

Original Paper

AI-Assisted Translation Pedagogy for Critical Thinking: A Pathway to Sustainable Education

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Abstract

In the era of artificial intelligence (AI), sustainable education requires not only the integration of advanced technologies but also the cultivation of key competencies such as critical thinking. This study investigates English major students' engagement with generative AI tools in translation learning, focusing on their usage patterns, critical thinking behaviors, and ethical awareness. A mixed-methods design combining questionnaire data and semi-structured interviews was employed to examine how students interact with AI in translation contexts. The results show that while students frequently use AI for translation, writing, and language learning, their engagement remains primarily functional and efficiency-driven. Although they display openness and flexibility toward AI, their reasoning confidence, self-regulation, and ethical reflection are underdeveloped, indicating surface-level interaction and overreliance on technological authority. These findings highlight the need to cultivate higher-order cognitive and ethical capacities in translation training. Central to this discussion is the conceptualization of the ideal learner in AI-assisted translation, a reflective, autonomous, and ethically aware individual who engages with AI as a partner in cognitive and moral development. Building on this, the study proposes pedagogical strategies that integrate AI literacy, process-oriented assessment, and teacher training to foster critical thinking and responsible AI use in sustainable translation education.

Keywords

AI-assisted translation, translation pedagogy, critical thinking, sustainable education, ideal learner

1. Introduction

In recent years, the rapid advancement of artificial intelligence (AI) has transformed the landscape of language learning and translation, presenting both opportunities and challenges for sustainable

education. These technologies are reshaping not only how knowledge is acquired but also the roles of teachers and learners. Sustainable education, advocated by UNESCO and aligned with the Sustainable Development Goals (SDG 4: Quality Education), emphasizes preparing learners to tackle complex global challenges, which necessitates the development of competencies that empower students to navigate an ever-evolving world. Critical thinking (CT), as a cornerstone of this vision, enables students to analyze information, evaluate alternatives, and make reasoned decisions. In translation studies, the ability to think critically extends to cultural awareness, ethical decision-making, and reflexivity. The integration of AI in translation pedagogy presents new opportunities by encouraging students to critically assess AI outputs, question algorithmic authority, and engage more deeply with meaning and context. Translation pedagogy therefore offers a unique opportunity to explore how AI-assisted learning can foster cognitive capacities crucial for sustainable education.

Existing studies have highlighted the pedagogical value of AI tools in foreign language learning, noting their potential to enhance efficiency, provide immediate feedback, and support personalized learning pathways (Wu & Li, 2024). However, much of the research has focused on the technical performance of AI systems or their impact on language proficiency, while relatively few studies have addressed how such technologies may cultivate higher-order cognitive skills. Even less attention has been paid to AI's role in domain-specific educational settings such as translation pedagogy. As AI becomes increasingly used by learners, it raises questions about how to effectively cultivate responsible and sustainable AI use and its impact on students' development as competent translators.

To address these gaps, this study aims to examine how AI tools are used among university translation learners, focusing on how students interact with these tools, the frequency and contexts of their use, and how such engagement influences their CT behaviors. By triangulating quantitative data with qualitative insights, the study seeks to provide a comprehensive understanding of how AI can be integrated into translation education by identifying strategies for fostering domain-specific CT within AI-integrated translation training.

2. Literature Review

2.1 AI in Language and Translation Learning and Teaching

Generative AI, defined as the ability of AI systems to create new data based on recurring patterns observed in existing datasets (Ray, 2023), and their capacity to simulate human cognitive functions, has drawn increasing attention in higher education. Research highlights AI's role as a learning partner that offers personalized feedback and self-paced study environments without constant teacher supervision (Sharadagh & Sa'di, 2022).

In language education, AI supports problem-solving, idea generation, and communicative practice (Grassini, 2023). Intelligent tutoring and automated feedback systems have reshaped pedagogy. The emergence of large language models (LLMs) such as ChatGPT further enhances chatbot capabilities and adaptability (Debets et al., 2025). These pre-trained systems facilitate fine-tuning for specific

instructional goals. Huang et al. (2022) examined chatbot-supported language learning, and several studies have similarly identified language learning as one of the most prominent domains for chatbot-based AI integration. They identify AI's instructional roles as tutors, feedback providers, and peer collaborators, and their influence on engagement and achievement (Kuhail et al., 2023) and highlights AI's positive emotional and cognitive effects (Jeon et al., 2024).

Although LLMs like ChatGPT were not designed for translation, they now demonstrate linguistic and computational sophistication comparable to Google Translate or DeepL (Lee, 2024). This shift reframes translation as a technologically mediated, semi-automated collaboration between humans and machines. From neural machine translation (NMT) to LLM-based tools, AI now offers draft generation, lexical alternatives, and context-sensitive suggestions that enhance efficiency and autonomy (Sahari et al., 2023). When critically engaged with, AI outputs can stimulate reflective and analytical learning (Gholiagha et al., 2025). Classroom comparisons between human and AI translations encourage evaluation of accuracy, style, and cultural appropriateness, promoting a shift from product- to process-oriented pedagogy.

Despite these benefits, concerns persist about misuse, overreliance, and misinformation (Yigci et al., 2025). Excessive dependence on AI can weaken motivation and problem-solving abilities, as students often accept automated feedback with minimal reflection (Koltovskaia, 2020). In translation, this tension is evident: while AI supports mechanical tasks such as drafting and editing, it remains unreliable for nuanced, judgment-based decisions (Sahari et al., 2023). Thus, AI-assisted translation is a double-edged process. It heightens cognitive demands on learners' CT, yet when used reflectively, provides a powerful context for developing those very skills.

2.2 CT in Translation Education

UNESCO regards CT as a core competency within Education for Sustainable Development (ESD), enabling individuals to make informed and responsible decisions for social, economic, and environmental well-being. Defined as "the ability to question norms, reflect on values, and take positions in sustainability discourse" (UNESCO, 2017, p.49), CT is listed among key transferable skills, alongside problem-solving and conflict resolution, that foster responsible global citizenship (UNESCO, 2014). CT is thus both an intellectual ability and a moral disposition, preparing learners to navigate the complex linguistic and technological challenges of modern education.

CT is commonly understood as reasonable, reflective thinking directed toward tasks, people, or beliefs (Ennis, 1993). It encompasses cognitive skills and dispositions (Pithers & Soden, 2000), including identifying problems, examining assumptions, evaluating evidence, and applying inductive and deductive reasoning. The Delphi Report (Facione, 1990) identifies two dimensions of CT: cognitive skills (interpretation, analysis, evaluation, inference, explanation, and self-regulation) and affective dispositions (inquisitiveness, prudence, and intellectual honesty). Cultivating CT in language and translation education thus aligns with ESD's goals and equips learners for the interplay of language, culture, and technology.

Although CT is often considered a broad and transferable competency, its application depends on domain-specific expertise (Facione, 1990). In translation, CT manifests in evaluating quality, judging equivalence and appropriateness, and adhering to professional ethics. Translation inherently involves decision-making and negotiation of meaning, making CT essential to pedagogical design. Empirical research confirms a positive link between translation students' CT and performance (Cheng, 2022).

However, the rise of AI tools poses new challenges. Overreliance on pre-generated responses can weaken creativity and higher-order reasoning (Viktorivna et al., 2022), as effortless access to AI outputs may discourage independent learning, a tendency that Aiken and Epstein (2000) described as intellectual laziness. Moreover, limited awareness of AI's limitations can lead to uncritical acceptance and academic integrity issues (Walter, 2024). Since LLMs rely on probabilistic synthesis from vast online corpora, their outputs often vary in reliability (Khowaja et al., 2024). Nonetheless, when AI is used reflectively, it can become a catalyst for higher-order thinking. Embedding AI within participatory and reflexive pedagogies reveals the cultural and political dimensions of technology (Gholiagha et al., 2025), strengthening students' analytical and ethical awareness.

Building on this discussion, cultivating CT in AI-assisted translation emerges as both a pedagogical necessity and a research priority. While AI's potential in translation learning is well documented, few studies explore its role in fostering CT within sustainable education. This study thus addresses that gap through the following questions:

RQ1: What are the frequency, contexts, and types of AI use among translation learners during translation tasks, and how do they perceive its benefits and limitations?

RQ2: What CT-related attitudes and behaviors do learners demonstrate when using AI?

RQ3: What pedagogical strategies best promote CT in AI-assisted translation learning?

3. Methodology

3.1 Research Design

A cross-sectional mixed-methods design was employed, consisting of a structured questionnaire and semi-structured interviews. Quantitative data were collected through an online questionnaire distributed via Qualtrics, examining the frequency and contexts of AI use, perceived benefits and limitations, and self-reported CT behaviors. Qualitative data were gathered through in-depth interviews that explored learners' decision-making, verification strategies, and ethical considerations in greater detail.

3.2 Instruments

3.2.1 Questionnaire

The questionnaire (see Appendix) examined translation learners' engagement with AI-assisted translation and its relationship to CT skills and dispositions. It was developed with reference to Facione's (1990) CT framework and recent studies on technological aids in translation education. The instrument contained nine sections and used a five-point Likert scale (1 = *Strongly Disagree/Never*; 5 = *Strongly Agree/Always*). Section 1 collected demographic information and prior AI experience.

Subsequent sections addressed the frequency, purpose, and strategies of AI use in translation, six CT subskills (interpretation, analysis, evaluation, inference, explanation, and self-regulation), and CT dispositions such as inquisitiveness, open-mindedness, and prudence. Items also assessed students' ethical awareness, perceived effects of AI on translation competence, prior training, and prompting behaviors reflecting reflective engagement.

Two experts in translation pedagogy and educational technology reviewed the initial draft for content validity and clarity. A pilot test with 15 English majors led to minor wording revisions and the removal of redundant items. The final version achieved balanced coverage of behavioral and attitudinal dimensions, with Cronbach's $\alpha > 0.80$ across all major constructs, indicating high internal consistency.

3.2.2 Interview Protocol

The semi-structured interview protocol complemented the questionnaire by exploring students' reasoning and reflective engagement in greater depth. Questions covered four themes: (1) Experiences and motivations for using AI in translation tasks; (2) Perceived benefits, limitations, and risks; (3) CT behaviors such as verification, evaluation, and revision of AI outputs; (4) Ethical awareness and attitudes toward responsible AI use. Open-ended prompts encouraged participants to describe specific translation scenarios, elaborate on decision-making, and reflect on how AI influenced their autonomy, confidence, and judgment.

3.3 Participants

Participants were 56 third-year English majors from a provincial Chinese university who had completed prior translation training. All were native Mandarin speakers with verified English proficiency. Participation was voluntary, with informed consent obtained before data collection. The questionnaire required about 20 minutes to complete. A subset of 15 students (12 females, 3 males) participated in online semi-structured interviews conducted in Mandarin or English according to preference. Each session lasted approximately 30 minutes and was audio-recorded with consent. Transcripts were produced verbatim for analysis.

3.4 Interview Procedure and Analysis

The interviews aimed to capture students' thought processes, verification behaviors, and ethical reasoning in AI-assisted translation. Each session began with general questions about AI use, followed by prompts on evaluation strategies, revision approaches, and reflections on AI's influence on translation competence and CT development. Data were analyzed thematically around the four predefined focus areas: AI use experience, perceived benefits and limitations, CT behaviors, and ethical awareness. Thematic analysis identified recurring patterns and representative viewpoints that complemented the quantitative findings. Selected excerpts illustrated key tendencies and provided qualitative depth.

3.5 Data Integration

Quantitative and qualitative data were integrated during both analysis and interpretation to achieve a comprehensive understanding of students' engagement with AI and its link to CT development.

Triangulation was performed by comparing convergent and divergent patterns across datasets. Quantitative results highlighted general tendencies and correlations, while qualitative insights contextualized these patterns through learners' experiences. This integrative approach provided a nuanced account of how AI engagement interacts with cognitive and attitudinal dimensions of CT in translation learning.

4. Results

This section presents findings from both the questionnaire and interviews. Quantitative data are summarized using descriptive statistics, while qualitative excerpts provide interpretive depth and contextual understanding.

4.1 Background Information

A total of 56 third-year English majors participated in the study, including 39 females (69.6%) and 17 males (30.4%), aged 19-21 years ($M = 19.86$, $SD = 0.71$). All were native Chinese speakers with sufficient English proficiency for academic study. Most participants reported prior translation experience through classroom assignments (57.1%), campus or club activities (64.3%), and, to a lesser extent, internships or paid projects (39.3%).

4.2 General AI Use and Perceptions

Participants reported frequent use of generative AI tools for academic and creative purposes: 52% used them at least three times per week, and 28.6% almost daily. The most common purposes were translation (76.8%), language learning (75%), and writing assistance (64.3%). Overall, participants viewed AI as a convenient, multifunctional resource that supported a wide range of linguistic and cognitive tasks, which may reflect their English-major background.

Interview insights further contextualized these findings. Many participants described AI as an indispensable and efficient companion. Others emphasized exploration and adaptability. Despite generally positive attitudes, participants recognized limitations and accuracy concerns. Interviewee 13 observed, *"AI summaries are convenient, but sometimes too general, barely usable."* Interviewee 14 added, *"After finding fabricated content once, I became more cautious and cross-check information now."* Overall, students demonstrated pragmatic yet reflective engagement, valuing AI's utility while acknowledging reliability issues.

4.3 Experience in AI-assisted Translation

Most students incorporated AI into translation tasks, with 64.3% using it "frequently" or "always," primarily to enhance efficiency (58.9%), accuracy (66.1%), and reduce workload (75%). Interview data confirmed these trends. Students praised AI for its accessibility and educational value. Interviewee 11 remarked, *"It's incredibly easy to use, just a few simple steps to get what you need."* Interviewee 2 compared AI to traditional machine translation, noting, *"AI is more convenient because it not only provides translations but also explains the source text. That's a kind of learning."* Overall, students employed AI as both a productivity tool and a learning aid that facilitated understanding and output

refinement.

4.4 CT Skills in AI-assisted Translation

As shown in Figure 1, participants demonstrated moderate engagement across CT skills when using AI in translation ($M = 2.97$, $SD = 1.15$). Responses clustered around “Occasionally” and “Frequently,” indicating partial but inconsistent application of CT behaviors.

Across the six CT dimensions, Explanation ($M = 3.32$, $SD = 1.14$) and Inference ($M = 3.21$, $SD = 1.12$) ranked highest. Students frequently reported justifying translation decisions and explaining AI influence (Explanation), and deciding when or how to use AI and generating alternative expressions (Inference). These reflect a reflective but not deeply analytical engagement. Lower means appeared in Interpretation ($M = 2.68$, $SD = 1.17$) and Analysis ($M = 2.65$, $SD = 1.19$), indicating limited effort to clarify meaning or identifying errors (Interpretation), and identify implicit assumptions or examine sentence accuracy (Analysis). Evaluation ($M = 2.79$, $SD = 1.02$) and Self-Regulation ($M = 3.17$, $SD = 1.27$) fell in the middle range. Participants occasionally assessed credibility and judged the fit of AI output to task purposes (Evaluation), and reflected on their reliance on AI or adjusted assumptions about its usefulness (Self-Regulation). Overall, participants exhibited reflective and evaluative tendencies, but less consistent analytical and interpretive reasoning.

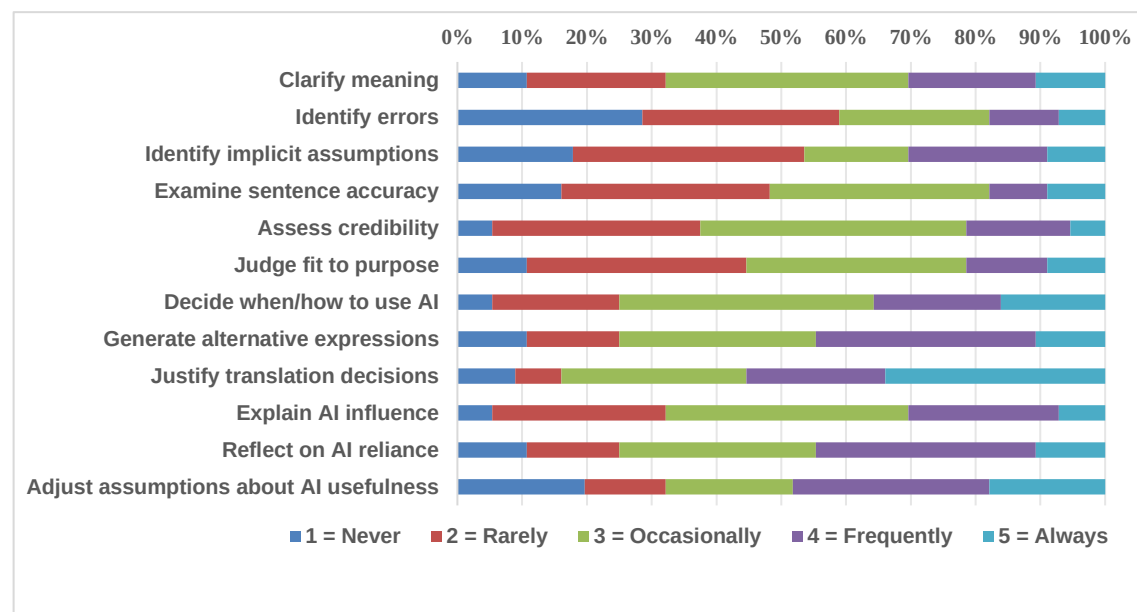


Figure 1. Distribution of Responses Across Six CT Dimensions

Interview data contextualized these patterns, revealing selective confidence in challenging AI outputs. While most valued AI's assistance, they often relied on external validation rather than independent reasoning. As Interviewee 1 explained, “AI can both provide help and weaken deep thinking, but overall, it's positive.” Interviewee 6 highlighted uncertainty, “Sometimes I sense something is off with AI's translation but can't explain why. I only feel sure after checking textbooks or official sources.”

This aligns with the lower scores in Interpretation and Analysis, showing hesitation to critique AI without authoritative reference. This tendency to rely on AI in uncertain cases reflects a preference for external validation over critical analysis. As Interviewee 9 observed, *“AI translations are mostly accurate, but verifying inaccuracies takes significant time and effort.”* Interviewee 14 described a multi-tool strategy: *“I switch between tools or use searches to find appropriate methods.”* These findings indicate uneven CT development: students are strongest in reflective justification and contextual reasoning but weaker in systematic analysis and verification. Their engagement with AI remains cautious, outcome-oriented, and shaped by a preference for confirmatory rather than exploratory reasoning.

4.5 CT Dispositions

Figure 2 illustrates participants' moderate engagement with CT dispositions ($M = 3.43$, $SD = 1.04$). Among these, Open-mindedness ($M = 3.88$, $SD = 1.05$) ranked relatively high, indicating participants' receptiveness to diverse translation strategies. However, AI's limitations sometimes prompted them to question its adequacy. As Interviewee 4 noted, *“For literary translation, AI's output often lacks the right tone or intensity. It just doesn't feel right.”* This suggests that students remained open to alternative approaches but exercised discernment regarding AI's stylistic constraints. Flexibility emerged as the strongest disposition ($M = 4.30$, $SD = 0.80^*$), reflecting participants' willingness to adjust translation decisions when new insights appeared. Interviewee 12 explained, *“When I ask AI to translate, I also provide background information. Smarter AIs understand context and adjust accordingly. How well it works depends on the tool's sophistication and how persistently you question it.”* Such comments highlight students' adaptability and awareness of contextual nuance in AI-assisted translation.

By contrast, Fair-mindedness ($M = 2.71$, $SD = 1.16$) showed weaker engagement. While some reflected on potential bias when assessing AI output, this behavior was inconsistent. Inquisitiveness ($M = 3.07$, $SD = 1.03$) also showed moderate engagement, with participants open to new translation methods but less inclined to probe deeply into AI-generated results. Confidence in reasoning was relatively low ($M = 2.80$, $SD = 1.23$), with many expressing uncertainty in evaluating AI translations. As Interviewee 15 remarked, *“Sometimes I'm not confident. AI translations are backed by massive data, so to challenge them, I need stronger evidence or expertise.”* This echoes Section 4.4, where students hesitated to dispute AI outputs without reliable reference points. Finally, Prudence ($M = 3.80$, $SD = 0.89$) was a salient trait, reflecting students' caution in relying on AI for graded or high-stakes tasks. Although they showed curiosity and openness, many still deferred to human judgment in critical contexts. Overall, while students displayed flexibility and open-mindedness, they would benefit from greater confidence and reflective awareness to evaluate AI translations critically and independently.

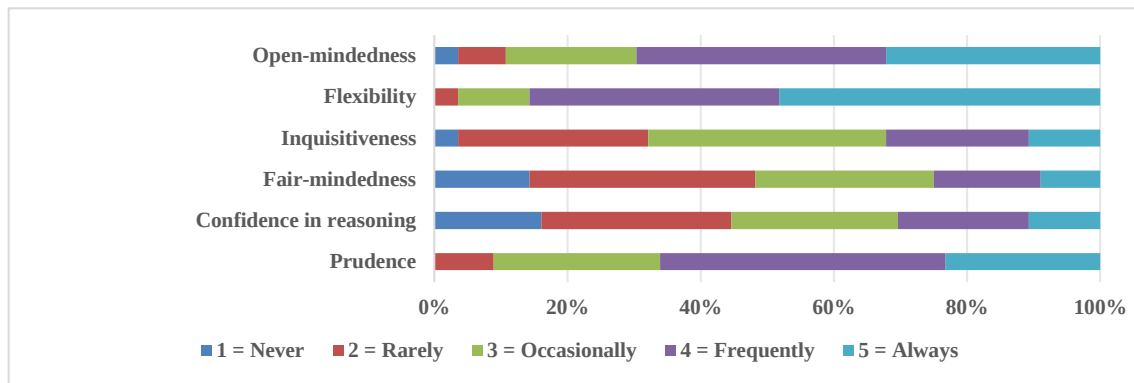


Figure 2. Distribution of CT Dispositions

4.6 Ethical Awareness of AI Use

Survey results revealed diverse perspectives on the ethical implications of AI use in translation. As shown in Figure 3, the most significant concern was using AI in graded assignments (82%), indicating students' awareness of academic integrity and fairness when assessment is involved. Interviewee 5 emphasized contextual judgment, *"Whether it is unethical depends on the context, scope, and whether the translation itself is acceptable, rather than the tool used."*

The degree of modification (75%) was the second most cited factor, showing that students considered human intervention central to ethical acceptability. Interviewee 3 observed, *"If the translation assignment prohibits AI use, it should not be used. But such rules are unrealistic. AI outputs differ each time, making detection harder."* This reflects the ethical ambiguity surrounding AI-assisted translation, especially regarding acceptable modification levels. Fewer students (41%) regarded text length as an ethical issue, suggesting its limited relevance. A minority (14%) considered AI use always unethical, while 16% saw no ethical concerns, revealing a clear divide in moral perspectives.

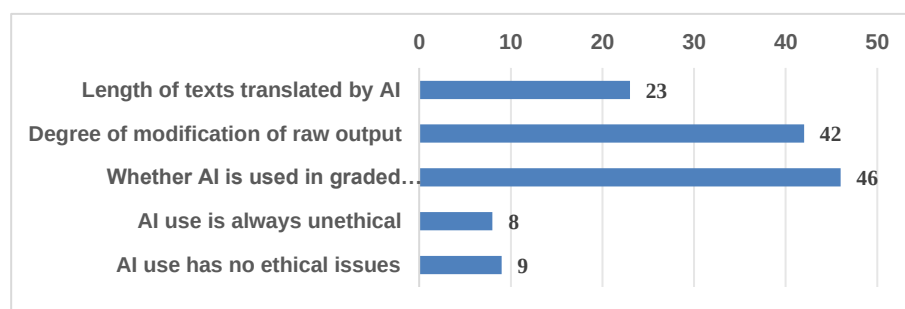


Figure 3. Ethical Concerns Related to AI-assisted Translation (N = 56)

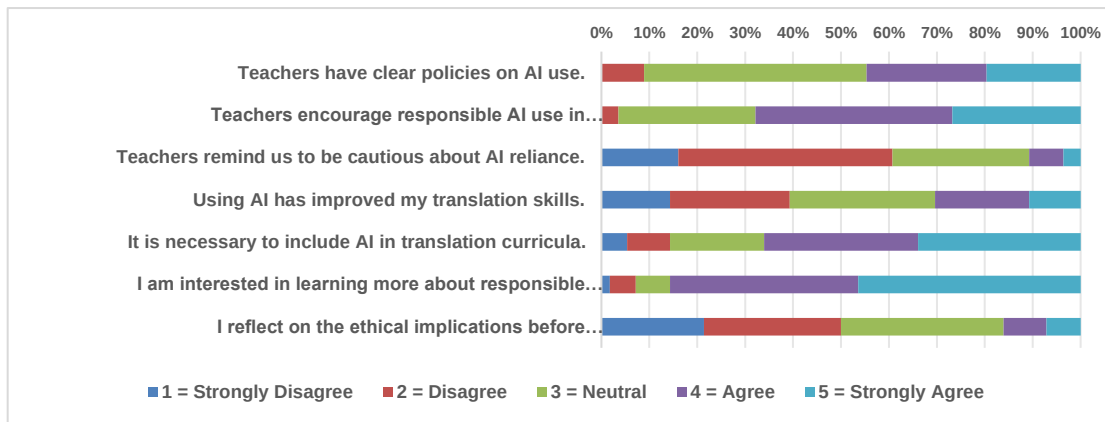


Figure 4. Attitudes towards Responsible AI Use in Translation

Figure 4 presents participants' attitudes toward responsible AI use ($M = 3.32$, $SD = 1.02$). The highest mean corresponded to interest in learning about ethical AI use ($M = 4.23$, $SD = 0.93$). Interviewee 2 stressed the need for formal instruction, *"I hope the school provides training on the professional and ethical use of AI tools, clearly distinguishing responsible use from misuse."* Participants also agreed that teachers should encourage responsible AI engagement ($M = 3.91$, $SD = 0.83$), though fewer supported explicit cautioning against overreliance ($M = 2.38$, $SD = 0.96$). Interviewee 9 noted, *"We discuss AI among classmates, but it's more of a scattered, trial-and-error approach,"* highlighting the gap between formal instruction and self-directed practice.

Support for integrating AI into the translation curriculum was strong ($M = 3.80$, $SD = 1.16$), as Interviewee 3 suggested, *"This is just a new tool, like machine translation. It's disruptive now, so we naturally need to understand it. But it should be introduced through workshops or lectures rather than in class."* However, students were neutral about AI's impact on translation skills ($M = 2.88$, $SD = 1.20$), expressing uncertainty about long-term effects. Interviewee 10 summarized the ethical ambiguity: *"There's still a gray area between unintentional misuse and deliberate misconduct."* The lowest mean was for reflecting on ethical implications before submission ($M = 2.52$, $SD = 1.13$), suggesting limited self-reflection despite recognizing ethical importance. Interviewee 8 advocated for a institutional approach: *"Preparation for the AI era should be handled by a dedicated department. Each course should address this issue to create a systematic, cross-disciplinary framework."*

Overall, students displayed context-sensitive but inconsistent ethical awareness, valuing responsible use yet lacking structured guidance and reflective practice in applying ethical principles to AI-assisted translation.

4.7 Perceived Impact on Translation Competence

Figure 5 presents participants' perceptions of AI's influence on translation competence ($M = 3.31$, $SD = 1.06$). AI was considered most beneficial for lexical knowledge ($M = 3.70$, $SD = 1.00$), as it broadened students' vocabulary and provided diverse translation options. Interviewee 11 explained, *"AI hasn't directly improved my skills, but it helps me test different translation techniques. I can request literal or*

liberal versions, which expands my lexical range and deepens my understanding of context and audience.” Grammatical knowledge received a more neutral evaluation ($M = 2.98$, $SD = 1.17$). Students acknowledged AI’s usefulness in confirming grammatical accuracy but felt it contributed little to deeper structural understanding. Similarly, textual knowledge ($M = 3.07$, $SD = 1.05$) and bicultural knowledge ($M = 3.25$, $SD = 1.04$) were rated moderately, indicating that AI supports text organization and provides limited cultural context but does not substantially enhance cross-cultural awareness. As Interviewee 14 reflected, *“Sometimes I think ‘why not just ask AI,’ but learning to solve translation problems myself is more valuable.”* Translation strategies and techniques ($M = 3.50$, $SD = 1.07$) and problem-solving ($M = 3.64$, $SD = 1.19$) scored moderately to highly, suggesting students saw AI as a practical aid for overcoming translation challenges by generating alternatives rather than fostering long-term strategic thinking. In contrast, self-reflection on translation processes received the lowest mean ($M = 3.00$, $SD = 0.89$), indicating that while AI facilitated task completion, it contributed little to metacognitive awareness or critical evaluation of translation reasoning.

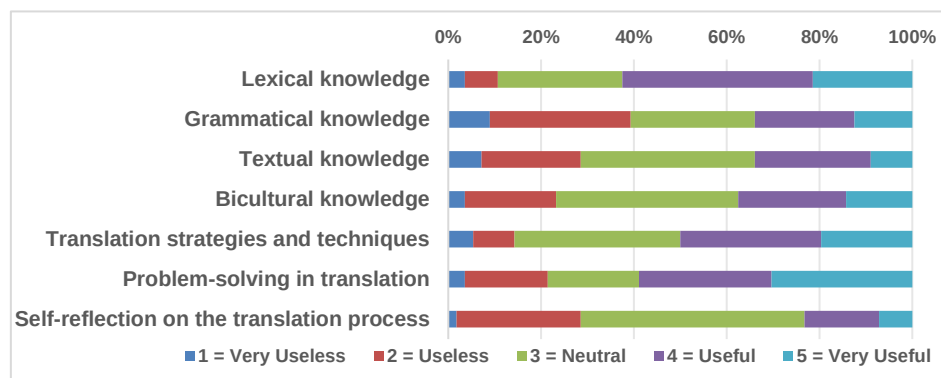


Figure 5. Perceived Impact of AI on Translation Competence

4.8 Training and Preparation

Most participants relied on self-learning for AI tool use (35, 63%), while 16 (29%) received informal training elsewhere, and only 5 (9%) had been instructed within translation courses. This indicates that despite growing exposure to AI technologies, formal training in translation programs remains limited.

As shown in Figure 6, participants viewed judging AI output quality (82%) and understanding AI’s strengths and limitations (77%) as the most essential preparatory skills. Other valued abilities included critical use of AI outputs (63%) and avoiding over-reliance (46%), whereas basic AI literacy (43%) and ethical awareness (38%) were less emphasized. These patterns suggest that students prioritize practical evaluation and task-oriented competence over foundational or ethical understanding. Interviewee 12 reflected on the risk of dependency, *“If assignments can easily be completed by AI, the issue will persist, especially in a grade-centered system. Evaluation methods should evolve to refocus on learning itself.”* This reflects the tension between AI’s convenience and traditional assessment models, highlighting the need for curricular reform that integrates reflective learning and ethical awareness.

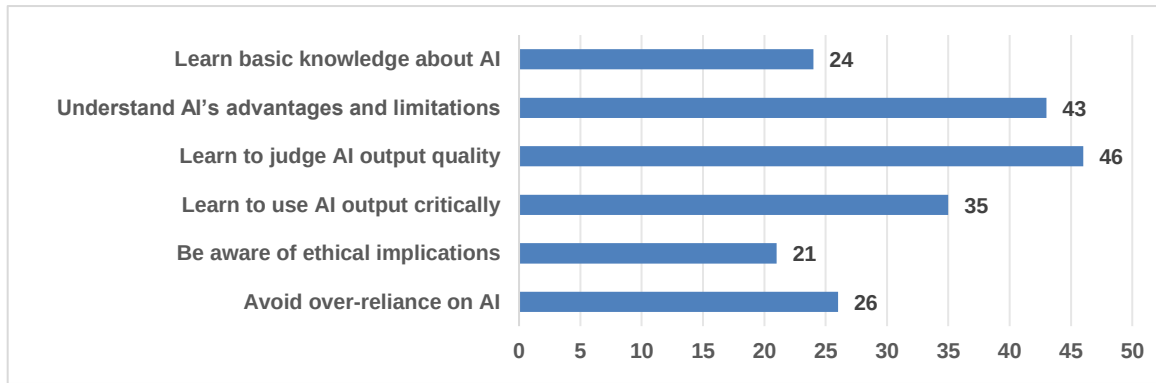


Figure 6. Perceived Prerequisites for Using AI in Translation

4.9 Prompting and Critical AI Use

Figure 7 shows that the most common prompting behavior was refining prompts to improve AI output ($M = 3.09$, $SD = 0.91$), though not always effectively. Interviewee 4 explained, “*When the output was unsatisfactory, I adjusted the prompt, but I think AI’s creativity is limited.*” Participants also designed prompts for specific feedback ($M = 2.82$, $SD = 1.07$) and attempted to identify weak prompts ($M = 2.48$, $SD = 1.25$), though such practices were less frequent. These results suggest that while students recognized the value of prompt refinement, they applied it inconsistently. Interviewee 7 shared, “*When translating from English to Chinese, if I don’t understand something, I ask AI to explain. I’m still exploring what it can do.*” This reflects students’ experimental and exploratory approach to prompting. However, less common strategies, such as including the target audience or requesting AI to explain translation choices ($M = 2.41$, $SD = 1.05$), point to limited critical engagement with AI’s reasoning process. Overall, participants displayed basic prompting literacy but lacked systematic strategies for critical use. Their engagement highlights the need for explicit training in prompt engineering to enhance analytical depth, optimize AI performance, and cultivate reflective interaction in translation tasks.

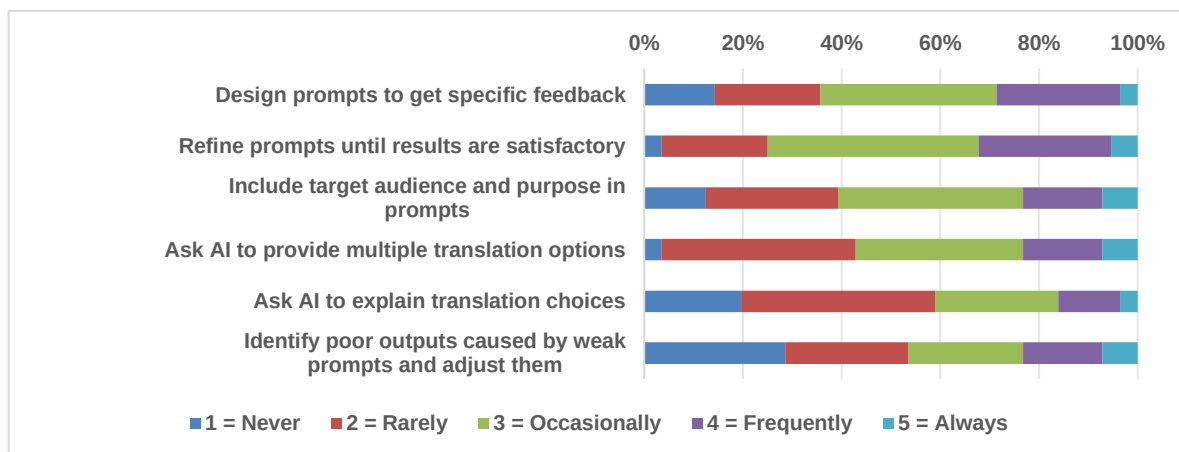


Figure 7. Frequency of Prompting Behaviors

Across all sections, the results indicate that translation learners widely used AI tools, perceiving them as beneficial for efficiency and accuracy. However, their critical engagement with AI was uneven, being stronger in evaluation and explanation but weaker in analysis and self-regulation. Ethical awareness was developing but constrained by a lack of formal training and structured training on responsible AI use.

5. Discussion

5.1 Overview of Findings

This study provides a preliminary picture of how translation students engage with AI tools. Addressing RQ1, the findings show that students use AI frequently, often daily or weekly, for translation, language learning, and writing support. Although they value AI for efficiency and convenience, their use remains largely instrumental, emphasizing task completion rather than reflective learning. Regarding RQ2, students exhibited openness and flexibility, yet limited development of CT and ethical reasoning. While refinement of AI outputs was common, it often lacked deeper analysis or evaluation. Ethical considerations were context-dependent, influenced by task type and the degree of modification rather than by explicit moral principles.

Across all findings, several patterns emerged. Students' CT dispositions, particularly self-reflection, reasoning confidence, and ethical awareness, were uneven. Many relied on AI's perceived authority and hesitated to challenge its outputs without external validation. Despite strong interest in responsible AI use, most had no formal training, depending instead on self-directed experimentation. This gap underscores the need for structured instruction in prompting, verification, and reflective practice. Finally, while AI contributed positively to lexical expansion, problem-solving, and strategy awareness, it had limited impact on metacognitive growth such as self-reflection and ethical judgment. Collectively, these findings reveal a core pedagogical challenge: integrating AI into translation education in ways that enhance rather than replace human critical thinking.

5.2 Ideal Learner in AI-assisted Translation

In AI-assisted translation, CT entails purposeful, self-regulatory judgment applied to the generation, revision, and evaluation of translations with AI support. It involves interpreting, analyzing, evaluating, and inferring from AI outputs, as well as explaining linguistic, cultural, contextual, and ethical choices. CT thus functions as both a professional competency and a metacognitive resource, enabling translators to balance technological assistance with human discernment to ensure quality, responsibility, and creativity in translation practice.

Building on Facione's (1990) Delphi Report and its model of the ideal critical thinker, the ideal learner in AI-assisted translation is inquisitive, open-minded, and flexible. They actively explore alternative translations and tools while maintaining confidence in their own reasoning rather than uncritically accepting AI authority. Such learners are fair-minded in evaluating AI-generated suggestions, prudent in adopting or rejecting them, and honest about both their biases and AI's limitations. Their translation

choices are justified through context, linguistic precision, and audience relevance. When confronted with complex challenges, they demonstrate persistence and reflective autonomy, systematically applying professional criteria, such as accuracy, fluency, cultural appropriateness, and ethical awareness to assess AI outputs.

Conceptualizing this ideal learner provides a pedagogical framework for cultivating effective, critical, and ethical engagement with AI in translation education. As the Delphi Report reminds us, no thinker fully embodies all CT skills and dispositions; rather, the model serves as a guiding vision for curriculum design and assessment, promoting balanced development of cognitive, ethical, and technological competence in future translators.

5.3 Pedagogical Implications

5.3.1 Treat CT as a Parallel Goal

Following Facione's (1990) Delphi Report, CT should be regarded as a core instructional objective alongside translation competence. Translation inherently involves interpretation, analysis, evaluation, and self-regulation; thus, AI-supported learning offers a natural context for embedding CT. Framing AI use as a structured opportunity for questioning and reasoning enables students to connect technical proficiency with reflective judgment.

5.3.2 Design Explicit CT Tasks

CT instruction and assessment should be explicit and scaffolded. Tasks can include categorizing AI translation errors (interpretation), applying rubrics of accuracy or cultural fit (evaluation), proposing alternative renderings (inference), and justifying post-editing decisions (explanation). Gradually increasing task complexity, from short AI outputs to full-length texts, allows students to model, practice, and internalize CT strategies transferable across contexts.

5.3.3 Adopt Multi-modal Assessment

A triangulated approach should assess both cognitive skills and dispositions through (a) process observation of AI interactions, (b) evaluation of final translations, (c) reflective commentaries, and (d) comparative benchmarking. Such multi-modal assessment captures students' reasoning processes as well as outcomes.

5.3.4 Promote Ethical and Dispositional Growth

Translation classes should explicitly address CT dispositions such as open-mindedness, prudence, and intellectual honesty. AI-mediated tasks provide opportunities to discuss bias, authorship, and academic integrity, reinforcing ethical awareness within and beyond translation contexts.

5.3.5 Encourage Self-regulation and Independent Reasoning

Students should be guided to document and reflect on their AI use, noting moments of over-reliance and explaining subsequent revisions. Such metacognitive reflection fosters self-monitoring, humility, and adaptability, which are hallmarks of advanced CT and professional maturity.

5.3.6 Enhance Teacher Training in AI Literacy

Effective integration of AI requires well-prepared educators. Consistent with Kostka and Toncelli (2023)

and Al-Khresheh (2024), teachers need professional development linking AI tools to pedagogical aims and strategies for fostering students' critical digital literacy. Institutional support for continuous training ensures that educators can guide learners to use AI both analytically and responsibly.

6. Conclusion

This study explored how translation learners engage with generative AI tools, focusing on their usage patterns, CT behaviors, and ethical awareness. Findings revealed that while students frequently use AI for academic and creative tasks, their engagement is primarily pragmatic and efficiency-driven, with limited use for cognitive growth or reflection. Students exhibited partial CT dispositions, particularly openness and flexibility, but showed weaker development in reasoning confidence, ethical reflection, and self-regulation. AI's perceived authority led to surface-level engagement, and ethical considerations were largely task-dependent.

These results underscore the need for translation pedagogy to strengthen critical judgment and ethical reasoning. Effective AI integration should include explicit instruction in prompting, verification, and reflection to foster metacognitive engagement. Assessment should adopt process-oriented approaches that value reasoning and ethical awareness alongside translation adequacy. At the institutional level, expanding AI literacy through cross-disciplinary collaboration, faculty training, and policy development will support a sustainable model of AI-assisted translation education. The concept of the ideal learner in AI-assisted translation offers a foundation for pedagogical strategies that cultivate CT, independent reasoning, and responsible use of AI tools.

Despite its contributions, this study is limited by the relatively small sample size and potential differences in participants' AI experience. Future research could adopt longitudinal or intervention-based designs to examine the development of AI use and CT over time, or to evaluate the effectiveness of specific pedagogical frameworks in classroom contexts.

In conclusion, while AI has become an integral part of translation students' learning environments, its pedagogical value depends on how it is framed and applied. Translation pedagogy must move beyond technical adoption toward critical integration, cultivating learners who can evaluate AI outputs discerningly, apply them ethically, and reflect on their own translation reasoning. Ultimately, the goal is not merely to train students to use AI but to prepare them to think beyond it, developing reflective, responsible, and critically aware translators capable of engaging in sustainable translation practices that balance technological efficiency with human creativity, judgment, and ethical responsibility in an evolving digital landscape.

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