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Innovative Design and Practice of Medical Translation Technology Curriculum from a Constructivist Perspective

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Abstract: This study addresses a critical gap in translation pedagogy—the disconnect between generic technology instruction and the specialized, technology-driven demands of the professional translation market. It presents the design, implementation, and evaluation of an innovative Translation Technology course for undergraduate students at Youjiang Medical University for Nationalities. Grounded in constructivist learning theory and aligned with national teaching guidelines, the curriculum is structured around the PACTE translation competence model. Its core innovation is the deep integration of tool training within a medical translation context, delivered through a cyclical structure of theoretical modules and hands-on Medical Translation Workshops. The curriculum progresses through three interconnected modules ofTranslation Knowledge, Instrumental Sub-competence, and Strategic Sub-competence over 16 weeks. Implementation results from a pilot cohort indicate significant success in shifting to a student-centered, outcome-oriented learning environment. Student performance and feedback demonstrated enhanced engagement, practical skill acquisition, and the development of integrated problem-solving abilities. The study concludes that this domain-contextualized, workshop-based model effectively bridges theory and practice, providing a sustainable framework for cultivating the technologically adept, specialized translators needed by the industry and setting a precedent for curriculum development in specialized translation education.

Keywords: Translation Technology; Medical Translation; Curriculum Design; PACTE Model; Constructivist Pedagogy

I. Introduction

The rapid advancement of language service industries and the integration of artificial intelligence have reshaped the landscape of translation. [1]. Against the broader backdrop of the Belt and Road Initiative and China's expanding engagement in global governance and international communication, contemporary translation professionals are no longer expected to rely solely on linguistic competence or theoretical knowledge. Instead, they are increasingly required to demonstrate technological literacy, domain specific expertise, and the capacity to participate effectively in authentic translation projects [2]. In response to these developments, the Ministry of Education of the People's Republic of China issued the Undergraduate Teaching Guide for Translation Majors in 2020, which explicitly emphasizes outcome based education, practice oriented training, and the systematic integration of translation technology into undergraduate curricula [3].

Despite these policy initiatives, curriculum design in many translation and English major programs remains largely theory driven and homogeneous, with limited institutional differentiation. Translation technology courses, which have the potential to enhance professional relevance and graduate employability, are often marginalized or delivered in abstract and decontextualized ways [4]. This issue is particularly evident in medical universities, where strong disciplinary resources in medicine and health sciences exist but are insufficiently integrated into translation education. Consequently, graduates frequently encounter a misalignment between their acquired competencies and the actual demands of the medical translation market, especially in terms of technological application and specialized knowledge [5].

It is within this context that the present project, A Constructivism Based Course Design for Medical Translation Technology, was proposed and approved as a 2021 education and teaching reform initiative at Youjiang Medical University for Nationalities. Anchored in constructivist learning theory, the project adopts the Translation Technology course offered to third year English Translation majors as a pilot for curriculum reform. By systematically integrating translation technologies, such as information retrieval tools, computer assisted translation tools, terminology databases, and project based workflows, into authentic medical English translation tasks, the course design moves beyond a single, theory oriented paradigm toward a multidimensional framework characterized by the integration of theory, translation technology, disciplinary knowledge, and practice.

The overarching objective of this reform is to achieve a fundamental shift from teacher centered instruction to student centered, learning outcome oriented education. Through the implementation of heuristic, discussion based, and participatory medical translation workshop models, the course seeks to clarify learning objectives, diversify assessment mechanisms, and foreground students' demonstrable post learning competencies. The project aims to cultivate medical translation professionals who are genuinely aligned with social and industry needs, graduates equipped with an

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international perspective, strong language competence, and solid cultural literacy, thereby supporting national development strategies, serving regional economic needs, and contributing to the establishment of a distinctive, practice oriented translation program with clear medical specialization and strong professional relevance.

II. Literature Review

Research on translation technology pedagogy broadly refers to studies that investigate how translation learners and practitioners acquire, use, and experience translation technologies, as well as the difficulties and needs encountered in this process [6]. Since the early 2010s, translation technology teaching has gradually emerged as a key subfield within translation studies, driven by the rapid development of computer assisted translation tools, machine translation, and the expansion of the language services industry. A growing body of literature indicates that translation technology has shifted from a peripheral skill to a core competence in translator training programs [7], [8].

Existing studies show that research output on translation technology education has increased steadily over the past decade. Domestic scholars tend to focus more on pedagogical practice research, proposing course models, teaching methods, and curriculum frameworks based on theoretical reflection and classroom experience [6], [14]. These studies often emphasize curriculum alignment with national teaching guidelines, outcome based education, and the localization of translation technology courses within English or translation majors [5], [13]. In contrast, international scholarship displays a more balanced distribution of research interests. In addition to pedagogical design, foreign researchers pay considerable attention to process and product research, learner cognition, and industry oriented surveys, often employing empirical or mixed research methods [9], [10].

In terms of pedagogical approaches, a variety of instructional models have been proposed. Early studies highlighted the role of CAT tools in academic settings and questioned their pedagogical value beyond mere tool familiarization [7]. Later research introduced more integrated approaches, such as translator workstation based teaching, which situates multiple tools within authentic professional workflows [8]. Portfolio based learning, particularly the use of electronic portfolios, has also been shown to enhance learner reflection and autonomy in translation technology training [9]. These approaches reflect a broader shift from tool centered instruction to learner centered and task oriented pedagogy.

Empirical research has become increasingly prominent, especially in international contexts. Doherty and Kenny [10] employed a mixed methods design combining self efficacy questionnaires and qualitative feedback to evaluate student learning outcomes in a statistical machine translation course. Moorkens [11] adopted task based learning to examine students' experiences with post editing of both statistical and neural machine translation, helping learners critically assess the strengths and limitations of different systems. More recent studies have extended this line of inquiry to neural machine translation literacy, post editing competence, and the changing skill sets required of translators in the age of artificial intelligence [15], [16].

Despite these advances, a significant gap remains in the literature. When the same search strategies are applied to keywords related to medical translation and translation technology curriculum design, almost no relevant studies can be identified. Existing research largely concentrates on general translation, business translation, or language service training, while discipline specific fields such as medical translation are rarely addressed from a curriculum design perspective [17], [18]. This gap is particularly striking given the high demand, risk sensitivity, and specialization of medical translation.

Recent studies published within the past three years further emphasize the need for domain specific and technology integrated translator training. Scholars have argued for closer alignment between translator education and industry practices, stronger interdisciplinary integration, and greater attention to learning outcomes and employability [16], [19], [20]. However, systematic course design models that integrate translation technology with medical domain knowledge remain underdeveloped.

This study directly addresses this underexplored area by proposing and evaluating a systematic, constructivism-based course design model that fully integrates translation technology with medical domain knowledge. It moves beyond general pedagogy to provide a concrete, replicable framework for building medical translation technology competence, thereby filling the specific gap in discipline-specific curriculum models.

III. Theoretical Framework

This curriculum reform project is built upon a dual foundation that combines established pedagogical theory with contemporary national educational policy. The integration of Constructivist Learning Theory and the official guidelines for Chinese undergraduate translation education provides a compelling and authoritative rationale for the innovative redesign of the Medical Translation Technology course.

Constructivist Learning Theory

At the heart of this curriculum design lies Constructivist Learning Theory, which posits that knowledge is not passively transmitted from teacher to student but is actively constructed by the learner. This theory views learning as a process where individuals build new understanding upon the foundation of prior knowledge and experience, facilitated through social interaction and engagement within meaningful contexts [21]. The teacher's role, therefore, shifts from a sole knowledge holder to that of a facilitator and guide, whose primary function is to create an environment conducive to discovery and collaborative problem-solving.

Applied to translation pedagogy, constructivism provides a powerful alternative to traditional, transmission-based models. Kiraly [21] argues convincingly for its application, advocating for a classroom that simulates authentic professional

practice. In this model, students gradually move from exercises to real-world tasks, constructing their translation competence and problem-solving abilities through guided experience. The Medical Translation Workshop, a central component of this project, is a direct application of this principle. It creates a "community of practice" where students, guided by the instructor, collaborate to tackle genuine or simulated medical translation tasks using modern tools. This environment enables the active construction of knowledge regarding technology use, terminology management, and workflow, moving beyond abstract theory to applied, student-centered learning.

National Policy

The pedagogical innovation is justified and necessitated by a clear set of national policy directives that define the standards for modern translation education in China. This project aligns meticulously with these authoritative guidelines, ensuring the curriculum meets the mandated competencies for graduates.

First, national standards explicitly call for technological proficiency. The Teaching Requirements for Undergraduate Translation Programs [24] state that graduates must be skilled in using translation tools. Furthermore, the professional landscape has been formally redefined; The Occupational Classification Dictionary of the People's Republic of China [22] lists tasks like post-editing and terminology management as core translator responsibilities, institutionalizing the technological dimension of the profession.

The most significant and direct mandate comes from The Teaching Guide for Undergraduate Translation Programs [23], which formally designates "Translation Technology" as a core compulsory course. The Guide's objective is to cultivate students' ability to use various translation technologies and enhance their technical literacy. Crucially, it has redefined the core construct of "translation competence" to include "tool competence" as a fundamental component alongside bilingual and strategic abilities. This official inclusion marks a paradigm shift, recognizing technological prowess as inseparable from modern translational expertise [23]. For a specialized medical university, these national mandates must be implemented with a localized approach. This project synthesizes these directives by integrating medical translation content with technological training, thereby fulfilling national standards while developing a distinctive, institution-specific program that meets strategic regional and professional needs.

IV. Methodology

This research employed an applied, practice-oriented case study design to develop and evaluate a reformed curriculum for the Translation Technology course at the School of Language and Culture, Youjiang Medical University for Nationalities. The study focused on a single cohort of 31 third-year undergraduate students enrolled in the English Translation major, using their required Translation Technology course as the site for pedagogical intervention. The primary aim was the systematic redesign of the syllabus, instructional materials, and assessment framework, guided by the constructivist principles and national policy mandates established in the preceding sections.

The methodological approach operationalized the PACTE model of translation competence through a structured 16-week course. The curriculum was organized into three sequential, interconnected modules: Translation Knowledge, Instrumental Sub-competence, and Strategic Sub-competence. Instruction blended direct lectures with hands-on Medical Translation Workshops, ensuring that theoretical tool knowledge was immediately applied within authentic medical translation scenarios and collaborative project work.

The study's effectiveness was evaluated through a pluralistic assessment system. This system integrated formative and summative measures, including: 1) staged practical evaluations after key tool instruction; 2) continuous observation and feedback during workshop sessions; 3) a final computer-based summative exam simulating a medical translation project; and 4) post-course student feedback gathered via anonymous surveys and focus group discussions. This multi-faceted approach allowed for a comprehensive analysis of both skill acquisition and student perceptions of the redesigned course.

V. Results, Discussion, and Implications

5.1 Rationale for the Curriculum Design

The curriculum design presented herein is the operational embodiment of the theoretical principles and policy mandates established earlier, translating them into a concrete, semester-long instructional blueprint. It serves as the critical bridge between the project's foundational research and its practical implementation aimed at cultivating specialized, technologically proficient translators within a medical university context.

The particular design stems directly from the identified gaps in traditional translation pedagogy and the specific institutional opportunity at Youjiang Medical University for Nationalities. The primary objective is to move beyond a generic, tool-centric syllabus and instead create a contextualized, competence-based learning journey. This is achieved by intentionally and systematically integrating the teaching of translation technology with authentic medical translation content and workflows. The design is therefore not merely about teaching software functions in isolation; it is about framing those functions as essential instruments for solving real-world communication problems in medicine. This approach directly addresses the core challenge of aligning student skill acquisition with the concrete demands of the language service industry in the healthcare sector.

Consequently, the curriculum is structured to facilitate a dynamic, student-centered learning process. It leverages the constructivist pedagogical approach by situating all technical learning within the collaborative, problem-solving environment of the Medical Translation Workshop. The overarching design logic follows a progression from building foundational awareness of the profession and technology landscape, through scaffolded skill acquisition in key tools, to the strategic application and synthesis of these skills in increasingly complex medical translation scenarios.

5.2 Core Philosophy and Structure of the Curriculum Design

The curriculum design for this Translation Technology course is developed in direct response to the trends of digitalization and specialization within the translation industry, aiming to align with the market's demand for translators with composite skill sets. Its core philosophy is to move beyond the traditional model of isolated skill training by emphasizing the integrated and balanced development of both "translation competence" and "information literacy." The design addresses students' typical weaknesses in applying technology within professional contexts. Through a systematic syllabus, it guides students to master the complete workflow of using modern information technology for retrieving, analyzing, selecting, processing, utilizing, creating, and delivering translation-related information. The ultimate goal is not only to solve practical translation problems but to fundamentally enhance students' comprehensive translation proficiency and professional information literacy, equipping them with the potential for continuous learning and innovation within complex, technology-driven language service environments.

To ensure the curriculum's systematic and scientific foundation, the design is primarily grounded in the authoritative Translation Competence Model proposed by the PACTE (Process in the Acquisition of Translation Competence and Evaluation) group, a leading framework in translation competence research [25]. This model deconstructs translation competence into a set of interconnected sub-competencies, providing a clear framework for the course's modular design. Based on this model, the instructional design is organized into three core modules that collectively contribute to building students' holistic translation competence:

1. Translation Knowledge Module: This module focuses on metacognitive knowledge about the translation profession, aiming to help students construct a macro-level understanding of the translation industry ecosystem. Content includes the structure of the translation industry, various client and audience types in the market, professional norms, associations, and career development paths for translators. This module seeks to help students understand the social and professional context of their skill acquisition, clarify their learning objectives, and establish a sense of professional identity.
2. Instrumental Sub-competence Module: This module directly corresponds to the "Instrumental Competence" in the PACTE model and forms the technological core of the course. The content encompasses the essential documentary resources and information and communication technologies (ICT) required in the translation process. From advanced techniques for online resource retrieval and evaluation to the operation and principles of mainstream computer-assisted translation (CAT) tools, corpus tools, terminology management systems, and online translation management platforms, this module provides systematic instruction and initial hands-on training. Its goal is to enable students to proficiently master the key technological tools that support modern translation practice.
3. Strategic Sub-competence Module: This module corresponds to the "Strategic Competence" in the PACTE model, representing the procedural knowledge core for ensuring an efficient translation process and solving translation problems. This module is not taught in isolation but is deeply integrated with the Instrumental Module through the Medical Translation Workshop format. After learning the basic operations of specific tools, students immediately apply them within simulated or authentic medical translation project scenarios. They confront genuine translation problems (e.g., terminology inconsistency, format conversion, project collaboration) to formulate and execute translation strategies, completing the entire workflow from project setup to delivery. This module emphasizes "learning by doing," facilitating the transformation of tool knowledge, linguistic knowledge, and domain knowledge into comprehensive problem-solving ability.

These three modules are not arranged linearly but are interwoven in a spiral structure of "knowledge foundation -> tool empowerment -> strategic integration" throughout the course. The detailed weekly schedule of modules and content, totaling 32 credit hours, is presented in the table below:

Table 1: Instructional Modules and Schedule

Week	Module	Content	Learning Outcomes / Instructional Objectives	Credit Hours
1	Translation Knowledge Module	Course Introduction	To enable students to understand the overall structure and significance of the course from a macro perspective.	Lecture (2 hours)
2		Introduction to the Translation Profession (types of agencies, clients, audiences, professional associations)	To acquire knowledge related to the translation profession.	Lecture (2 hours)
3	Instrumental Sub-competence Module	Concepts, Classification, and Principles of Translation Technology (CAT tools, MT tools, general tools & online resources)	To understand the complete landscape of translation technology.	Lecture (2 hours)
4		Methods and Techniques for Using Online Sharing, Search/Query, and Communication Functions	To utilize massive online shared resource banks (e.g., encyclopedias, online dictionaries, thematic resources) and search engines to quickly find needed information for querying and verifying translations.	Lecture + Practice (2 hours)
5		Introduction and Operation of SDL Trados	To understand the basic Trados workflow, master its operation, and learn about online collaborative translation.	Lecture + Practice (2 hours)

6	Strategic Sub-competence Module	Medical Translation Project Practice using Trados	To be able to operate Trados to complete a medical translation project.	Practice / Workshop (2 hours)
7		Group Presentation and Discussion of Translation Outcomes	To consolidate mastery of Trados and understanding of network-based collaborative translation.	Formative Assessment (2 hours)
8	Instrumental Sub-competence Module	Introduction to Déjà Vu & MemoQ	To understand the operational workflows, similarities, and differences of the Déjà Vu and MemoQ software.	Lecture (2 hours)
9	Strategic Sub-competence Module	Medical Translation Project Practice using Déjà Vu / MemoQ	To be able to perform operations for creating and translating a project.	Practice / Workshop (2 hours)
10		Group Presentation and Discussion of Translation Outcomes	To master collaborative translation using either Déjà Vu or MemoQ.	Formative Assessment (2 hours)
11	Instrumental Sub-competence Module	Introduction and Application of Corpora; Corpus Compilation	To master applying corpus data extraction and other functions to translation.	Lecture + Practice (2 hours)
12	Strategic Sub-competence Module	Terminology Database Management	To learn how to manage terminology.	Practice / Workshop (2 hours)
13		Operation of Online Platforms (e.g., Tmxmall)	To learn to use online translation platforms for assistance and acquiring corpus data.	Lecture (2 hours)
14	Strategic Sub-competence Module	Desktop Publishing & Formatting Training + Self-Selected Project Practice (Medical Project 3)	To master translation product packaging skills and conduct self-selected project training.	Practice / Workshop (2 hours)
15		Group Presentation of Self-Selected Project Outcomes	Integration of multiple objectives.	Formative Assessment (2 hours)
16		Final Course Assessment	Computer-based test.	Summative Assessment (2 hours)

5.3 Implementation Results, Discussion, and Implications

The designed curriculum was implemented and evaluated over one academic semester. This section details the observed outcomes, analyzes their significance in relation to the project's goals and theoretical foundations, and explores the broader implications for specialized translation education.

5.3.1 Implementation Results and Observed Outcomes

The pilot implementation involved a cohort of 31 third-year undergraduate students majoring in English Translation. The curriculum was executed as planned across the 16-week schedule, with instruction delivered through the integrated lecture-workshop model.

The primary observed outcome was the successful operationalization of the core pedagogical shifts. The course orientation demonstrably moved from a theory-centric approach to a student-learning-outcome orientation. Each session's objectives were explicitly tied to practical competencies, which were consistently assessed. The teaching mode effectively transitioned to a student-centered workshop model, with approximately 65% of contact hours dedicated to hands-on, collaborative project work. The integration of medical content was seamless; all tool practice and strategic exercises utilized authentic medical texts (clinical trial documents, patient information leaflets, academic abstracts), thereby achieving the intended fusion of technology, language, and domain-specific knowledge.

Assessment data revealed positive developmental trajectories. Formative assessments during workshops (Weeks 7, 10, 15) provided continuous feedback and showed steady improvement in collaborative problem-solving. Stage-based evaluations following key tool modules (e.g., post-Trados, post-MemoQ) indicated that over 88% of students achieved proficiency in executing core software workflows for standard medical translation tasks. The final summative computer-based practical exam required the localization of a medical device manual using specified tools. The average score was 84.7%, with students demonstrating competent application of translation memory, terminology management, and basic desktop publishing skills.

Student feedback, collected via anonymous surveys and focus groups, was overwhelmingly positive. Over 92% of respondents agreed that the workshop-based, medical-focused approach was more engaging and professionally relevant than traditional translation courses. Qualitative comments highlighted the value of "applying tools to real medical texts" and "seeing the direct connection between classroom skills and potential career tasks." The linkage to the existing "Youyi Language Service Center" provided a tangible bridge to professional practice.

5.3.2 Discussion

The results validate the efficacy of a constructivist, context-embedded approach to translation technology education. The Medical Translation Workshop served as the crucial "situated learning" environment [21], where theoretical tool knowledge was activated and transformed into procedural skill through collaborative, problem-based tasks. This directly addressed the identified gap between abstract technical instruction and market-ready competence.

The three-module structure based on the PACTE model proved effective in building holistic competence. The Instrumental Sub-competence module provided the necessary technological scaffolding. The Strategic Sub-competence module, through iterative workshops, forced the integration of these tools with translation strategies and medical domain knowledge, fostering the development of higher-order problem-solving abilities. This structure effectively nurtured the "tool competence" mandated by national guidelines [23].

The main challenge encountered was the uneven baseline of digital literacy among students, which initially caused varying paces in tool acquisition during workshops. This was mitigated by implementing a peer-support system within project groups and creating a repository of short, task-specific software tutorial videos for self-paced review. Another challenge was the significant instructor facilitation load during simultaneous workshop sessions. This underscored the need for specialized teaching assistants or technical support staff in such practice-intensive courses.

5.3.3 Implications

The outcomes of this project carry significant implications for the design of curricula in specialized translation programs. Primarily, it establishes a compelling model for contextualized technology training, demonstrating that instruction in translation tools is most effective when embedded within a specific domain, such as medicine, law, or engineering. Moving beyond generic software tutorials to frame technology as a set of instruments for solving real-world, domain-specific communication problems enhances student motivation, relevance, and the depth of skill acquisition. This approach provides a replicable blueprint for other institutions aiming to leverage their unique disciplinary strengths to create more targeted and effective translation education.

A key implication of this model is the necessary redefinition of the instructor's role. The successful shift from a lecture-based to a workshop-oriented classroom underscores the evolution of the translation educator from a primary knowledge-transmitter to a facilitator, project designer, and technology mentor. This transformation requires not only technological proficiency but also renewed pedagogical skills in guiding collaborative, problem-based learning. Consequently, providing dedicated training and support for educators is essential for the successful adoption and sustainability of such practice-focused curricula.

The implemented curriculum demonstrates a direct and practical pathway for aligning academic programs with professional realities and standards. By structuring learning around authentic medical translation tasks, the course directly prepares students for the technological components of professional practice as outlined in industry frameworks. It operationally fulfills the "tool competence" requirement mandated by national teaching guides, thereby closing the gap between academic preparation and the evolving demands of the language services industry. This alignment ensures that graduates possess not only theoretical knowledge but also the applied skills immediately valuable in the workplace.

For specialized universities, this curricular strategy is instrumental in building institutional distinctiveness and graduate employability. For an institution like Youjiang Medical University for Nationalities, transforming a standard translation technology course into a medically specialized program creates a signature, value-added offering. It differentiates graduates in the competitive job market by equipping them with niche, industry-ready expertise that directly addresses specific sectoral needs. Looking ahead, while short-term outcomes are positive, longitudinal research tracking graduate career progression is recommended to further validate the model's impact. Additional study is also warranted to explore its scalability, refine assessment of strategic tool use, and investigate the integration of emerging technologies like neural machine translation post-editing.

VI. Conclusion

This study demonstrates the viability and effectiveness of a constructivist-based, domain-specific approach to translation technology education.The results confirm that moving from a generic, tool-centric syllabus to a contextualized, student-centered, and practice-driven learning journey significantly enhances student engagement, deepens technological skill acquisition, and fosters the strategic problem-solving abilities essential for modern translators. This approach has proven to be a practical and powerful method for operationalizing national educational mandates and cultivating the integrated "tool competence" required by the contemporary language services industry.

The implications of this curriculum reform extend beyond a single course, offering a replicable model for building distinctive, market-responsive programs in specialized higher education contexts. For institutions like medical, legal, or technical universities, this framework provides a strategic blueprint to leverage inherent strengths, transforming standard courses into signature programs that enhance graduate employability. By aligning academic training so closely with professional realities, this model not only addresses immediate pedagogical gaps but also contributes to the broader professionalization of translators, preparing them to act as competent, technologically adept specialists. Future longitudinal research on graduate outcomes will be valuable, but the present findings firmly establish that the meaningful integration of technology, domain knowledge, and collaborative practice is paramount for the future of translation education.

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