence (AI) tools are being used and perceived in translation pedagogy within Vietnamese higher education. The quantitative component consisted of a structured survey administered to translation students and lecturers, while the qualitative component involved semi-structured interviews designed to explore participants' lived experiences and pedagogical reflections in greater depth.

The rationale for this design lies in the complementarity between numerical and narrative data, enabling both breadth and depth of insight. Quantitative analysis captures general trends in AI awareness, usage, and perceived impact, whereas qualitative insights illuminate contextualized meanings, attitudes, and ethical concerns that are not easily measurable. To enhance the validity and reliability of findings, methodological triangulation was applied-cross-verifying data across instruments, sources, and analytical methods (Creswell & Plano Clark, 2018). This integrative design ensures that observed patterns are both statistically supported and theoretically meaningful, reflecting the complex intersection of technology, pedagogy, and human agency in translation education.

3.2 Participants

The research sample comprised 93 undergraduate students majoring in English Language Studies (Years 3 and 4) and five lecturers specializing in translation, interpreting, and translation technology. The student group was selected to represent learners with sufficient exposure to both translation practice and AI-based tools such as *Google Translate*, *DeepL*, and *ChatGPT*. The lecturers were chosen from three universities offering translator - training programs in Northern Vietnam.

Participants reflected a diversity of demographic and academic backgrounds, including differences in gender, academic standing, and prior experience with digital technologies. This heterogeneity provided a representative snapshot of the evolving translation -learning ecosystem in Vietnamese higher education.

3.3 Instruments

Data were collected through two main instruments developed and validated through a multi-stage process. The first instrument was a 22-item questionnaire based on a five-point Likert scale (ranging from 1 = *Strongly Disagree* to 5 = *Strongly Agree*), measuring participants' (i) AI awareness and literacy, (ii) frequency and purpose of AI use, (iii) perceived pedagogical benefits, and (iv) perceived ethical or technical risks. The questionnaire was piloted with 20 students to ensure linguistic clarity and contextual appropriateness, achieving a Cronbach's Alpha reliability coefficient of ≥ 0.7, indicating strong internal consistency (Hair et al., 2019).

The second instrument consisted of semi-structured interview protocols comprising six thematic domains: (1) perceptions of AI in translation learning, (2) classroom integration practices, (3) post-editing strategies, (4) ethical and academic integrity issues, (5) perceived institutional or infrastructural barriers, and (6) recommendations for sustainable AI adoption. Each interview lasted 30-45 minutes, conducted in Vietnamese and subsequently translated into English for analysis. The dual-instrument design allowed for both quantifiable comparisons and in-depth exploration of pedagogical dynamics.

3.4 Data Analysis

Quantitative data were analyzed using SPSS (version 26.0) through descriptive and inferential statistics. Descriptive analysis (means, standard deviations, and frequency distributions) was employed to profile AI usage trends, while independent-samples t-tests and ANOVA were used to examine group differences by academic level, gender, and AI familiarity.

Qualitative data from the semi-structured interviews were transcribed verbatim and analyzed using thematic analysis (Braun & Clarke, 2019). A coding framework (T1-T4) was developed to identify recurring patterns related to:

T1: awareness and readiness,

T2: application and learning practices,

T3: perceived risks and ethical dilemmas, and

T4: proposed solutions and pedagogical innovations.

Cross-validation between quantitative and qualitative datasets enabled a multi-dimensional interpretation of the findings, strengthening the robustness of the conclusions drawn.

3.5 Ethical Considerations

The study adhered to the ethical standards of educational and social research, following the principles outlined in UNESCO's Recommendation on the Ethics of Artificial Intelligence (2021) and the OECD (2022) guidelines on AI in education. All participants were informed of the research purpose, procedures, and their right to withdraw at any stage without consequence. Participation was entirely voluntary and anonymous, with all personal identifiers removed during data processing.

Informed consent was obtained from all respondents, and digital data were stored securely in compliance with institutional and international data-protection protocols. The ethical framework thus ensured

transparency, respect for participants' autonomy, and the protection of sensitive educational information in accordance with global norms of Responsible AI and research integrity.

4. Results

4.1 Students' AI Readiness and Usage

Survey results reveal a high level of AI readiness and frequent usage among translation students. The mean frequency score for AI use reached M = 3.56/5, indicating that most participants engage with AI tools on a regular basis to support translation learning and related linguistic tasks. Among the technologies used, ChatGPT emerged as the most popular tool, reported by 72% of respondents, followed by Google Translate (65%) and DeepL Translator (38%).

While these tools were primarily employed for preliminary translation and vocabulary enhancement, qualitative interviews show that students also utilized AI for post-editing exercises, paraphrasing, and cross-checking terminology accuracy. Comparative analysis between third - and fourth-year students revealed statistically significant differences in technological self-efficacy and autonomy, with senior students demonstrating higher proficiency in evaluating AI output and managing post-editing workflows. The findings suggest a gradual transition from dependency to critical engagement, highlighting the role of classroom scaffolding and cumulative digital exposure in shaping AI literacy.

4.2 Teachers' AI Integration Practices

Lecturers' responses demonstrated a cautious yet growing interest in leveraging AI to enhance translation pedagogy. The qualitative data indicated that instructors integrated AI primarily into learning-material design, corpus simulation, and post-editing exercises, aligning with blended-learning and task-based approaches. Teachers reported using AI tools to generate sample translations for class discussions, to illustrate machine-human translation discrepancies, and to develop interactive tasks that promote critical error analysis.

However, the integration process remains fragmented and uneven, hindered by several contextual constraints. Key barriers include limited technological infrastructure, inconsistent access to premium AI tools, and the absence of a clear pedagogical framework guiding ethical and effective AI usage. Additionally, the digital competence gap between instructors of different age groups or professional backgrounds further restricts consistent adoption. Despite these challenges, most teachers expressed a positive attitude toward AI, acknowledging its potential to foster learner autonomy and engagement when accompanied by appropriate pedagogical oversight.

4.3 Perceived Benefits and Risks

Both student and teacher participants identified a balanced mix of benefits and risks associated with AI-assisted translation learning.

From a pedagogical perspective, the benefits were considerable. Participants agreed that AI significantly accelerates linguistic processing, allowing users to handle large volumes of text more efficiently. Many reported that AI tools contribute to vocabulary expansion and semantic awareness, as students actively

compare and refine AI-generated outputs against human translations. Furthermore, exposure to imperfect machine translations encouraged critical thinking, as learners were prompted to question linguistic accuracy, stylistic choices, and cultural equivalence. This reflective engagement aligns with the objectives of higher-order learning and metacognitive development in translator education.

Nevertheless, participants also voiced concerns about academic and cognitive risks. Over-reliance on AI outputs may diminish students' attention to grammar, stylistic nuance, and contextual appropriateness, leading to mechanical reproduction of AI text without critical mediation. Teachers cited instances of digital plagiarism, where students submitted AI-generated translations with minimal revision-and noted a decline in effort toward manual translation and editing skills. Additionally, the opacity of AI algorithms raised ethical concerns about data transparency, authorship accountability, and the erosion of academic integrity. These findings underscore the necessity of cultivating responsible AI use through explicit instruction in post-editing, citation ethics, and reflective evaluation.

4.4 Key Influencing Factors

The synthesis of quantitative and qualitative data identified four major factors shaping the effectiveness of AI integration in translation pedagogy.

First, digital competence and user attitudes emerged as decisive variables. Students and teachers possessing higher digital literacy and more positive dispositions toward technology demonstrated more innovative and self-regulated use of AI tools. *Second*, technological infrastructure and software access strongly influenced adoption levels, as many institutions lacked stable internet connectivity or institutional subscriptions to advanced AI platforms.

Third, the absence of a pedagogical and policy framework governing AI use in translation education created uncertainty among educators regarding ethical limits, data protection, and evaluation criteria. *Finally*, the broader culture of AI use and academic integrity played a crucial role. Where institutional cultures emphasized transparency, originality, and reflective learning, AI was more likely to be integrated responsibly. Conversely, environments lacking clear norms were associated with uncritical imitation and dependence.

Together, these factors reveal that the success of AI-assisted translation pedagogy depends not only on technological availability but also on pedagogical readiness, institutional policy, and ethical orientation. A structured, pedagogically guided approach to AI integration is therefore imperative for achieving sustainable, responsible innovation in translator education.

5. Discussion

5.1 AI as a Catalyst for Pedagogical Shift

The findings of this study reaffirm that artificial intelligence (AI) is not merely a technological supplement but a catalyst for deep pedagogical transformation in translator education. Consistent with the constructivist and experiential paradigms outlined by Kolb (1984) and Vygotsky (1978), AI redefines the classroom as a dynamic, data-driven environment where learners interact critically with machine

outputs. As emphasized by Muñoz-Basols et al. (2023) and Ulitkin & Ivanova (2024), this environment shifts the lecturer's function from that of a traditional content transmitter to a pedagogical designer, cognitive coach, and ethical advisor, a professional who orchestrates human-machine interaction while safeguarding linguistic and moral integrity.

In this reconfigured ecosystem, data-driven learning (DDL) becomes a cornerstone of translator training. Students exploit AI's vast linguistic corpora to observe real-time language patterns, test hypotheses, and refine stylistic choices. Such interaction cultivates critical reading, post-editing, and reflective judgment-skills that bridge theory and practice. This shift resonates with the current vision of *Translation Pedagogy 4.0*, where AI functions as both collaborator and mirror, reflecting the learner's evolving competence rather than replacing human cognition.

5.2 Risks of Over-Reliance

Despite these pedagogical advantages, the research also validates concerns raised by Kanglang (2021) and Krüger (2024) regarding the risks of uncritical dependence on AI technologies. Students' tendency to accept AI output without rigorous evaluation illustrates what Kanglang terms *automation complacency*-a phenomenon that erodes grammatical precision, stylistic sensitivity, and intercultural awareness. Krüger's AI-literacy model similarly warns that without guided reflection, users may develop "surface efficiency" at the expense of deeper linguistic reasoning.

To mitigate such risks, this study proposes graduated AI-use thresholds aligned with task complexity. In introductory courses, AI may serve as a stimulus for terminology exploration and comparative error analysis; in intermediate courses, it should be restricted to supervised post-editing; and in advanced professional-practice modules, AI engagement ought to emphasize ethical evaluation and creative augmentation, not substitution. This scaffolding ensures that learners' agency and accountability grow in proportion to technological autonomy, maintaining equilibrium between automation and human expertise.

5.3 The Need for Structured, Guided AI Integration

The results underscore an urgent need for a structured and pedagogically guided model of AI integration in translator education. The absence of institutional frameworks and ethical guidelines has produced fragmented practices, echoing the global call for *Responsible AI* articulated by UNESCO (2021) and the OECD (2022). Within translation pedagogy, this translates into the imperative to operationalize AI Literacy for Translators, a construct defined by Krüger (2024) as the interplay of technological proficiency, critical awareness, and ethical discernment in AI-mediated communication.

Embedding AI literacy within existing competence frameworks such as the European Master's in Translation (EMT, 2017) and PACTE (2003) models requires the evolution toward an EMT-Hybrid Competence Framework. This hybrid model integrates (1) *linguistic-cultural competence* for contextual accuracy, (2) *technological-AI competence* for intelligent tool use and evaluation, and (3) *critical-ethical competence* for responsible decision-making. The study's evidence confirms that without such explicit structuring, AI implementation risks remaining incidental and ethically ambiguous.

Ultimately, sustainable innovation in translation education will depend on the coexistence of humanistic pedagogy and algorithmic intelligence. Guided AI integration-anchored in reflective practice, professional ethics, and curricular coherence-can transform translator training from a reactive adaptation to a proactive re-envisioning of what it means to learn, teach, and translate in the digital age.

6. Conclusion

6.1 Key Findings

This mixed-method study provides empirical insights into the early-stage integration of artificial intelligence (AI) in translation education within the Vietnamese higher education context. The findings indicate that both students and lecturers demonstrate a high level of readiness and positive disposition toward AI, yet their applications remain fragmented and inconsistent across courses and institutions.

AI-based tools such as ChatGPT, Google Translate, and DeepL are widely used to enhance vocabulary learning, post-editing, and comparative translation analysis. However, the pedagogical use of AI still lacks systematic guidance, resulting in uneven outcomes. The research highlights that while AI presents significant opportunities for innovation, it also introduces academic and ethical risks, including over-reliance, reduced linguistic sensitivity, and emerging challenges of digital plagiarism and transparency.

Therefore, the study concludes that a controlled, pedagogically guided approach to AI integration is essential. AI should not substitute human cognition but rather function as a co-agent that stimulates critical reflection, creativity, and ethical awareness in translation learning. The findings emphasize that sustainable innovation in translator education depends on balancing technological capability with humanistic pedagogy and institutional responsibility.

6.2 Theoretical Contributions

Theoretically, this research extends existing literature by offering context-specific empirical evidence from Vietnam, an underrepresented region in global studies of AI-assisted translation pedagogy. It validates and contextualizes the conceptual frameworks proposed by Krüger (2024), Ulitkin and Ivanova (2024), and Muñoz-Basols et al. (2023), demonstrating how AI literacy can be cultivated within developing educational ecosystems undergoing digital transformation.

By articulating the notion of "AI Literacy for Translators" as a multidimensional construct-encompassing technological, critical, and ethical competences-this study contributes to the advancement of Translation Pedagogy 4.0. Furthermore, it supports the evolution toward an EMT-Hybrid Competence Model, where linguistic-cultural competence is dynamically linked with technological-AI and ethical decision-making capacities.

Collectively, these contributions enrich the global discourse on translator education, bridging the gap between technological innovation and pedagogical sustainability. They position Vietnam as a meaningful case study in the worldwide movement toward responsible, human-centered AI integration in translation training, a cornerstone for future research and curriculum design.

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