

Human–AI Collaboration in Translation Teaching and Assessment: An ADDIE-Based Approach

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Abstract:

With the rapid advancement of intelligent technologies, generative artificial intelligence (GenAI) has gained widespread application in translation teaching and practice due to its significantly improved translation quality. GenAI tools such as DeepSeek offer new possibilities for both learning and instruction. To effectively integrate GenAI into education, the ADDIE model—comprising the stages of Analysis, Design, Development, Implementation, and Evaluation—provides a systematic framework for instructional design. Starting from the analysis of students' needs, the ADDIE model enables educators to design and develop a human-AI collaborative teaching approach that incorporates GenAI into both instruction and assessment. This collaboration enhances students' translation accuracy, improves teaching efficiency, and streamlines evaluation processes. It fosters an interactive learning environment where students actively use AI tools to sharpen their language, editing, and technical abilities. Meanwhile, teachers are able to shift their focus to higher-order thinking, critical feedback, and personalized guidance. The integration of human and GenAI translation supports differentiated instruction by accommodating diverse learning styles and paces. Translation education becomes more intelligent, precise, and learner-centered, meeting the evolving demands of the digital age.

Keywords:

ADDIE, Generative AI, Human-AI Collaborative Learning, Prompt Engineering, Technological Empowerment

1. Introduction

With the rapid development of artificial intelligence technologies, generative artificial intelligence (GenAI) has been widely adopted in translation education and practice, improving both efficiency and accuracy while reshaping traditional workflows and instructional methods [1]. In response to these technological advancements, translation education is undergoing a paradigm shift of artificial intelligence in education (AIED). It now faces new challenges that require a fundamental transformation in teaching objectives, content, and pedagogical strategies,

facilitating innovation in teaching and learning [2]. Despite growing interest in GenAI-assisted translation, a gap remains in systematic approaches to integrating these tools into pedagogically sound instructional design. Specifically, there is a lack of research that addresses how translation education can effectively adapt to incorporate GenAI tools in a way that fosters not only technical proficiency but also higher-order skills such as critical thinking, collaboration, and independent learning.

“Soft skills” such as technological adaptability have become increasingly valued in the language services industry [3], alongside instrumental competences such as human–AI collaboration and Machine Translation Post-Editing (MTPE), which are now considered essential for professional translators [4]. To address these evolving demands, this study adopts the ADDIE model, a structured instructional design model consisting of five stages: Analysis, Design, Development, Implementation, and Evaluation, into translation education. The model plays a crucial role in systematically guiding the integration of GenAI into teaching by aligning instructional practices with students’ needs and industry requirements. Using this framework, the study investigates how GenAI tools such as DeepSeek and ChatGPT can be incorporated into collaborative translation, post-editing, and assessment activities for English and translation majors. This approach not only improves the quality and efficiency of translation tasks, but also promotes autonomous learning, critical reflection, and a more student-centered learning environment. Ultimately, the study aims to provide a replicable model for enhancing translation pedagogy and equipping students with the skills needed to thrive in a digitally-driven profession.

2. GenAI and Translation Teaching

Machine translation has evolved through multiple technological iterations, from rule-based and statistical models to neural machine translation (NMT) and now to generative AI-driven systems. GenAI is transforming the landscape of translation education by offering new tools and pedagogical possibilities. These technologies not only support instructional design but also inspire creativity, broaden learners’ thinking, and provide real-time feedback on student assignments. It enables teachers to tailor content based on learners’ proficiency and interests while encouraging students to actively engage with language in a dynamic and interactive environment. GenAI has been applied in various aspects of translation teaching, including human-AI collaborative feedback on translation tasks [5], GenAI-assisted translation, and terminology management [1], demonstrating its potential in professional training and language services. It empowers teaching by generating customized teaching materials, producing diverse thematic content, and facilitating human-AI interaction.

GenAI-based translation tools offer considerable improvements in fluency, contextual relevance, and semantic accuracy, making them assistant in translation pedagogy. The application of GenAI in translation extends beyond translation practice to teaching platforms, knowledge frameworks, and personalized learning systems, creating new opportunities while simultaneously posing challenges to conventional translation education. These include shifts in teaching content, learning objectives, instructional methods, and even the role of the teacher.

In the digital age, translation education is confronted with a range of new challenges. From the students’ perspective, their practical translation competence, particularly in Chinese-English translation, remains underdeveloped. Many students lack systematic training in the use of generative AI (GenAI) tools, especially in

prompt engineering, critical evaluation of machine-generated outputs, and post-editing techniques. Their learning is still largely dependent on teacher-led instruction and corrective feedback, which restricts the cultivation of autonomous learning, critical thinking, and reflective translation practice. From the teachers' perspective, traditional pedagogical and assessment models present further constraints. These models often rely on standardized answers and rigid scoring rubrics, which are insufficient for capturing the nuanced, context-sensitive nature of translation tasks. The approaches not only overlook individual variation in problem-solving strategies and linguistic creativity but also prove inefficient when applied to large cohorts of students, making personalized feedback and formative assessment difficult to implement. As a result, both teaching and learning in translation education must be re-envisioned to align with the demands of intelligent, adaptive, and learner-centered pedagogies

The integration of GenAI software with interactive machine translation can address these issues by enhancing translation fluency, improving text functionality, and streamlining workflow. When the source text is relatively simple, the difficulty of post-editing is reduced, and the overall efficiency of translation tasks increases significantly. Moreover, intelligent technologies like AI and Large Language Model can promote the interconnectivity, and interactivity of translation teaching, encouraging a more student-centered learning environment.

GenAI also facilitates teaching by offering intelligent feedback on translation quality, thus complementing traditional methods and encouraging pedagogical innovation. In Master of Translation and Interpreting (MTI) programs, platforms such as *Yixuejia* utilize AI and big data to monitor students' learning behaviors, helping teachers refine instruction and support student development. AI can also contribute to designing teaching materials, building real-world, problem-based learning scenarios, optimizing learning sequences, and fostering higher-order thinking skills such as creativity and critical analysis.

Most research and practice in post-editing and GenAI integration focus on postgraduate education, with limited application in undergraduate teaching. However, incorporating deep learning-based GenAI into undergraduate translation courses, through human-machine collaborative teaching and assessment, offers great potential. It can increase classroom efficiency, improve translation quality, and enhance students' bilingual proficiency, technical capabilities, and independent learning skills, making translation education more aligned with industry needs and future career expectations.

3. The ADDIE Model and Translation Teaching

The ADDIE model, developed in 1975 by Florida State University, is a widely recognized and applied instructional design model used across educational and training contexts [6]. Comprising five stages—Analysis, Design, Development, Implementation, and Evaluation—ADDIE provides a structured and iterative process for creating effective instructional programs. It emphasizes a learner-centered approach, ensuring that teaching is continuously refined through teacher–student interaction and formative feedback. As an adaptive model, ADDIE supports dynamic instructional innovation and is particularly suitable for integrating emerging technologies such as generative artificial intelligence (GenAI).

In translation teaching, the ADDIE framework offers a practical and systematic path for integrating GenAI tools into curriculum design and classroom practice. Beginning with a thorough analysis of students' learning needs and existing skill gaps, instructors can identify core areas requiring intervention—such as prompt engineering, machine translation post-editing (MTPE), and human–AI collaboration. Instructional goals are then designed to cover language transfer abilities, theoretical understanding of translation, and the development of digital literacy. The development phase involves creating learning materials and designing interactive activities using GenAI tools such as ChatGPT and DeepSeek. Project-based learning, scenario-based tasks, and AI-assisted quality assessment methods are employed in the implementation phase to engage students actively in collaborative translation tasks. Finally, both formative and summative evaluations are conducted to assess learning outcomes and improve future instructional cycles.

This approach not only enhances students' translation accuracy and post-editing competence but also equips them with the professional skills required in the increasingly technology-driven language services industry. By aligning instructional content with industry demands, the ADDIE framework ensures that students develop comprehensive competences—including bilingual proficiency, translation strategy, AI tool usage, and critical reflection.

3.1. Practice of Human–Machine Collaborative Translation Teaching Based on ADDIE Model

Translation instruction designed under the ADDIE model begins with a detailed needs analysis, identifying the weaknesses in students' Chinese–English translation abilities and their unfamiliarity with GenAI tools. Leveraging the vast language data and real-time feedback capabilities of large language models, the framework supports the creation of adaptive instructional strategies that supplement traditional pedagogy with intelligent technologies. Human–machine collaboration becomes a central axis of the course, where AI acts as an auxiliary tool throughout the teaching and evaluation process.

In this study, the ADDIE-based instructional model was applied to 82 first- and second-year undergraduate students majoring in English and Translation at a university. The curriculum was structured to blend conventional classroom instruction with AI-assisted tasks, including collaborative translation, prompt design, and MTPE activities. Students engaged in translation projects where GenAI-generated drafts were evaluated, edited, and refined under teacher supervision. Throughout the course, AI provided instant feedback on grammar, coherence, and style, while teachers offered in-depth commentary on translation strategies and theoretical application. This dual-feedback mechanism enhanced classroom interaction and fostered autonomous learning. The full implementation process and corresponding instructional stages are illustrated in Figure 1:

As shown in Figure 1, according to the ADDIE model, the process begins with a questionnaire survey to understand students' perception toward the course and the application of GenAI in the classroom. This step analyzes the learning context and students' actual needs. Based on the analysis, instructional goals, teaching models, and course content are designed, including the development of prompts and other teaching resources. Human–machine collaborative teaching is then implemented throughout the course, followed by a final evaluation.

Analysis	Design	Development	Implementation	Evaluation
•Students •Course •GenAI •Learning feedback •Need analysis	•Teaching objectives •Teaching models-Teaching content	•Teaching resources	•Before class • Pre editing •While class - Human-machine interaction •After class • MTPE	•quantitative •qualitative

Figure 1. Human-AI collaborative translation teaching and assessment based on ADDIE model.

The overall design of the human-machine collaborative translation teaching and assessment process has a clear objective: to enhance students’ linguistic, editing, and technical tool competencies. The specific stages are as follows:

(1). Analysis

Student needs and learning conditions were assessed through a questionnaire distributed to 82 first- and second-year students majoring in English and Translation. The results revealed that 80.5% of respondents frequently used generative AI tools such as DeepSeek, ERNIE Bot, and Kimi, demonstrating familiarity with AI-assisted translation. Moreover, 79.2% expressed a strong willingness to integrate AI into formal translation courses, and 91.46% acknowledged the significance of AI in their future professional development. These findings reflect a high level of enthusiasm for the application of GenAI in both academic and career contexts.

Despite frequent usage, students lacked systematic training in prompt engineering and critical engagement with AI-generated content. Most reported simply inputting source texts to receive immediate outputs, without understanding how to craft effective prompts or critically assess the quality and limitations of the translations. This indicates a clear gap between tool familiarity and deeper functional literacy. From a pedagogical standpoint, students expressed the need to incorporate GenAI into structured classroom activities, where they could learn not just how to use these tools, but how to collaborate with them effectively. Addressing these needs can enhance students’ ability to engage in post-editing, improve translation accuracy, and develop human-AI collaboration skills critical for the evolving translation industry.

(2). Design

The instructional model was constructed as an integrated course of teaching, learning, and assessment grounded in human-machine collaboration. Drawing on the ADDIE framework, the model emphasized real-world application, active learning, and skill development, with course content combining translation theory and practical strategies for interacting with generative AI in translating both literary and non-literary genres. Students were encouraged to use GenAI tools such as DeepSeek and ChatGPT to produce initial drafts, identify errors or limitations in machine output, and conduct post-editing to ensure accuracy, coherence, and appropriateness based on context.

This course design aimed not only to familiarize students with the practical application of GenAI tools in translation workflows but also to encourage collaboration in post-editing and critical evaluation of machine-generated content. By highlighting the limitations of AI, students learned to maintain professional judgment and linguistic sensitivity. The course further promoted teamwork in AI-supported

translation projects, aligning with the collaborative nature of professional translation environments.

Instructional goals were designed to enhance both intra-linguistic competencies (such as language accuracy, style, and fluency) and extra-linguistic competencies (such as technical literacy, editing skills, analytical thinking, and the ability to collaborate using digital tools). On one hand, the interaction with AI and iterative feedback processes enabled students to recognize and reflect on their language errors and improve their expression in the target language. On the other hand, the learning objectives extended beyond mere language transfer to include AI prompt engineering, post-editing workflows, terminology management, and the development of critical awareness regarding the capabilities and limitations of GenAI technologies.

The teaching content covered foundational topics such as translation theory, genre-specific translation techniques, and human-machine interaction strategies. Emphasis was placed on learning how to generate and optimize prompts, establish post-editing standards, and manage terminology databases. Through human-machine collaboration, translation efficiency was significantly improved, and students developed a stronger ability to work with different text types and translation contexts.

The instructional model represented a shift from traditional teacher-centered methods to a task-driven, student-centered approach. It emphasized experiential learning and active engagement, with human-machine-student collaboration forming the core of classroom dynamics. Project-based learning was implemented using authentic texts—including news reports, commercial advertisements, and technical manuals—to replicate real-world translation scenarios. Students worked in teams to complete AI-assisted translation projects, refining their translations through peer collaboration and AI-based feedback. Clear post-editing criteria were introduced to guide quality assessment and ensure consistency. This approach not only improved translation performance but also fostered students' professional competence, adaptability, and digital literacy in a rapidly evolving translation landscape.

(3). Development

To support students in effectively interacting with generative AI tools, the course introduced different types of prompt engineering strategies, including zero-shot prompting (where the AI is asked to perform a task without prior examples), few-shot prompting (where a few examples are provided to guide the AI's response), iterative prompting (where prompts are refined based on the AI's previous outputs), and role-playing prompts (where the AI is assigned a specific role, such as a professional translator or editor) [7]. These prompt types allowed students to explore diverse ways of engaging with GenAI tools, fostering an understanding of how different prompt structures influence translation output quality, style, and functionality.

To further enhance the instructional value of prompt design, prompts were aligned with specific translation goals and theoretical approaches. For instance, prompts rooted in *skopos theory* encouraged students to define the purpose of translation and adjust the AI-generated output accordingly, tailoring it to different target audiences. *Semantic translation* prompts emphasized preserving the original meaning and structure, making students more sensitive to linguistic nuance and fidelity. In contrast, *communicative translation* prompts directed the AI to prioritize naturalness and clarity for the target readership, reflecting real-world functional translation practices.

By applying theoretical knowledge to prompt design, students learned to navigate and control AI behavior, bridging the gap between abstract translation principles and hands-on machine collaboration. This not only deepened their understanding of translation theories but also enhanced their ability to critically evaluate machine output in light of specific translation purposes. As a result, students developed the capacity to use GenAI tools not passively, but strategically—engaging in meaningful human–AI interaction that aligns with both academic expectations and professional standards. This component of the course was central to cultivating prompt literacy, AI awareness, and translation competence in the age of intelligent technology.

(4). Implementation

The practice of human–machine collaborative translation was implemented in three phases: pre-class, in-class, and post-class. This structured approach ensured that students engaged with translation tasks comprehensively—from initial text selection and research to AI-assisted translation and post-editing. Each phase contributed to the development of students’ translation competence, technical skills, and critical awareness of the human–AI collaboration process.

Pre-class Phase: In the pre-class stage, students were tasked with selecting translation materials relevant to their interests and aligned with course themes, covering both literary and non-literary genres such as news articles, advertisements, technical manuals, and short stories. They conducted an initial analysis of the source text, identifying key terminology, syntactic features, and domain-specific language. Students also carried out background research on the cultural, stylistic, and functional aspects of the source and target texts. A central focus of this stage was the application of pre-editing strategies—modifying the source text to enhance machine readability and translation accuracy. Students examined how simplifying sentence structures, clarifying ambiguous references, or standardizing terminology could lead to more consistent and accurate AI outputs. These tasks laid the groundwork for effective interaction with AI during the next phase.

During class Phase: During class, students worked in collaborative groups to experiment with various generative AI translation tools such as DeepSeek, ChatGPT, Kimi, and Doubao. Depending on the genre and purpose of the selected texts, students chose appropriate prompt strategies—such as zero-shot, few-shot, iterative, or role-based prompts—to engage the AI tools. They compared outputs from multiple systems and critically analyzed their differences in terms of meaning retention, stylistic fidelity, and functional adequacy. Students were encouraged to revise and iterate prompts to improve translation quality, reinforcing their understanding of prompt engineering and translation theory. This phase emphasized collaborative decision-making, peer learning, and reflection on AI performance, fostering a dynamic classroom environment where students engaged in real-time problem-solving and strategy optimization.

Post-class Phase: The post-class stage focused on machine translation post-editing (MTPE) and quality assessment. Students individually reviewed and revised the AI-generated drafts, improving accuracy, fluency, and target language appropriateness. This phase allowed students to apply theoretical knowledge and linguistic judgment in a practical context, honing their editing and evaluation skills. Students were trained to assess translations using criteria such as accuracy of information transfer, idiomatic expression, consistency in terminology, and overall textual functionality. Teachers played an active role by assessing students’ post-edited translations and providing

detailed feedback through both written comments and AI-assisted evaluation tools. Feedback focused on the effectiveness of the translation, the student's ability to refine machine output, and the alignment with genre-specific requirements.

This three-phase structure ensured that students developed a holistic understanding of the translation process in the GenAI era. From critical analysis and prompt design to tool selection and post-editing, learners engaged in each stage of translation production. The model not only improved their bilingual competence and technical proficiency but also encouraged self-directed learning and collaboration—equipping them with the essential skills to thrive in a digitally mediated translation landscape.

(5). Evaluation

Teachers employed a combination of quantitative assessment metrics and qualitative student feedback to continuously refine and enhance the integrated human-machine collaborative teaching and assessment model. This dual approach allowed for both objective measurement of learning outcomes and a deeper understanding of students' experiences and challenges with generative AI-assisted translation tasks.

Quantitatively, teachers evaluated student performance through accuracy scores, fluency ratings, and post-editing effectiveness, comparing AI-assisted translations against established benchmarks and reference translations. These metrics provided insight into how well students applied their language skills and post-editing techniques to improve machine-generated drafts. Additionally, AI tools with built-in evaluation functions contributed data on lexical choices, syntax, and semantic consistency, which helped identify common error patterns and areas needing further instruction.

Simultaneously, student reflective feedback was systematically collected through surveys, journals, and group discussions. Most students recognized that generative AI translations generally succeeded in conveying the core content and major thematic elements of texts, particularly when translating from Chinese to English. They appreciated the speed and convenience that AI tools provided, noting how these technologies could effectively reduce initial workload and offer multiple draft options for further refinement.

However, students also identified several persistent challenges. Regarding vocabulary, AI tools frequently struggled with internet neologisms—terms like “出圈” (go viral) and “出海” (go global)—which are culturally specific and rapidly evolving. Similarly, culture-loaded terms such as “英歌舞” (a traditional Chinese folk performance of opera and dance in southern China) were often rendered literally or inaccurately, failing to capture their full cultural nuance or significance. This limitation underscores the difficulty of AI systems in handling culturally embedded language and idiomatic expressions [8].

Grammar issues were particularly pronounced in English-to-Chinese translations. Students reported frequent word order confusion, incomplete or erroneous sentence structures, and coherence problems, including inappropriate collocations and unclear pronoun referents. Such grammatical weaknesses compromised overall text readability and naturalness, requiring substantial human intervention during post-editing.

Through critical reflection and class discussions, students reached an important consensus: while generative AI enables rapid and efficient draft production, the role

of human translators remains indispensable. They observed that machine translation, no matter how advanced, lacks the creativity, cultural sensitivity, and linguistic intuition that human translators bring to the process. One student succinctly stated, “Although machine translation enables fast output, human involvement and creative translation are irreplaceable. Translators must improve their language mastery through continuous practice and study to produce more vivid, accurate, and expressive translations.”

This feedback encouraged teachers to emphasize the complementary relationship between AI tools and human expertise in their instructional design. It highlighted the necessity of training students not only to use AI effectively but also to critically evaluate and enhance machine outputs. In response, subsequent iterations of the course incorporated targeted modules on cultural competence, idiomatic expression, and advanced post-editing strategies. Teachers also refined assessment rubrics to balance quantitative accuracy with qualitative measures such as creativity and cultural appropriateness.

Overall, this iterative feedback loop strengthened the integrated teaching–assessment model, ensuring that it remained responsive to student needs and aligned with the evolving demands of professional translation in an AI-augmented environment.

3.2. Effectiveness of Human-AI Collaborative Translation Teaching Based on the ADDIE Model

Translation teaching based on the ADDIE model and human–AI collaboration offers a dynamic and interactive learning environment that significantly enhances both teaching effectiveness and student competence. One of the core advantages of this approach is the provision of real-time feedback, editing suggestions, and reference translations generated by large language models (LLMs). This immediate, data-driven input helps students quickly identify their linguistic and conceptual weaknesses, encouraging timely self-correction and continuous improvement in translation quality. Such responsiveness fosters deeper learner engagement and cultivates critical self-assessment skills essential for professional development.

Moreover, the integration of LLMs into the assessment process enables teachers to conduct more objective, nuanced, and comprehensive evaluations. Unlike traditional assessment methods that often rely on static answer keys and subjective judgment, AI-assisted evaluation can analyze multiple dimensions of translation quality, including accuracy, fluency, coherence, and adherence to genre-specific conventions. This comprehensive analysis supports more personalized and targeted feedback, allowing instructors to tailor their teaching strategies to individual learner needs and progress.

This human–AI collaborative instructional model also reshapes traditional educational roles and learning modes. Teachers transition from being the sole knowledge providers to facilitators who guide students in navigating complex AI tools, fostering independent learning, and encouraging critical thinking. Students, in turn, become active participants who collaborate not only with their peers but also with AI systems, developing hybrid competencies that blend linguistic proficiency with technological literacy.

Furthermore, the model promotes the development of a broader skill set. Beyond language skills, students cultivate technical abilities such as prompt engineering, post-editing, and terminology management. They also strengthen analytical skills by

critically evaluating AI outputs and understanding translation theories in practice. This holistic approach breaks away from conventional paradigms centered solely on language transfer and memorization, preparing learners for the evolving demands of the translation profession in the digital era.

The effectiveness of this innovative model is reflected in improved translation accuracy, increased learner autonomy, enhanced classroom interaction, and better alignment with industry standards—demonstrated clearly in the comparative results that follow.

As shown in Table 1, the adoption of human–machine collaborative translation teaching based on the ADDIE model has profoundly transformed the roles of teachers and students, students’ learning methods, and the development of learning abilities. This instructional model encourages students to engage actively in translation through teamwork and human–AI collaboration, marking a significant departure from traditional, passive learning approaches. Instead of passively receiving information, students become discovery-driven learners who construct knowledge actively and collaboratively. This shift not only stimulates greater motivation and engagement but also leads to measurable improvements in translation skills, bilingual competence, and autonomous learning.

Table 1. *Comparison of Traditional and Human-AI Collaborative Translation Teaching Based on the ADDIE Model.*

	Traditional Teaching	Human-AI Collaborative Teaching
Students	Passive recipient	Active constructor of knowledge
Teacher	Knowledge transmitter	Learning organizer, guide, collaborator
Learning	Teacher–student interaction	Teacher–GenAI–Student interaction
Thinking	remember, understand, apply	Analyze, evaluate, create

Students participate directly in the entire translation cycle, particularly during post-editing practice, where they no longer wait passively for teacher feedback but engage interactively with AI-generated drafts, peers, and instructors. This hands-on experience enhances a wide range of competencies including bilingual language conversion, technical proficiency with AI tools, strategic decision-making, and self-regulated learning. Through tasks such as building and managing terminology databases, comparing outputs from various machine translation systems, conducting error analyses, and collaboratively refining translations, students develop critical translation skills and cultivate a mindset oriented toward discovery and problem-solving.

From the teacher’s perspective, their role has evolved significantly in this model. Teachers are no longer mere transmitters of knowledge but assume the roles of organizers, facilitators, guides, and collaborators. Their primary focus is on designing and orchestrating learning activities that effectively integrate generative AI resources, such as DeepSeek and ChatGPT, into translation instruction. Teachers guide students on how to employ AI tools strategically, evaluate machine translation strengths and weaknesses, and cultivate a nuanced understanding of AI’s supportive rather than substitutive role in translation work. This pedagogical stance fosters students’ critical thinking skills and promotes an instructional environment that balances human judgment with technological assistance, ultimately leading to a more efficient and adaptive teaching model.

Central to this approach is the “teacher–machine–student” interactive triadic intelligent education model, which drives educational innovation through multi-

dimensional collaboration. This model replaces the traditional unidirectional flow of knowledge with a dynamic, interactive learning process that combines teacher expertise, AI capabilities, and active student participation. Such interaction creates a vibrant learning ecosystem where the teacher provides guidance, AI offers immediate assistance and feedback, and students engage deeply with the content and technology. This synergy enhances classroom efficiency and translation quality by increasing flexibility, openness, and responsiveness in teaching. The triadic model embodies a forward-thinking paradigm aligned with the digital transformation of education.

In terms of cognitive development, generative machine translation software, built upon massive datasets and sophisticated algorithms, serves as both a resource and a reflective mirror for learners. By analyzing AI-produced English translations, students can identify their linguistic and conceptual weaknesses, benchmark their work against authoritative reference translations, and critically assess the comparative advantages and limitations of machine outputs. This process promotes metacognitive awareness and deepens students' understanding of translation quality criteria. Particularly in complex genres like literature and news reporting, students are encouraged to propose creative and contextually nuanced alternatives that compensate for the deficiencies of AI-generated translations, thus exercising originality and professional judgment.

Students' cognitive abilities progress from foundational language skills, such as memorization, comprehension, and application, to higher-order thinking skills including analysis, evaluation, and innovation. The progression equips learners with the intellectual agility and practical expertise required for the evolving translation industry. The integration of human-machine collaboration within the ADDIE model cultivates not only technical proficiency but also critical, creative, and autonomous translators prepared to navigate the challenges and opportunities of the digital era.

4. Conclusions

GenAI technology brings convenience and efficiency to translation teaching. Its rapid language conversion and instant feedback enable students to complete a large volume of practice and comparative analysis in a short time. However, generative AI still faces challenges such as semantic inaccuracies and limited handling of cultural differences. The human-machine collaborative translation teaching based on the ADDIE framework centers on student needs and constructs an interactive teaching ecosystem involving human-machine collaboration and triadic interaction. The approach integrates the technological advantages of AI with the organization and guidance of teachers, achieving a deep fusion of intelligence and pedagogy that effectively enhances teaching efficiency and students' critical thinking skills. With the continuous advancement of generative AI technology, translation teaching models will become more open and adaptable. Teachers will continually improve their technological literacy, and students will strengthen their AI competencies, jointly exploring the integration of AI and educational innovation to promote the intelligent, modernized, and personalized development of translation teaching.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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