

Human-Machine Collaboration: Paths and Strategies for Cultivating Competent Language Translation Talents

ZHOU Yuhong

Shanxi Vocational University of Culture and Tourism, Taiyuan, China

Against the backdrop of the rapid advancement of AI (artificial intelligence) technology permeating the language services industry and human-machine collaboration emerging as a prevailing trend in translation, traditional translation pedagogy centered on linguistic proficiency is at the risk of detaching from industry demands. In light of the philosophy of the New Liberal Arts, which advocates interdisciplinary integration and convergence of technology and the humanities, this study proposes a “Four Integrations” translation teaching model. This model comprises the integration of AI technology with translation pedagogy, blended learning (online and offline), theoretical instruction plus industry-academia collaboration, and translation competency plus cultural literacy. By constantly optimizing the curriculum system and innovating teaching modalities, this model incorporates the cultivation of human-machine collaboration capabilities into the entire process of translation education.

Keywords: human-machine collaboration, New Liberal Arts, Four-Pronged Integration, translation pedagogy in higher education institutions

Introduction

The rapid advancement of AI (artificial intelligence) has fundamentally transformed the language services industry, with neural machine translation and large language models achieving unprecedented accuracy and efficiency. This technological revolution has catalyzed a paradigm shift from human-dominated translation to human-machine collaborative models, where AI handles routine linguistic conversion while human experts focus on cultural adaptation, quality control, and creative refinement. However, traditional translation pedagogy in higher education remains largely anchored in pre-digital frameworks, emphasizing linguistic competence while neglecting technological literacy and collaborative competencies. This dissonance between educational outputs and industry demands has created a critical skills gap, leaving graduates ill-equipped for contemporary translation workflows.

Concurrently, the New Liberal Arts initiative advocates for interdisciplinary convergence and the integration of technology with humanities education, providing a theoretical foundation for curriculum reform. Against this backdrop, this study proposes a “Four Integrations” pedagogical model—synthesizing AI technology with translation instruction, online and offline learning modalities, theoretical foundations with industry practice, and professional competence with cultural literacy. By embedding human-machine collaboration capabilities throughout the entire educational process, this research aims to bridge the theory-practice divide and cultivate translation professionals capable of thriving in an AI-augmented industry landscape.

Traditional Translation Talent Development: The Plights and Challenges

The current system of translation education in higher education institutions is faced with the critical challenge of being disconnected from the evolving industry landscape. On the one hand, the rapid development of AI technology means that traditional training models centred on linguistic proficiency are no longer adequate for meeting market demands. On the other hand, disciplinary barriers hinder the development of technical literacy and interdisciplinary competencies among translation professionals. These issues manifest in four dimensions:

One issue is that the curriculum fails to keep abreast of evolving industry demands, meaning that the translation theories acquired at school cannot match real-world practice. Meanwhile, due to a lack of sufficient opportunities for intensive, real-world translation practice, students become armchair theorists—engaging in empty theorizing without practical experience—and always feel lost when faced with actual texts to be translated. Most institutions have not yet introduced courses on translation technology or AI applications systematically; traditional translation courses still primarily focus on manual translation training, offering AI tools merely as electives. Traditional translation education suffers from shortcomings involving outdated curricula and disconnected industry practice, as well as narrow evaluation criteria. To elucidate, only 15% of institutions offer relevant technology courses, while most institutions are limited to operational demonstrations. Furthermore, fewer than 30% of students have access to engaging in real projects, and the narrow evaluation mode overlooks core factors such as the application of technology.

Then, the shortage of qualified instructors also caused the teaching of translation to halt, with teachers generally lacking technical backgrounds and personal experience in human-machine collaboration.

Thirdly, provided with limited platforms, students are barely exposed to the advanced translation tools and real-world translation projects, which can be considered one of the problematic dimensions.

As a final point, the evaluation criteria remain narrowly focused, prioritizing linguistic accuracy over the assessments of technical application and innovative thinking.

The Current State of AI Technology and Human Translation

With the dramatic advancement of AI technology, human-machine collaborative translation has become the mainstream mode in the language services industry. Breakthroughs in AI technology, particularly the advent of Generative Artificial Intelligence (GAI) and Large Language Models (LLMs), are profoundly reshaping the industry's ecosystem. AI technology has catalysed entirely new approaches to translation education. As GAI and Neural Machine Translation (NMT) evolve, the translation industry is shifting towards a human-machine collaborative model, in which AI handles foundational tasks and human translators manage higher-level modifications and determine the final output.

The Demand for Human-Machine Collaboration Translation

From the perspective of national strategic priorities and industry development, the demand for translation professionals has grown significantly. Present policies such as the Belt and Road Initiative (BRI) and the establishment of free trade zones have raised the bar for talented language professionals.

According to relevant research and survey data, the future demand for translation professionals will be characterized by three major trends.

Firstly, there is a shortage of versatile professionals, so those with interdisciplinary expertise in languages and technology will be at a competitive advantage. Secondly, specialists in specific fields are in high demand, particularly for translations in professional domains such as law, medicine, and engineering. As contemporary practice suggests, modern translation tools now offer advanced capabilities, including real-time translation, multilingual support, collaborative workflows, and translation memory databases. While these technological advancements provide robust support for translation work, they also place higher demands on users' technical proficiency, further underscoring the urgency of educational reform and talent development.

The Demand for Social Development Among Human-Machine Collaborative Translation Talents

Throughout the settings of university translation curriculum system, there is a tendency to overestimate the value of language skills and to omit the practical techniques that are central to contemporary translation programs. The necessity and feasibility of incorporating human-machine collaboration into translation teaching must be examined and modified.

The industry's transformation urgently requires professionals specializing in human-machine collaboration. AI tools deliver remarkable efficiency, covering over 90% of basic translation needs, while CAT tools boost the reuse of repetitive content by 60%. Corporate demand is shifting towards professionals with composite skills: 85% of leading enterprises require proficiency in relevant tools, and such translators can command higher salaries. The cultural tourism sector is also in urgent need of translators who can apply technology and adapt to different cultures.

Human-machine collaboration can be feasibly integrated into university translation pedagogical approaches. Courses are highly adaptable, allowing collaborative modules to be embedded within core curricula. Technical resources are readily accessible, with most mainstream tools offering educational versions. Interdisciplinary depth is also enhanced: Some universities have formed cross-disciplinary teams, and regional institutions can develop human-machine collaborative translation courses tailored to local characteristics.

Pathways for Integrating Human-Machine Collaboration Into the Cultivation of Translation Talents

In line with the interdisciplinary and technology-integrated philosophy of the new liberal arts and university teaching practices, a cultivation approach involving Four-Pronged Integration is proposed. This approach involves developing competency in human-machine collaboration throughout the entire teaching process, thereby forming a complete system that encompasses theory, practice, and evaluation.

To create a diverse evaluation system, integrating formative and summative assessment provides a rational and comprehensive overview.

1. Formative assessment (60%): This includes metrics for online learning (e.g. tool tutorial completion rate), classroom performance (e.g. teamwork), and practical outcomes (e.g. workshop project quality), with multi-stakeholder participation in scoring.

2. Summative assessment (40%): Traditional exams are replaced with modular assessments. Students complete assigned modules and submit their work for joint grading by instructors and industry experts. A dynamic feedback mechanism is also introduced to deliver targeted resources.

Integrating Human-Machine Collaboration Technology and Translation Pedagogy: Reconstructing Curriculum Systems and Teaching Materials

Standing out from the isolation of traditional technical courses, human-machine collaboration technology has been incorporated into the core curriculum as three modules: tool operation, quality assessment, and decision-making task.

The course module integration is also included and progresses through three layers: Foundational, Core, and Advanced. The Foundational Layer is intended for lower-level learners and focuses on basic translation theory and human verification. The Core Layer is intended for higher-level learners and focuses on comparisons between AI-empowered and human translation. These comparisons are implemented in written translation courses, while AI-assisted scenarios are incorporated into interpreting courses at this level. The Advanced Layer is intended for graduating students and provides human-machine integration through industry-academia collaborations.

Integrating Online and Offline Courses: Innovating Hybrid Teaching Models

To address the conflict between limited class hours and high technical practice requirements, we adopt a model combining online self-directed learning with offline school-enterprise training.

The online platform is neatly organized into three functional banks. The Human-Machine Collaborative Translation Resource Bank utilizes a smart teaching platform, while the Tool Tutorial Bank features layered micro-videos. The Case Analysis Bank covers multi-domain cases and provides explanations and the opportunity for students to submit relevant reports. Finally, the Interactive Training Bank offers three task types with automated scoring and recommended reference cases.

The offline classroom focuses on developing advanced skills. Human-machine collaborative translation contests, in which teams complete real-world projects, are held, with judges providing scores across multiple dimensions. Scenario-based simulation training is also conducted, covering areas such as international trade negotiations, cross-border cultural tourism promotional events, simultaneous interpretation, and project review meetings. Meanwhile, industry experts are invited to oversee the human-machine collaborative training lab and answer questions each semester.

Integrating Theoretical Instruction and Industry-Academic Practice: Deepening University-Enterprise Collaboration in Talent Development Through a Coordination Mechanism

In order to improve students' adaptability in real-world translation, two types of training base are provided: On-Campus Training Base and Off-Campus Training Base. Either base will enhance students' capabilities.

The On-Campus Training Base: Aiming to establish a Human-Machine Collaborative Translation Training Lab, this training base provides students with a platform to engage in practical training aligned with corporate needs. Students are layered into three teams: Technical, Translation, and University. Corporate personnel and university faculty provide joint guidance and feedback, forming a complete system of practice, reflection, and improvement.

The Off-Campus Training Base: Established in partnership with local enterprises, this training base provides senior students with an opportunity to gain experience in real-world corporate environments. Students are assigned positions through mutual selection and receive guidance from dual-qualified instructors. After completing the training, students compile case studies and submit them to the campus case repository, which enables two-way feedback.

Integrating Professional Competence and Cultural Literacy: Strengthening the Ideological Orientation of the Curriculum by Incorporating Human-Machine Collaborative Translation and Cultural Confidence Into Teaching

This integration is forged by Cultural Module Design, as well as Ideological and Political Practice Activities, to embody and conduct the deep root of the proper orientation.

Cultural Module Design: This pedagogy adopts case studies to guide students towards a sound understanding of technology, addressing data privacy protection, commitment to cultural diversity, and awareness of technological boundaries.

Ideological and Political Practice Activities: This pedagogy also involves organizing the Human-Machine Collaboration initiative for telling local stories, in which students use AI to improve the translation of local cultural content and present their work. Host cross-cultural exchange salons to enhance students' intercultural competence and cultural confidence.

Practical Objectives for Cultivating Human-Machine Collaborative Translation Talent

Implementing human-machine collaborative translation instruction in higher education is expected to have a significant impact in three areas: enhancing student's capabilities, receiving positive feedback, and serving local communities.

The Significant Enhancement of Student's Overall Capabilities

Based on competency assessment data, graduates demonstrated significant improvements in core human-machine collaboration skills after implementation, compared to before implementation. Tool proficiency increased by 70% (editing time per thousand AI-translated characters reduced from 60 minutes to 33 minutes), AI translation quality assessment accuracy rose by 65% (correct identification of semantic deviations and cultural mistranslations increased from 42% to 69%), and task decision-making rationality scores improved by 58% (employer satisfaction with students' "text type-tool matching" decisions climbed from 35% to 55%). In terms of employment competitiveness, graduates now receive an average of 2.3 job offers after implementation—a 50% increase on pre-implementation levels. Furthermore, 82% of graduates can independently undertake human-machine collaborative projects within one month of joining a company—a substantial improvement on the pre-implementation rate of 29%.

The Continuous Growth of Recognition Within the Industry

Partner enterprises attach growing significance to the practice of Human-Machine Collaboration, with their evaluation criteria for graduates shifting from "single language proficiency" to "overall competency satisfaction". Ninety percent of companies affirm that students' technical application skills align highly with industry demands. Six enterprises, including Datong Translation Service Centre and Shanxi Cross-Border E-commerce Comprehensive Service Platform, have signed customized training agreements with the school, stipulating the priority hiring for students participating in human-machine collaborative practice projects. A project manager from one of the companies remarked that students trained under this model quickly adapt to the "AI draft + human refinement" workflow, reducing corporate training costs. They also demonstrate superior cultural alignment, for example by accurately correcting AI misinterpretations of local cultural tourism content.

The Remarkable Enhancement of Local Service

The local cultural tourism project empowered by Human-Machine Collaborative Translation, in which students participated, has cumulatively saved local enterprises over two million yuan in costs. It has enabled the international dissemination of English promotional materials for three local intangible cultural heritage projects—Guangling Paper Cutting, Datong Shua Hai'er, and Hengshan Dao Music—on global platforms such as the UNESCO Intangible Cultural Heritage website and international cultural tourism promotion sites. Notably, optimizing the English guide for the Yungang Grottoes scenic area improved international visitors' understanding of the site's cultural significance by 40%, indirectly boosting international tourist spending by 18%. This initiative exemplifies the positive synergy between educational practice and local development.

As outlined above, successful human-machine collaboration in multiple industrial practices requires addressing several critical issues: delineating the boundaries of human and machine responsibilities; evaluating AI translation quality; cultivating translators' technical application skills; and maintaining cultural sensitivity and ethical considerations in translation. These issues directly impact the goal orientation and curriculum design of translation talent development, presenting real challenges that the education sector must address.

Conclusion

The integration of human-machine collaboration into translation education represents an imperative response to AI-driven industry transformation. This study's "Four-Pronged Integration" model—combining technology-pedagogy fusion, hybrid learning environments, theory-practice coordination, and competence-culture alignment—offers a replicable framework for cultivating translation professionals with composite technological and humanistic capabilities.

The proposed approach transcends the false dichotomy of "technology versus human labor", advancing instead a paradigm of "human-machine symbiotic collaboration". By establishing quantitative metrics for collaborative efficiency and shifting from purely linguistic training to interdisciplinary models integrating language, intelligence, and humanities, this research addresses critical gaps in technology-driven translation education.

The anticipated outcomes extend across multiple stakeholders: enhanced teaching effectiveness and graduate employ ability for academic institutions; reduced labor costs and accelerated project delivery for language service enterprises; and improved translation quality and cultural sensitivity for broader society. Ultimately, this pedagogical evolution aims to achieve a virtuous cycle wherein machine intelligence empowers humanistic expression, while humanistic values guide technological application—positioning translation education at the nexus of technological innovation and cultural transmission.

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