education sciences

MDPI

Article

Bridging Theory and Practice: Integrating Objectivist–Constructivist Pedagogy in Medical Translation Education

Zang Li [1], David Litz [2,*] and Nicholas Gromik [3]

[1] Department of Foreign Language Education, Qingdao University, Qingdao 266071, China; zangli@qdu.edu.cn
[2] School of Education, University of Northern British Columbia, Prince George, BC V2N 4Z9, Canada
[3] Independent Educational Consultant, Darwin 0810, Australia; gromik.n.a@gmail.com
* Correspondence: david.litz@unbc.ca

Abstract

Developing translation competence among non-English-major students at Chinese universities remains a pedagogical challenge, especially given the rising demands of cross-cultural communication. This quasi-experimental study examined whether first-year medical students at a Chinese university could improve their translation skills using the constructivist–objectivist theoretical approach (COTA), which combines constructivist learning theories (e.g., active student participation, collaboration, analysis of real-world issues) with objectivist learning methodologies (e.g., sequential skill development, explicit knowledge transfer). In total, 110 students participated in this mixed-methods study. The research methods included (a) pre- and post-tests of students using College English Test Band 4 criteria to evaluate vocabulary, grammar, and accuracy; (b) student perception surveys; (c) semi-structured interviews with instructors; and (d) classroom observations of students, using Gagné's nine instructional events to ensure faithful implementation of the COTA framework. The COTA-trained students showed statistically significant improvements in translation skills compared to the control group. Additionally, increased student participation and engagement, positive attitudes toward learning, instructors' ability to implement COTA effectively, and areas for future development were identified in the qualitative findings. These results suggest that integrating constructivist and objectivist teaching philosophies can benefit curriculum designers, language and translation instructors, and policymakers aiming to enhance translation education in Chinese universities and other Asia-Pacific institutions. However, the modest sample size from a single institution limits generalizability, and future studies with larger, more diverse samples are recommended.

Keywords: translation competence; language education; pedagogical integration; translation training in China; language proficiency examinations

Academic Editor: Grace Oakley

Received: 14 April 2026
Revised: 15 May 2026
Accepted: 20 May 2026
Published: 25 May 2026

1. Introduction

Recently, translation education has undergone significant developments, including a shift from prescriptive, product-based approaches to competence-based, socio-constructivist, and experiential methods (Albir, 2007; González-Davies, 2004, 2020; Kelly, 2005; Kiraly, 2014; Ouyang, 2024). Existing research has highlighted competence-based and technology-enhanced translation pedagogy, emphasizing the importance of collaborative learning environments, authentic tasks, and digital translation tools in modern translation education (Bowker & Buitrago Ciro, 2020; Briva-Iglesias et al., 2023; European Commission EMT Expert Group, 2022; Man et al., 2020; Neves, 2022). However, studies

focusing on China and other regions have largely overlooked the needs of non-English majors. Chinese students are expected to develop translation skills to succeed in language proficiency exams like the CET-4 (College English Test Band 4), a nationally standardized English proficiency test for Chinese undergraduates administered by the National Education Examinations Authority (J. Li, 2021). This study contributes to the literature by offering a theoretical and empirical foundation for applying the *constructivist–objectivist theoretical approach* (COTA) to the development of translation competence among Chinese undergraduates (see Lister & Leaney, 2003; Taber, 2024, for a COTA explanation). By integrating objectivist scaffolding with constructivist engagement, the COTA model provides a practical framework for translating the technical aspects of translation competence into real-world experience for non-translation majors who require advanced language skills for academic and professional communication.

By integrating experiential learning into knowledge transmission, the model addresses the ill-defined nature of translation as a field of study, where problems may have multiple solutions depending on context. The model helps students develop adaptive skills essential for high-stakes test preparation, such as the CET-4, and for effective, professional communication in a globalized environment. Beyond examination performance, translation pedagogy also plays an integral role in developing intercultural communicative competence, enabling students to navigate linguistic and cultural nuances in real-world professional and academic contexts (Aladini & Gheisari, 2025). As such, translation training utilizing approaches such as the COTA model not only supports test preparation but also advances the broader goal of fostering effective cross-cultural communication.

Problem Statement and Research Questions

Most universities lack sufficient translation instructional capacity to support new students, many of whom may have received little or no formal training in translation (Dai & Lin, 2025; Yang, 2008; Zhou & Zou, 2017). Additionally, X. M. Liu and Liu (2013) identified four systemic elements that explain current system deficiencies: (1) poor curriculum design, with a failure to integrate translation effectively into students' broader language program; (2) insufficient institutional support and resources for teaching translation; (3) ineffective pedagogical practices that do not support the development of translation skills; and (4) inadequate opportunities for non-English majors to build competence in translation. Consequently, many higher education institutions are unable to provide students with the instruction they need.

High-stakes testing for the CET-4 adds further complexity to these problems. Since 2013, the test has shifted from sentence-to-sentence to paragraph-by-paragraph translation, increasing test-takers' cognitive load and requiring advanced translation skills (J. Li, 2021). As such, translation educators need to develop practical, theory-based approaches that help students build holistic translation competencies, as fragmented, skill-based approaches are insufficient for developing comprehensive abilities. Consequently, only integrated pedagogies can equip students with the necessary tools. Accordingly, this study addresses the following research questions:

- RQ1 (Baseline): What is the baseline level of translation competence across vocabulary, accuracy, and grammar among non-English majors before the COTA intervention?
- RQ2 (Student Experience): How do non-English majors perceive translation learning in terms of engagement, relevance, and effectiveness within the COTA framework?
- RQ3 (Teacher Viewpoints): What are instructors' perspectives on the COTA model's theoretical foundations, implementation requirements, and effectiveness for teaching translation to non-English majors?

- RQ4 (Classroom Practice): How is the COTA model enacted in real classroom settings, including adherence to its principles and adaptations to contextual constraints?
- RQ5 (Impact Assessment): How effectively does the COTA model improve measurable translation competence outcomes among non-English majors when assessed through standardized instruments?

Based on the COTA theoretical framework, this study tests two primary research hypotheses (with corresponding null hypotheses):

Hypothesis 1:

- $H0_1$: No significant differences exist in adapted CET-4 scores between non-English majors taught with the COTA model and those taught without it.
- H_1 (CET-4 Performance Hypothesis): Non-English majors receiving COTA-based instruction will achieve statistically higher adapted CET-4 translation scores than students receiving traditional instruction.

Hypothesis 2:

- $H0_2$: COTA strategies used in the translation classroom have no significant effect on students' translation competence scores.
- H_2 (Competence Improvement Hypothesis): COTA pedagogical strategies significantly improve overall translation competence compared with traditional approaches.

This study aims to enhance translation pedagogy by creating and validating the COTA model, which combines objectivist and constructivist approaches to translation education. These approaches have traditionally been seen as mutually exclusive; however, the COTA framework shows they can be integrated into a single model, each strengthening the other (Jonassen, 1991; Kiraly, 2014; X. Li, 2019). Besides providing evidence for the benefits of merging objectivist and constructivist methods in translation, the COTA model challenges classic pedagogical dualities and offers an alternative framework based on cognitive and educational psychology. Our findings are relevant across various educational contexts and offer a scientifically grounded model for teaching translation to non-English majors, validated tools for evaluating students' translation skills, strategies for training translation instructors, and data that may influence policies on language standards, further advancing translation education for non-specialists in China.

2. Literature Review

2.1. Traditional Objectivist Translation Teaching

2.1.1. Theoretical Foundations

Objectivism provides an epistemological foundation for educational practices that rely on sequential, systematic learning to reduce ambiguity and increase predictability in the transmission of objective knowledge (Hodell, 2025; Tao, 2016). Objectivist teaching methods emphasize structured learning systems that encourage students to acquire organized, predictable knowledge. One of the most influential linear curriculum models was proposed by Tyler (1949), who identified four steps in the development of a linear curriculum: (1) specifying instructional goals, (2) selecting learning experiences likely to achieve the specified objectives, (3) organizing these learning experiences in a logical order, and (4) developing criteria and procedures (i.e., assessments) for determining whether the objectives have been met.

2.1.2. Behavioral and Cognitive Approaches

Behavioral theory views learning as stimulus-based and observable, emphasizing consequences (i.e., responses to stimuli and/or consequences such as positive or negative reinforcement or corrective feedback) (Skinner, 1953). Therefore, the behavioral approach

to translation pedagogy, although too limited to describe the translation process as a psychomotor skill, is useful for characterizing lower-level sub-skills (e.g., accurate lexical substitution, reproduction of grammatical patterns, consistent application of rules) as procedural behaviors that can be developed through repetitive practice and ordered instructional steps. Lower-level sub-skills are discrete and lend themselves well to stimulus-response learning, where immediate feedback helps novices automate basic linguistic routines before engaging in more complex cognitive processes. This clarifies how the behavioral approach influenced the development of instructional sequences in earlier years, without reducing translation to a mechanical activity. At the same time, interpretation, strategic decision-making, and creativity are required to develop the higher-order cognitive function of translation competence, underscoring the need for additional theoretical paradigms in translation pedagogy (Williams & Burden, 1997).

Cognitive theories within the objectivist paradigm focus on internal mental processes such as memory, prior knowledge, and active information processing (Anderson, 1976; Atkinson & Shiffrin, 1968). Kiraly's (2014) formative model of the translator as an active agent who uses knowledge of language and external sources of information, employing strategies as a "cognitive blueprint" to guide strategy selection, further reflects the increased internal complexity over behavioral theory, yet still treats translation as separable into teachable sub-skills and strategies.

2.1.3. Strengths and Limitations: Behavioral and Cognitive Approaches

While translation is a challenging, non-linear process, objectivist, instructional-design-based models remain valuable because they help novices manage these complexities. Objectivist models do not attempt to reproduce all components of the translation process; instead, they provide linear, sequential instruction that offers a framework for acquiring foundational skills in areas such as accuracy, terminology use, and pattern recognition. By dividing tasks and defining performance expectations, objectivist models reduce cognitive load in the early stages of translation and establish procedural stability before learners engage in the interpretive, contextual, and creative aspects of translation. Recent research in instructional psychology emphasizes the importance of structured guidance for novice learners working in cognitively demanding domains. Pedagogical approaches that explicitly manage working-memory demands improve learning outcomes when tasks require complex problem-solving and domain-specific knowledge (Paas & Van Merriënboer, 2020; Sweller, 2023). Such models are likely to remain significant in early translation education, although holistic, constructivist-based approaches may focus on developing learners' higher-order competencies.

Concurrently, objectivist models have been criticized for being overly restrictive in developing learners' holistic translation competence. Kiraly (2014) and Jonassen (1991) suggested that objectivist models position students as passive recipients of instruction and do not adequately address the complexities of the translation process. In addition to omitting the critical problem-solving skills of translation processes identified by Göpferich (2009) and PACTE Group (2003, 2005), they also inadequately support the development of metacognitive awareness, which is critical to the development of translation expertise. The rigid structure of objectivist models can be overly simplistic in its approach to teaching and learning and fails to provide learners with an understanding of the dynamic, context-dependent nature of the translation process (Kiraly, 2014). Therefore, there is a need for more learner-centered, authentic models of translation education.

2.2. Constructivist Translation Teaching

2.2.1. Philosophical Origins

Constructivist principles were gradually incorporated into translation pedagogy during the late 20th century and continue to highlight learner-centered education and authentic learning experiences that promote learner agency and the development of meaningful knowledge (Neves, 2022). Kiraly (2014) argued that constructivism shifts traditional roles of authority, responsibility, and control by granting students greater agency than in conventional instruction. This contrasts with a transmission model, which positions students as passive recipients of information rather than co-creators of meaning and co-constructors of knowledge (Jonassen, 1991; Von Glasersfeld, 1989; Vygotsky, 1978). Constructivist theory also questions the notion that knowledge is static, universal, and unchanging, instead viewing it as dynamic, culturally embedded, and revisable through individual experience and social interaction (Pourfarhad et al., 2018).

2.2.2. Learning Theory Applications

Translation pedagogies grounded in constructivism use authentic materials to promote active, self-directed knowledge construction through learners' engagement with them. Learners construct their own meanings as they interact with one another and reflect on their experiences (González-Davies, 2004, 2020; Kiraly, 2014). Additionally, facilitative teachers provide resources that enable students to become independent and take initiative in the learning process (Hua et al., 2011). Therefore, constructivist teachers use original materials, encourage open discussion, and elicit prior student knowledge through thought-provoking, open-ended questions to develop their ideas (Savery & Duffy, 1996; Taber, 2024). Constructivist approaches can also challenge initial assumptions by allowing students to engage in productive cognitive conflict and debate, thereby developing critical thinking skills and fostering greater awareness of the world around them.

2.2.3. Social Versus Cognitive Constructivism

Constructivism comprises two paradigms: social constructivism and cognitive constructivism. The social paradigm focuses on how students learn through interaction and dialogue within and across communities of translators (real or simulated) (Lave & Wenger, 1991; Vygotsky, 1978; Saleem et al., 2021). Rather than emphasizing individual learning, it highlights how students build knowledge collectively through dynamic, intersubjective processes (Brown et al., 1989). Vygotsky (1978) and Brown et al. (1989) also identified the Zone of Proximal Development as a space for legitimate peripheral participation (i.e., situated learning). While cognitive constructivism (Piaget, 1970; Von Glasersfeld, 1989) emphasizes individual cognitive processes in schema development, both paradigms highlight learner autonomy, authenticity, and the teacher's role as a facilitator (He et al., 2024; Jonassen, 1999). Moreover, contemporary translation research increasingly conceptualizes translation as a situated and distributed activity embedded in professional and technological contexts, thereby reinforcing the pedagogical value of collaborative and authentic translation tasks that replicate real-world translation processes (Risku & Rogl, 2021). These commonalities underpin the COTA model, which blends social collaboration with individual cognitive processing and incorporates objectivist scaffolding to develop translation competence through authentic teamwork and individualized, guided practice (Jonassen, 1991; Mayer, 2004). This theoretical underpinning supports this study's mixed-methods design and classroom intervention.

2.2.4. Strengths and Limitations: Constructivism

Constructivist approaches to translation teaching promote learner autonomy, collaboration, and engagement with authentic, context-dependent tasks, thereby supporting the development of higher-order competencies such as strategic decision-making and intercultural awareness. However, these approaches may pose challenges for novice learners who lack sufficient foundational knowledge to engage effectively in open-ended tasks. Limited structure can lead to cognitive overload or uneven skill development. Therefore, constructivist approaches are most effective when complemented by structured guidance that supports the gradual development of core translation skills.

2.3. COTA Model Framework

2.3.1. Theoretical Integration

The COTA model integrates constructivist and objectivist pedagogies, creating an effective approach to teaching translation at the university level (Jonassen, 1991; Mayer, 2004). Together, the paradigms provide a more comprehensive education for translation learners who are not English majors and mitigate the inherent deficiencies of relying on a single paradigm (Dignath & Veenman, 2021; Jonassen, 1991, 1994). For instance, the constructivist aspects of the model enable students to become actively engaged in their learning, think critically, collaborate with others, and perform authentic tasks (Mayer, 2004; Risku & Rogl, 2021). Conversely, the objectivist aspects of the model enable students to build on a foundation of structured knowledge of languages, conventions, and techniques, develop skills systematically, and receive direction and structure (Mayer, 2004). Overall, the model's combination of constructivist and objectivist aspects supports novice translators in developing basic translation proficiency. This synthesis is necessary because no single paradigm is sufficient to address the multiple requirements of translation competence, particularly for novices. For example, translation requires knowledge of languages, conventions, and techniques, as well as an understanding of how this knowledge is applied across various contexts. The former represents the strength of the objectivist paradigm and the latter that of the constructivist paradigm.

While prior research has examined blended, guided-discovery, competence-based, and socio-constructivist approaches to translation pedagogy, the COTA model offers a unique contribution by explicitly integrating objectivist and constructivist principles within a single, operationalized pedagogical framework. Unlike models that prioritize a single paradigm or implicitly combine elements, COTA provides a structured instructional sequence that aligns the development of foundational knowledge with progressively authentic, collaborative tasks (Amini et al., 2022). In doing so, it bridges the gap between highly scaffolded, teacher-led approaches and open-ended, student-centered models, offering a coherent design that links instructional processes, classroom practice, and assessment within an integrated pedagogical system.

Table 1 shows how COTA's elements combine to form a balanced educational strategy that integrates constructivist and objectivist theory. These elements provide a structured way to learn content, scaffolded practice opportunities to apply that knowledge, and a clearly defined set of performance criteria to assess whether students have mastered those early skills and the extent of their progress. By combining authentic, learner-centered experiences with a structured, guided instructional format, novice language learners are provided with the foundational skills necessary to develop competent translation skills and with flexible strategies to continue developing that competence. Combining these two approaches enhances the overall effectiveness of this instructional model.

Table 1. Aspects of the Constructivist–Objectivist Theoretical Approach (COTA).

Aspect	Constructivist Approach	Objectivist Approach	COTA
Learning Theory Perspective	Learners actively construct knowledge through experiences.	Knowledge is transmitted from experts to learners.	Integrates elements of active construction and guided instruction.
Learning Process	Active exploration, inquiry, and reflection.	Systematic presentation of content and structured practice.	Balanced approach, combining exploration with structured guidance.
Role of Instructor	Facilitator, coach, and guide in the learning process.	Expert who presents content, provides guidance, and assesses.	Acts as a facilitator, providing support and guidance when needed.
Learning Activities	Hands-on activities, problem-solving tasks, and collaboration.	Lectures, direct instruction, and structured practice.	Variety of activities to engage learners actively and provide guidance.
Assessment	Performance-based assessments, portfolios, and reflections.	Objective tests, quizzes, and assessments of mastery.	Assessments measure both understanding and skill mastery.

2.3.2. Gagné's Instructional Framework

Robert Gagné's nine events of instruction provide a methodological framework for applying the integrated COTA model to structured translation education. The sequence aligns with the cognitive information-processing theory and COTA's dual foundations (Gagné et al., 1992, 2004; McNeill & Fitch, 2023). Table 2 summarizes the nine events and their application within a COTA-based lesson.

Table 2. Robert Gagné's nine events of instruction.

Event	Description	Example
1. Gain Attention	Use stimuli (e.g., questions, visuals, novelty) to capture learners' interest.	Using multimedia, show a provocative image or ask a challenging question to spark curiosity.
2. Inform Learners of Objectives	State what learners will be able to do after the instruction.	Explain that learners will be able to translate a short paragraph from English to Chinese at the beginning of a lesson.
3. Stimulate Recall of Prior Learning	Help learners make connections with previous knowledge.	Brainstorming, concept mapping, and asking students to recall vocabulary or grammar structures from a previous lesson.
4. Present the Content	Deliver the instructional material clearly and effectively.	Breaking content into chunks, using visual aids such as a short video or a text demonstration of a model translation, and providing explanations.
5. Provide Learning Guidance	Offer examples, strategies, and cues to support understanding.	Providing cues or step-by-step instruction, scaffolding activities, or discussing strategies for identifying key terms and maintaining meaning across languages.
6. Elicit Performance (Practice)	Allow learners to apply new knowledge or skills.	Quizzes, simulations, or problem-solving tasks, such as having students work in pairs to translate a new paragraph.
7. Provide Feedback	Give immediate, specific feedback to reinforce learning.	Review student translations and identify strengths and areas for improvement through written comments, verbal praise, or automated scoring systems.

Table 2. *Cont.*

Event	Description	Example
8. Assess Performance	Evaluate learning through tests or demonstrations.	Conduct a quiz, test, or an in-class translation task to assess competence.
9. Enhance Retention and Transfer	Use varied contexts and practice supporting long-term use of knowledge.	Provide opportunities for application, encourage reflection, and foster connections between new and existing knowledge (e.g., by assigning a real-world translation task, such as translating an article summary).

The initial three instructional events develop the core cognitive skills students need to learn from a lesson. These events focus on directing an appropriate level of attention so students can work at their best; clearly communicating the lesson objectives so students understand what they are trying to achieve and can use known strategies and tools to accomplish those objectives, thereby supporting the development of metacognition and self-regulation; and promoting the retrieval of prior knowledge so new information can be connected to what students already know (Gagné et al., 1992, 2004; McNeill & Fitch, 2023; Jia et al., 2025). Students' attention may be engaged by using interesting questions, engaging media, surprising facts, and real-life translation problems/dilemmas to stimulate interest and encourage participation. The next three events present the instructional materials in ways that enable students to receive the structured input, strategic support, and contextualized practice they need to develop their cognitive abilities. As a result, they will be able to apply these skills in a controlled environment. However, they must receive immediate, specific feedback on their responses. This immediate, specific feedback will help students accurately understand why some of their responses were incorrect and correct their mistakes. After receiving feedback, students can take a performance assessment whose results will indicate whether they have made adequate progress. The final instructional event will involve developing strategies to help students retain the cognitive skills learned during the lesson and ensure they apply those skills to future translation challenges. Developing strategies to help students retain the cognitive skills acquired during the lesson will enable them to apply these skills to other challenges and continue growing cognitively over time.

2.3.3. Implementation Components

The COTA model demonstrates its theoretical and practical viability through three interdependent elements. The first element is the importance of systematic knowledge transfer for non-English majors. This systematic approach provides foundational knowledge of language, culture, and procedures to support the development of advanced skills. The systematic structure of this objectivist-inspired knowledge transfer model will accelerate early learners' acquisition of the basic skills necessary to meet the demands of short-term translation courses (Gagné et al., 1992, 2004; Mayer, 2004).

The second is that student engagement in authentic or simulated translation environments is vital to their translation competence. As Jonassen (1994) noted, the domain of translation is ill-structured, comprising multiple valid solution paths, ambiguous evaluation criteria, and context-dependent decision-making. Therefore, developing flexible problem-solving methods to address these complexities cannot be achieved solely by applying abstract rules. Constructivist paradigms are the most effective means of helping learners develop problem-solving strategies to navigate the complexities of professional practice (Kiraly, 2014).

Third, the combination of objectivist and constructivist elements in the COTA model serves as a regulatory mechanism that balances structured direction with open-ended

discovery. This mechanism enables learners to develop foundational knowledge and build an efficient, effective base, while providing opportunities to acquire the adaptive and innovative skills required for successful real-world translation. Additionally, it mitigates constructivism's inefficiencies stemming from a lack of foundational knowledge and objectivism's potential to foster inert knowledge, which limits learners' ability to adapt to new information (Jonassen, 1991; Mayer, 2004).

Finally, beyond informing instructional design, the COTA model provides a framework for assessment and evaluation. It supports integrating product-oriented measures (e.g., accuracy, vocabulary, and grammatical accuracy) with process-oriented evaluation (e.g., collaboration, reflection, and problem-solving strategies). This combined approach enables the assessment of both translation outcomes and the underlying cognitive and strategic processes, aligning evaluation practices with the multidimensional nature of translation competence.

2.4. Translation Competence Development

2.4.1. Competence Components

Translation competence is widely recognized as a complex, multifaceted construct comprising several interdependent subcompetences essential to professional performance. The PACTE Translation Competence Model (PACTE Group, 2003, 2005) provides a comprehensive framework that identifies the following components:

- *Bilingual Sub-Competence:* Mastery of both working languages, including receptive and productive skills, vocabulary depth, grammatical accuracy, syntactic control, discourse conventions, and pragmatic awareness for precise comprehension and idiomatic expression.
- *Extra-Linguistic Sub-Competence:* General world knowledge, cultural understanding of source language and target language contexts, domain-specific knowledge, and awareness of relevant socio-political contexts.
- *Knowledge about Translation* Sub-Competence: Understanding translation principles, procedures, methods, strategies, and professional ethics.
- *Instrumental Sub-Competence:* Effective use of documentation resources (dictionaries, glossaries, parallel texts) and technological tools (computer-assisted translation tools, databases, corpora).
- *Strategic Sub-Competence:* The central executive capability responsible for planning, executing, and monitoring the translation process, including problem identification, decision-making, resource use, strategy selection, quality control, and effort management.
- *Psychophysiological Components:* Cognitive skills (memory, attention, analytical thinking), attitudinal traits (perseverance, critical insight, ethical commitment), and psychomotor abilities (typing, tool operation).

More recent competence frameworks for translator education also emphasize the multidimensional nature of translation competence, highlighting the importance of technological literacy, service-provision skills, and professional collaboration alongside linguistic and strategic capabilities (European Commission EMT Expert Group, 2022). Moreover, empirical research examining the competencies required of translation graduates in professional contexts has indicated that employers increasingly value strategic problem-solving abilities, technological competence, and domain-specific knowledge, in addition to linguistic proficiency (Hao & Pym, 2021).

2.4.2. CET-4 Assessment Framework

China's most common standardized English test for non-native speakers, which includes a translation section (J. Li, 2021), is the CET-4. In 2013, the CET-4 assessment shifted

from translating single sentences to longer paragraphs of 140–160 Chinese characters, focusing on cultural and educational topics related to Chinese history and culture, as well as economic and social issues (J. Li, 2021). This change required greater cognitive engagement and more complex analysis to achieve coherence, cohesion, an appropriate writing style, and overall contextual understanding. Recent studies examining the assessment have also examined task comparability and difficulty across parallel translation tasks, highlighting the need for careful design and validation when CET-based translation tasks are used as research instruments (Y. Liu & Zheng, 2022).

The CET-4 scoring rubric uses a six-band scale (0–15 points) to assess three domains:

- *Accuracy*: Faithful conveyance of meaning and key information.
- *Vocabulary*: Appropriate, precise, and varied lexical choices, including culturally specific terms.
- *Grammar & Syntax*: Correct structures, coherent sentence construction, and overall syntactic fluency.

Scores of 13–15 reflect highly accurate translations with advanced vocabulary and minimal grammatical errors. Lower bands indicate omissions, inaccuracies, and lexical or grammatical issues; a score of 0 is assigned to irrelevant or blank responses. Given its high-stakes nature, the CET-4 significantly influences translation education in China, with universities aligning curricula closely with its requirements (J. Li, 2021).

2.5. Theoretical Framework

Gagné's instructional theory and the COTA model were selected as the foundations for designing an integrated translation training program for non-English majors. Gagné's Nine Events provide a structured, sequential process that promotes attention, activates schemas, provides guided practice, and facilitates feedback, all critical to developing early translation skills (Jia et al., 2025). The COTA model aligns with this structure by integrating objectivist and constructivist principles across each instructional stage. During the introductory stages, teachers use explicit instruction, clear objectives, and activation of prior knowledge to scaffold foundational linguistic and procedural skills while engaging students with authentic translation prompts and contextualized examples. In the presentation and practice stages, structured demonstrations, guided support, collaborative translation tasks, and immediate feedback combine systematic knowledge transfer with active inquiry and problem-solving. Finally, during assessment and retention activities, students apply translation skills independently through authentic tasks, reflection, and transfer to new contexts. Together, the COTA and Gagné models demonstrate how two frameworks that appear to be based on opposing paradigms can work together to support both foundational skills and the independence and flexibility needed to translate successfully in real-world contexts.

3. Materials and Methods

3.1. Research Design

This study used a mixed-methods design to assess the effectiveness of the COTA model, integrating quantitative and qualitative data to provide a comprehensive understanding of learning outcomes and instructional processes. Quantitative data (e.g., pre- and post-tests, surveys) measured changes in translation competence, while qualitative data (e.g., interviews and classroom observations) provided contextual insights into implementation and participant experiences. This complementary design enabled methodological triangulation, strengthening the validity and interpretability of the findings.

Within this mixed-methods framework, a quasi-experimental design was employed to assess the effect of the COTA model on the translation skills of non-English majors. Mixed methods combine quantitative and qualitative approaches to develop a

deeper understanding of the model's application and effects than either approach alone (Creswell & Creswell, 2017). As shown in Figure 1, the combination of quantitative and qualitative approaches in this quasi-experimental design enabled the evaluation of both the teaching–learning process and instructional effects (Babbie, 2020; Fraenkel et al., 2015), providing a comprehensive assessment of measurable outcomes and the contextual learning that occurred through translation instruction.

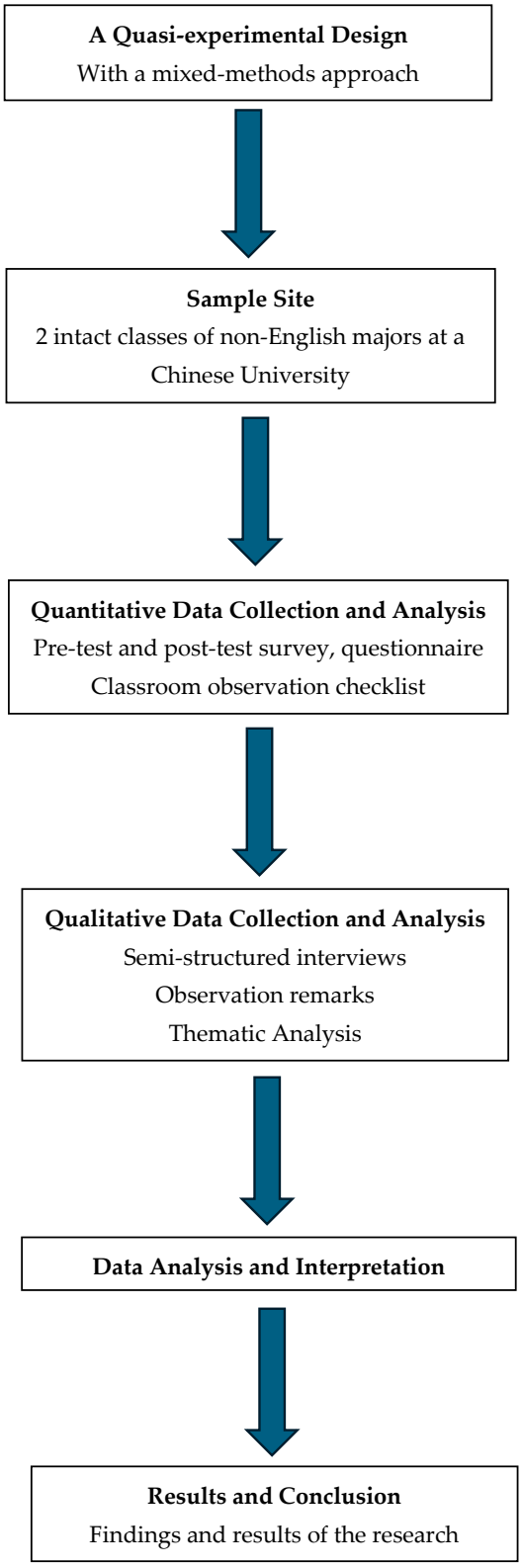


Figure 1. Quasi-experimental research design procedures.

Quantitative data provide objective measures of students' perceived competence and reveal consistent trends in students' perceptions (Delice, 2003). By contrast, qualitative methods offer rich insights into how an intervention is implemented, teachers' experiences, and the contextual factors that may affect its implementation (Patton, 2015). Creswell and Plano Clark (2018) argued that a mixed-methods approach enhances validity through methodological triangulation, combining the strengths of both methodologies.

Given the difficulty of implementing true experimental designs in real-world educational settings, due to the fixed nature of classes and the rigidity of class schedules and administrative policies (Fraenkel et al., 2015; Shadish et al., 2002), a quasi-experimental design was employed. As Fraenkel et al. (2015) noted, quasi-experimental designs can establish plausible causal relationships even when randomization is not feasible. Although this design does not retain all the advantages of true experimental designs, it allows for a high degree of control over variables while providing the flexibility required to examine a variety of topics in a realistic, practical manner, making it ideal for applied pedagogical research.

Because intact classes and administrative policies in authentic educational settings determined the structure, students were assigned to the experimental and control groups at the class level rather than individually, consistent with the logic of cluster sampling in educational intervention research (Babbie, 2020; Fraenkel et al., 2015). To strengthen internal validity and address potential clustering and teacher effects, several measures were taken. First, an independent-samples *t*-test on pre-test scores confirmed no significant difference in baseline translation competence between the two groups ($p = 0.960$), establishing baseline equivalence. The absence of significant baseline differences supported the use of post-test comparisons to evaluate intervention effects relative to comparable starting conditions. Second, both groups were taught by instructors with similar teaching experience and received comparable training; the same number of class hours and the same textbook content were used across conditions, thereby controlling for systematic teacher effects. Third, all analyses were conducted with the class as the unit of assignment, and group differences were interpreted conservatively.

3.2. Participants and Setting

The participants were 110 first-year students majoring in non-English subjects at a Chinese post-secondary medical school. Students were assigned at the class level to either the experimental group (EG, $n = 55$), which received COTA-based instruction, or the control group (CG, $n = 55$), which received traditional instruction. The sample included 59 males (53.6%) and 51 females (46.4%), all enrolled in medical-related majors, including Clinical Medicine, Pharmacy, and Nursing. This uniform disciplinary background minimized extraneous variables and supported meaningful group comparisons (Delice, 2003; Palinkas et al., 2015). The study was conducted over a 12-week period during a single academic semester, including pre-testing, a 10-week intervention, and post-testing.

Selection criteria required that participants: (1) be first-year students, (2) major in a non-English discipline, (3) be enrolled in the medical school, and (4) have no prior formal translation training. These criteria ensured consistency in academic background, language-learning experience, and baseline exposure to translation. Students came from various regions of China, most from northern provinces, yielding a reasonably representative sample of Chinese university students in science and in various medical fields. Additional inclusion criteria were a minimum English college entrance examination score of 110, no prior translation training, and no overseas study experience exceeding six months.

3.3. Intervention Protocol

Before the intervention, the instructors in the experimental group attended preparatory training on the COTA model and received mentorship throughout its implementation. The training provided teachers with theoretical explanations, lesson-plan templates, and demonstration lessons using authentic medical texts. They continued to receive coaching from an experienced COTA-trained teacher throughout the 10-week COTA model-based translation instruction to maintain adherence to COTA principles.

During the 10-week COTA model-based translation instruction (90 min/week), the teachers in the experimental group were also trained to use Gagné's nine events of instruction and both the objectivist and constructivist instructional design strategies. The instructional strategies used in the COTA model are presented below:

- Foundation (Weeks 1–2): Established goals, activated prior knowledge, and built rapport using authentic medical texts aligned with CET-4 standards.
- Development (Weeks 3–6): Introduced translation rules (vocabulary, grammar) and facilitated guided small-group tasks, gradually shifting from structured support to greater independence.
- Integration (Weeks 7–10): Focused on performance assessment and retention through CET-4 tasks, peer review, and reflective discussions to strengthen independent application.

All translation materials were authentic CET-4 past-paper paragraphs (2018–2023). Example activities included negotiating culture-specific terms in pairs, such as "Spring Festival Gala", small-group collaborative translation, and peer review using the CET-4 rubric.

The control group conducted vocabulary drills, sentence-by-sentence translation, and individual work, with assessments focused on product accuracy. Traditional instruction was teacher-centered, consisting of individual sentence-level drills, vocabulary memorization, and corrective feedback focused solely on product accuracy. No collaborative or peer-review activities were included.

Data collection followed a four-stage schedule:

1. Week 0: Adapted CET-4 baseline pre-test and demographic questionnaire.
2. Weeks 1–10: Experimental group intervention; control group traditional instruction. Classroom observations at weeks 2, 4, 6, and 8 monitored fidelity.
3. Week 11: Immediate adapted CET-4 post-test mirroring pre-test structure with different texts and perception questionnaires.
4. Week 12: Follow-up interviews with instructors to explore experiences, perceived effectiveness, and challenges.

This ensured consistent implementation across instructors and strengthened fidelity and internal validity (Century et al., 2010).

3.4. Instrumentation

Students' translation performance was evaluated using CET-4-based criteria on vocabulary, grammatical accuracy, and overall translation quality. The use of structured evaluation criteria reflected the broader efforts within Chinese higher education to develop translation assessments that balance methodological rigor with practical applicability (Dai & Lin, 2025). Diagnostic pre-tests and summative post-tests were also directly adapted from authentic CET-4 translation tasks and served as the primary quantitative measures of changes in translation competence across vocabulary, accuracy, and grammar. Each student had 30 min to translate a cohesive Chinese passage of approximately 140–160 characters into idiomatically correct English under CET-4-like testing conditions, providing a highly reliable and ecologically valid measure of students' applied translation competencies. Each test was based on authentic Chinese passages that addressed culturally, historically, and socially

relevant topics, were at a complexity level appropriate for first-year university students, and presented translation challenges consistent with CET-4 requirements. All tests were rated by three independent raters with expertise in assessing translations, using the official CET-4 rating scale to establish inter-rater reliability and reduce rater bias. Strong inter-rater reliability (ICC values greater than 0.717) (Field, 2018) was observed. Raters agreed to resolve discrepancies exceeding half a point on the rating scale through discussion.

Additionally, a purpose-designed questionnaire with 20 items measured student perceptions across three constructs central to the COTA experience:

- *Translation Materials*: Relevance, authenticity, and usefulness of texts and resources (6 items).
- *Classroom Teaching & Learning*: Effectiveness of instructional methods, teacher guidance, and activities (8 items).
- *Tasks & Activities*: Value, engagement, and contribution of translation tasks and collaboration (6 items).

All items used a five-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree) to minimize respondent burden while maintaining sensitivity in a mixed-competence sample. The five categories, using clear labels, an easily identifiable neutral midpoint, and a well-balanced format, reduced cognitive load, improved response consistency, and enhanced translation and anchoring of the scale across languages. Additionally, the five-point Likert scale is commonly used in higher education contexts in China and provides sufficient discrimination for assessing reliability and group-level differences. Content validity was confirmed by an expert panel of three experienced educators in translation studies, applied linguistics, and Teaching English to Speakers of Other Languages. The content validity index for each item exceeded the recommended threshold of 0.78 (Polit & Beck, 2006), confirming item relevance and representativeness.

Reliability analysis demonstrated excellent internal consistency for the full questionnaire (Cronbach's $\alpha = 0.941$) and each subscale: Materials ($\alpha = 0.853$), Teaching/Learning ($\alpha = 0.912$), and Tasks/Activities ($\alpha = 0.964$) (Bland & Altman, 1997). All variables showed high reliability, with α values above 0.8. Overall reliability was very high, as the KMO for each item exceeded 0.70. Bartlett's test of sphericity indicated that all items were significant at $p < 0.001$. The exploratory factor analysis, which used principal axis factoring with promax rotation, confirmed the existence of three latent constructs with a priori-specified relationships and that all items loaded (>0.60) onto their corresponding constructs. Collectively, these three factors accounted for more than 81% of the dataset's total variance, providing strong evidence of construct validity and theoretical alignment (Field, 2018).

Semi-structured interviews were conducted with two experienced teachers who implemented the COTA model in the experimental group. Interview participants are identified using anonymized codes (e.g., T1, T2) to ensure confidentiality while distinguishing individual perspectives. The interview protocol explored: (1) perceptions of the model's theoretical validity, (2) implementation experiences, (3) perceived student responses and learning gains, (4) challenges encountered, and (5) suggestions for refinement or support needs. Participants were purposively selected for their expertise. Each interview, conducted in Mandarin, lasted 45–60 min, was audio-recorded with written consent, and transcribed verbatim.

Systematic classroom observations were used to evaluate the fidelity of COTA implementation. The observation checklist, structured around Gagné's nine events of instruction, guided the process. Trained observers recorded the presence and quality of each instructional event across eight translation lessons in the experimental group. Implementation was rated on a five-point scale ranging from 1 to 3, using 0.5 increments to capture variation in implementation quality (1 = Not Observed; 1.5 = Weak/low Implementation; 2 = Moderate/partial Implementation; 2.5 = Strong Implementation; 3 = Full Implemen-

tation). Inter-rater reliability was confirmed using Cohen's kappa (κ = 0.782), based on two independent observers coding 20% of sessions, indicating substantial agreement. The results confirmed consistent observational data.

Regarding the assessment procedures, the CET-4 rubric was scored on a dimensional scale for Accuracy, Vocabulary, and Grammar. For analysis, each dimension was linearly transformed to a 0–30 (Vocabulary, Grammar) or 0–40 (Accuracy) scale, then summed to create a composite translation competence score out of 100 (aggregation: Vocabulary 30% + Accuracy 40% + Grammar 30%). Inter-rater reliability (ICC) for each dimension was strong: pre-test (Vocabulary = 0.732, Accuracy = 0.718, Grammar = 0.735); post-test (Vocabulary = 0.741, Accuracy = 0.729, Grammar = 0.746) (all > 0.717). Equivalence of pre- and post-test forms was supported by parallel passages matched for length (140–160 characters), topic complexity, and lexical density, verified by an expert panel, and confirmed by a pilot study (n = 30) showing no significant difference in difficulty (p = 0.68).

Quantitative data were analyzed using SPSS 26. Descriptive statistics (means, standard deviations, frequencies) summarized participant characteristics, baseline competence, and questionnaire responses. Normality tests (Kolmogorov–Smirnov, Shapiro–Wilk, Q-Q plots) confirmed that parametric analyses were appropriate. Independent samples t-tests compared pre-test (baseline equivalence) and post-test (intervention effects) group means. Paired samples t-tests assessed within-group change. Cohen's d quantified effect sizes, and reliability analyses verified the scales' internal consistency.

Qualitative data analysis followed a thematic analysis (Braun & Clarke, 2008) of interview transcripts and observation notes. The six stages included: (1) familiarization, (2) initial coding, (3) theme searching, (4) theme reviewing, (5) theme definition and naming, and (6) report production with representative excerpts. NVivo was used for data management and coding. Trustworthiness was strengthened through peer debriefing and the maintenance of an audit trail (Tracy, 2010).

Ethical approval was obtained before data collection. Informed-consent procedures were strictly followed, and participants received detailed written information on the study's purpose, methods, risks and benefits, voluntary participation (including withdrawal without penalty), confidentiality measures, and data storage plans. Written consent was obtained from all participants, and anonymity and confidentiality were ensured through the use of pseudonyms and secure data handling.

4. Results

4.1. Baseline Characteristics

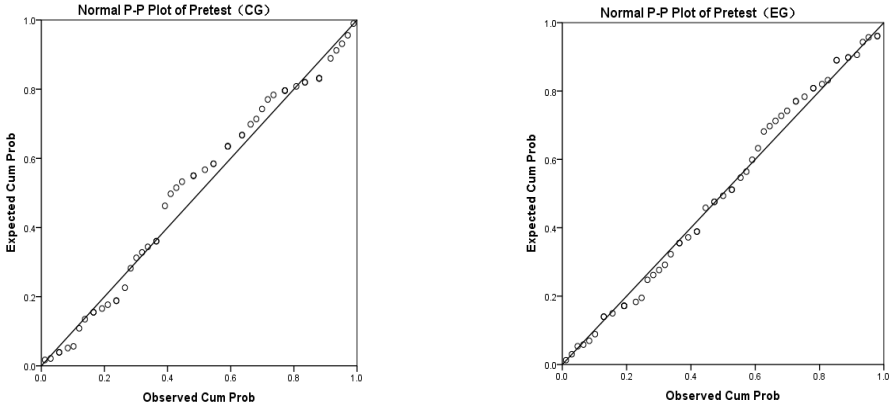
Participant homogeneity minimized the influence of academic background on group comparisons. At the same time, assessing pre-test translation competence was essential to establish baseline equivalence between the experimental (COTA) and control (traditional) groups before the intervention. Independent samples t-test results showed no significant difference between the experimental group (M = 72.682, SD = 3.415) and the control group (M = 72.573, SD = 3.456) ($t(108) = 0.171$, $p = 0.960$), confirming statistically similar starting levels and allowing post-intervention differences to be attributed to COTA. Normality checks using Kolmogorov–Smirnov tests (Experimental: $D(55) = 0.098$, $p = 0.200$; Control: $D(55) = 0.084$, $p = 0.200$) and Q-Q inspections verified normal distribution, satisfying the assumptions for parametric testing.

The significance levels for both groups exceeded 0.05, indicating no significant pre-test differences (Table 3). A P-P plot test for the pre-test data (Figure 2) confirmed normality, supporting the validity of subsequent analyses (Field, 2018).

Table 3. Kolmogorov–Smirnov tests of normality.

	Kolmogorov–Smirnov [a]			Shapiro–Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
Pre-test (CG)	0.097	55	0.200 *	0.976	55	0.329
Pre-test (EG)	0.063	55	0.200 *	0.980	55	0.505

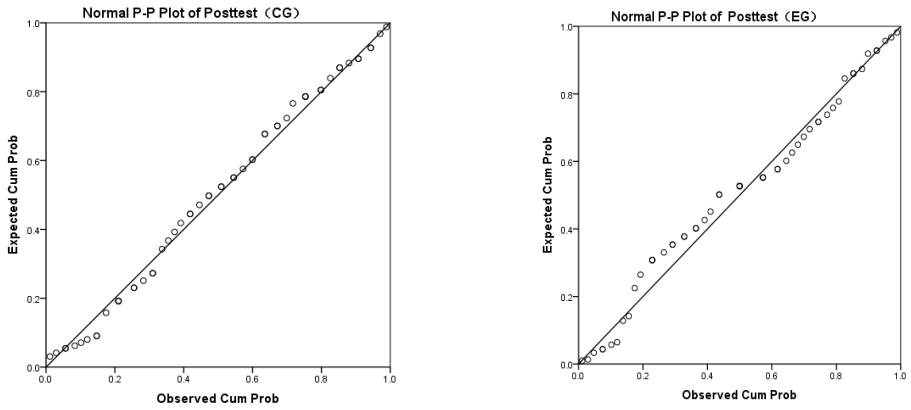
CG = Control Group; EG = Experimental Group. * Lower bound of true significance. [a] Lilliefors significance correction.



(**a**) (**b**)

Figure 2. (**a**) Normal P-P Plot of pre-test scores of the Experimental Group (EG) and (**b**) Normal P-P Plot of pre-test scores of the Control Group (CG).

The P-P plot test of the post-test data (Figure 3) indicated a predominantly normal distribution (Field, 2018).

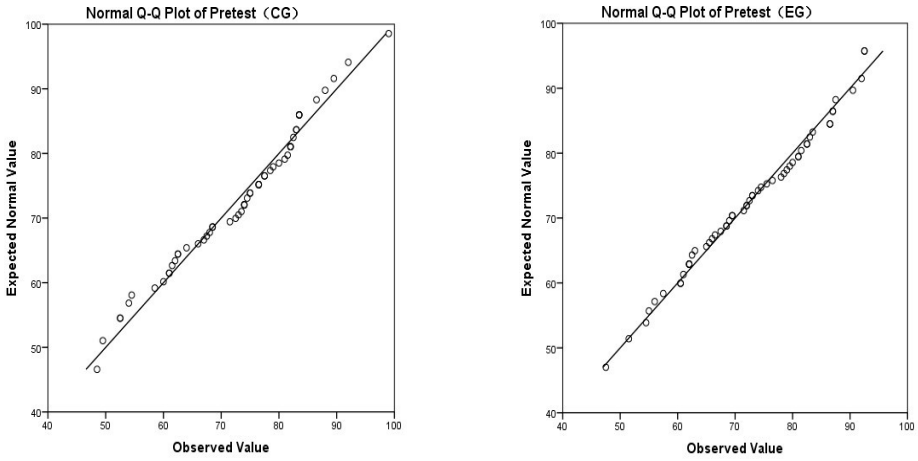


(**a**) (**b**)

Figure 3. (**a**) Normal P-P plot of post-test scores of the Experimental Group (EG) and (**b**) Normal P-P Plot of post-test scores of the Control Group (CG).

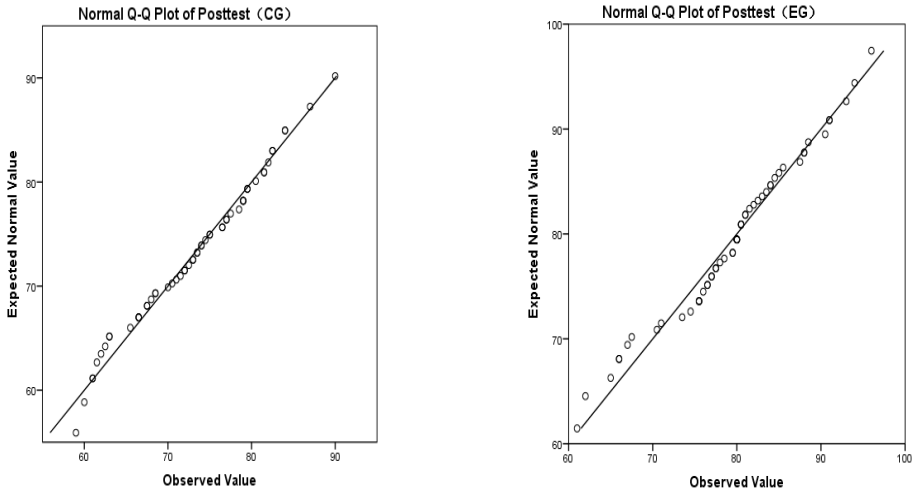
Pre-test scores aligned along the oblique line (Figure 4), with no extreme outliers; Q-Q plots with scores from 45 to 100 confirmed normality (Field, 2018).

Similarly, Figure 5 shows that post-test scores cluster along an oblique line, with no extreme outliers. Q-Q plots indicated a range of 55–98, again demonstrating normal distributions (Field, 2018).



(**a**) (**b**)

Figure 4. (**a**) Normal Q-Q plot of the pre-test scores of the Experimental Group (EG) and (**b**) Normal Q-Q plot of the pre-test scores of the Control Group (CG).



(**a**) (**b**)

Figure 5. (**a**) Normal Q-Q plot of the post-test scores of the Experimental Group (EG) and (**b**) Normal Q-Q plot of the post-test scores of the Control Group (CG).

4.2. Post-Test Student Perceptions

Post-test questionnaire analysis revealed generally positive perceptions of translation competence teaching and learning within the COTA framework: Translation Materials (M = 3.65, SD = 0.60), Classroom Teaching and Learning (M = 3.82, SD = 0.52), and Tasks and Activities (M = 4.23, SD = 0.47). These results are summarized in Table 4. Students strongly supported specific activities, particularly understanding cultural complexities (M = 4.35, SD = 0.56), conceptual contributions (M = 4.27, SD = 0.60), and resource use for accuracy (M = 4.18, SD = 0.74). Overall, the findings indicate the model's practical benefits relative to prior experiences.

Table 4. Mean scores of the three questionnaire constructs.

Constructs	Mean	SD
Translation Materials	3.6557	0.82221
Classroom Teaching and Learning of Translation Skills and Knowledge	3.8255	0.80052
Tasks and Activities Translation	4.2367	0.65902
Total	3.9059	0.70759

4.3. Teacher Perspectives

Thematic analysis of teacher interviews identified five key themes regarding COTA implementation. These themes captured teachers' experiences with the model's blend of constructivist and objectivist principles. They highlighted its instructional value, classroom impact, resource use, student engagement, feasibility, observed effects, and areas for improvement.

4.3.1. Pedagogical Approach Perceptions

First, the teachers considered the COTA model highly effective at combining constructivist and objectivist ideals, resulting in a balanced pedagogical ecosystem. The model also addressed diverse learners' needs, encouraged exploration and critical thinking, and moved beyond traditional lecture-based and rote-memorization practices. By integrating structured knowledge delivery with authentic, problem-based activities, the model bridged theory and practice through real-life tasks, scaffolding, and reflection. As teacher T1 pointed out:

> *"This model combines elements of constructivist and objectivist theories to enhance language learning. . . learners actively construct their language understanding through interaction with authentic materials and experiences. . . while. . . explicit instruction provides structured learning tasks, and systematic presentation of language rules and patterns."*

Similarly, T2 noted:

> *". . . In the constructivist aspect, learners are encouraged to actively engage with language through authentic tasks and real-world contexts. . . Conversely, the objectivist component emphasizes explicit instruction and systematic presentation of structures and rules. . . Integrating both approaches. . . is important."*

4.3.2. Learning Environment Considerations

Regarding the learning environment, the instructors focused on creating a conducive environment and emphasized the centrality of designing resource-rich pedagogical settings. For example, T1 suggested:

> *"Creating a supportive learning environment is crucial for student success. I encourage an atmosphere where students feel comfortable asking questions, trying different approaches, and learning from mistakes. Constructive feedback and encouragement build their confidence as translators."*

Concurrently, authentic texts from varied sources were used to highlight genuine translation challenges, while technology demonstrations (e.g., translation software) and online resources supported practice. Similarly, multimedia platforms encouraged collaboration and peer review, further enriching the learning context. This was evident in T2's comment:

> *". . . I emphasize using authentic texts. . . They expose students to real-world translation challenges and encourage critical engagement with linguistic nuances and cultural contexts. . . I also integrate technology (e.g., translation software, online resources, and multimedia platforms) to provide interactive learning opportunities, immediate feedback, support for self-directed learning and skill development. Activities and projects promote collaborative learning through group discussions, peer review sessions, and collaborative translation tasks, fostering practical application and a supportive learning environment."*

4.3.3. Teaching–Learning Activities

Regarding teaching and learning activities, both teachers discussed using tasks designed to foster a positive learning environment, boost students' interest and motivation, and promote the development of their translation competence and self-directed learning

skills. Teachers emphasized that innovative pedagogical practices were used to foster active student engagement and improve learning outcomes. They also mentioned integrating constructivist and objectivist principles to design a range of learning activities, including interactive tasks, practical translation assignments, and group projects. These activities fostered collaboration and autonomous learning while stimulating students' critical thinking and problem-solving skills. Additionally, the incorporation of technology and reflective practices was highlighted as a means of enhancing the effectiveness of learning activities and tasks. For instance, T1 noted:

> *"... I integrate interactive and experiential learning activities into the curriculum... For instance, I organize group translation projects where students collaborate to translate real-world texts (e.g., advertisements, social media posts, or product descriptions), gaining practical experience and fostering teamwork and communication... I also create interactive exercises (e.g., sentence-level translations, comparative analyses, and collaborative projects) to apply theory in practice... These hands-on activities develop problem-solving and critical thinking skills, consistent with the constructivist approach."*

> *"Students can access diverse resources, interactive exercises, and immediate feedback, promoting self-directed learning and skill development. Activities and projects encourage collaborative learning and practical application of translation principles... through group discussions, peer review sessions, and collaborative translation projects, fostering a supportive environment for exchanging ideas and learning from others."*

Similarly, T2 pointed out:

> *"... I align translation tasks with students' interests and career aspirations... through group projects, students address real-world translation challenges, fostering teamwork and practical skills. I also integrate translation technology to reflect modern practices... Reflection is encouraged, students' progress is monitored, and they take ownership of their learning. By combining relevance, hands-on experience, and reflection... students become increasingly motivated and engaged in honing their translation competence, preparing them for success in diverse academic and professional contexts... the COTA model enhances translation competence by integrating active learning, practical application, and reflective practices into the curriculum, which fosters critical thinking and a supportive, real-world focused learning environment."*

4.3.4. Feasibility and Effectiveness Evaluations

The teachers observed improved accuracy, fluency, and contextual awareness in students' translations when using the COTA model. Moreover, classroom interaction and trust increased, and students demonstrated greater strategic thinking and curiosity about translation decisions. The teachers found the model practical and adaptable, and emphasized the importance of sourcing authentic materials and designing integrated tasks. When discussing differences between the COTA model and traditional approaches, T1 emphasized:

> *"In traditional translation teaching, emphasis often lies on memorizing vocabulary, grammar rules, and fixed techniques, with limited critical thinking and focus on context... Conversely, the COTA model promotes a student-centered approach, encouraging engagement with authentic texts and real-world tasks, alongside critical analysis and cultural awareness... It fosters deeper comprehension, problem-solving, and autonomy while also valuing explicit instruction through structured guidance... Overall, COTA offers a more holistic and interactive approach, emphasizing meaning, context, and critical thinking over rote memorization."*

While further elaborating on specific classroom processes, T1 suggested:

"Motivating non-English major students to develop translation competence requires active engagement, critical thinking, and practical application… Making tasks relevant to students' interests and career goals helps them recognize the value of translation skills… Incorporating reflective practices encourages students to evaluate their learning, identify challenges, and set goals, fostering metacognitive awareness and self-directed learning."

T2 provided a similar perspective:

"In traditional translation teaching, students often follow a 'set recipe,' memorizing and applying rules with limited attention to context or underlying principles, emphasizing rote learning over critical thinking… In contrast, the COTA model promotes an interactive, student-centered approach that fosters engagement, critical thinking, and problem-solving… Students analyze texts, consider cultural nuances, and make informed decisions… While traditional methods are largely teacher-led, COTA encourages collaboration and independent inquiry, supporting active student participation and ownership of learning."

4.3.5. Challenges and Suggested Solutions

Significant challenges included student diversity, varying levels of English proficiency, resistance to active learning, and maintaining translation technologies. Teachers used flexible grouping, tiered resources, motivational strategies, and individualized support to address these issues. Regular use of classroom technology, along with the development of repositories of authentic materials, was also recommended to reduce workload and sustain implementation. As T1 suggested:

"One… hurdle is students' diverse academic backgrounds and language proficiency levels. To address this, I employ flexible teaching strategies, including supplemental resources and one-on-one consultations to support individual learning needs. Moreover, fostering intrinsic motivation and engagement among students who may not initially see the value of translation skills is crucial. By contextualizing translation within real-world scenarios relevant to students' interests and career aspirations, I enhance motivation and promote active participation…"

Alternatively, T2 focused on the significance of encouraging reflective practices and critical engagement, as well as keeping materials and technologies up-to-date:

"The rapid evolution of language and technology challenges keeping teaching materials and methods up-to-date. Regular updates and the integration of emerging technologies… provide students practical experience and prepare them for the modern translation landscape… Integrating reflective practices into the curriculum promotes metacognitive awareness and continuous improvement, as encouraging students to critically evaluate their translation processes fosters self-directed learning and greater proficiency."

Regarding tangible suggestions for implementing the COTA model successfully, T1 offered:

"I… engage students… through group discussions, interactive exercises, and hands-on translation tasks, allowing them to collaborate and learn from diverse perspectives… To ensure practicality, I integrate real-world translation projects into the curriculum (e.g., articles, advertisements, or even social media posts) so students can see direct classroom applications… Reflection is [also] key to personal and professional growth. I encourage regular reflection on translation processes and outcomes through self-assessment, goal-setting, and celebrating progress, fostering a culture of reflection and proactive learning."

Alternatively, T2 suggested:

> *"... the COTA model enhances translation competence among non-English major students by integrating active learning, practical application tasks, and reflective practices ... This approach promotes meaningful engagement and the development of essential translation skills, supported by collaboration, critical thinking, and real-world relevance... Leveraging technology, including translation software and digital resources, further supports independent exploration and practice."*

4.4. Classroom Implementation

Classroom observations analyzed using Gagné's Nine Events framework revealed varying fidelity across instructional events:

- *Highest Implementation:* Presenting Content (M = 2.81, SD = 0.14) and Eliciting Performance (M = 2.79, SD = 0.15), with teachers consistently offering explanations, models, examples, and ample practice.
- *Moderate Implementation:* Informing Objectives (M = 2.65), Providing Guidance (M = 2.58), Providing Feedback (M = 2.55), and Assessing Performance (M = 2.42) were generally evident but inconsistent. Objectives were sometimes loosely linked to activities, feedback and peer input were underutilized, and assessments focused primarily on final products.
- *Lower Implementation:* Gaining attention (M = 2.35), Stimulating Recall (M = 2.28), and Enhancing Retention/Transfer (M = 2.20) were least consistent. Openings were occasionally rushed, recall Activities were superficial, and retention/transfer strategies were limited.

Overall, teachers effectively delivered core instructional components but require stronger engagement, greater activation of prior knowledge, and more explicit transfer strategies.

4.5. Intervention Effectiveness

Post-test analysis provided strong quantitative evidence of COTA's effectiveness. As shown in Table 5, the experimental group (EG) (M = 79.464, SD = 7.89682) performed significantly better than the control group (CG) (M = 73.045, SD = 7.51613). This highly significant result indicates notable improvement attributable to COTA.

Table 5. Descriptive group statistics of post-test scores between the Control Group (CG) and the Experimental Group (EG).

Group	Mean	N	SD
CG	73.045	55	7.51613
EG	79.464	55	7.89682
Total	76.254	110	8.32314

Additionally, after 10 weeks, the experimental group's mean score increased from 72.682 to 79.464 (9.33% gain), while the control group's score increased from 72.573 to 73.045 (0.65% gain). The experimental group outperformed the control by 6.419 points.

An independent samples *t*-test comparing post-test means is presented in Table 6.

The effect size (Cohen's d = 1.81) indicated a substantial effect. Subscale analysis showed significant gains for the experimental group across all three dimensions:

- *Vocabulary*: EG = 26.182 vs. CG = 24.491 ($\Delta = 1.691$, $p < 0.001$, d = 1.32);
- *Accuracy*: EG = 37.473 vs. CG = 32.491 ($\Delta = 4.982$, $p < 0.001$, d = 2.10);
- *Grammar*: EG = 15.809 vs. CG = 15.518 ($\Delta = 0.291$, $p = 0.032$, d = 0.43).

Table 6. Independent samples *t*-test.

		Levene's Test for Equality of Variances		*t*-Test for Equality of Means						
		F	Sig.	t	df	Sig. (2-Tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Post-test	Equal variances assumed	0.059	0.808	−4.366	108	0.000	−6.4186	1.470	−9.332	−3.5047
	Equal variances not assumed			−4.366	107.737	0.000	−6.4186	1.470	−9.3324	−3.505

Table 7 displays improvements across these scales.

Table 7. Mean differences in mean post-test scores of three scales for the Control Group (CG) and the Experimental Group (EG).

Dimensions	Group	Mean	N	SD
Vocabulary	CG	21.564	55	1.1982
	EG	23.473	55	1.27446
	Total	22.518	110	1.56059
Accuracy	CG	35.036	55	6.55663
	EG	38.264	55	5.90422
	Total	36.65	110	6.41835
Grammar	CG	16.927	55	2.12441
	EG	17.727	55	1.93845
	Total	17.327	110	2.06371

The findings demonstrate that COTA strengthened all aspects of translation competence, with the most significant improvement in accuracy, a skill tied to strategic decision-making and contextual understanding. This improvement was reinforced through real-world tasks and guided practice. Overall, the model's pedagogical value was strongly supported, as were both research hypotheses.

5. Discussion

First-year students demonstrated moderate translation skills at the outset, and the statistical validation of baseline equivalence across groups strengthened internal validity. The experimental group reported positive perceptions of the COTA model, particularly valuing authentic materials and collaborative learning activities. They also expressed a preference for practical translation tasks, suggesting that applied activities increased engagement and learning. The COTA model further supported an iterative learning process as teachers found the approach practical and effective in fostering balanced skill development. These findings align with research on translation pedagogy, which emphasizes authentic, collaborative learning environments that promote the development of professional competence (Kiraly, 2014). They also align with research indicating that learner-related factors such as engagement, motivation, and strategy significantly influence translation learning outcomes among university students (Jiang, 2023). Similarly, Hao and Pym (2021) highlighted how individuals engage in cycles of concrete experience, reflection, abstraction, and experimentation in complex translation tasks. Moreover, González-Davies (2004, 2020) argued that authentic tasks, when appropriately scaffolded, enable learners to transfer classroom

learning to real-world translation contexts. More broadly, these findings reflect views of translation as a situated professional activity in which learning occurs through interaction with authentic materials and collaborative problem-solving (Risku & Rogl, 2021).

5.1. COTA Model Effectiveness

Evidence supporting the post-intervention effects of the COTA model on the translation competence of non-English majors is provided by significant increases in overall scores and across specific competence areas within the experimental group. This suggests that the COTA model develops competence comprehensively rather than in isolation. In addition to these significant increases in competency within the COTA group, there were minimal, insignificant changes in the control group that received traditional instruction.

Dimensional analysis helped clarify how the COTA model exerts its effect. Accuracy was the area of greatest improvement in the COTA group relative to the control group (effect size d = 2.10). This improvement reflects the COTA model's emphasis on strategic decision-making, contextual understanding, and accurate meaning transfer in authentic paragraph-level tasks, which are typically addressed in sentence-based methodologies. Vocabulary was another area of significant improvement in the COTA group (effect size d = 1.32), primarily due to the contextually meaningful environments used in the COTA model, participants' strategic use of resources, and their ability to collaborate in lexical exploration. Finally, although grammar showed the smallest improvement (effect size d = 0.43), it was still statistically significant relative to the control group. While systematic (objectivist) instruction is likely to provide the foundation on which knowledge rests, complex tasks (constructivist) will consolidate that knowledge. From a learning-science perspective, these outcomes are consistent with research showing that structured instructional guidance can reduce cognitive overload and support skill acquisition in complex learning domains (Paas & Van Merriënboer, 2020; Sweller, 2023).

The improvement pattern described above also aligns with the PACTE Group's (2003, 2005) multidimensional framework for translational competence, as well as with Albir's (2007) work, which distinguished linguistic, strategic, and instrumental translational competencies. Therefore, the COTA model supports not only linguistic competence but also the strategic and instrumental competencies necessary for real-world translational competence, thereby further advocating holistic competence development.

5.2. Theoretical and Practical Implications

5.2.1. Theoretical Implications

This study contributes to language and translation pedagogy by integrating constructivist and objectivist paradigms. By presenting a model (COTA) that demonstrates the compatibility of these paradigms, it shows how they can be used together to maximize their benefits and mitigate their drawbacks. Jonassen (1991) argued that, due to its ill-structured nature, translation is best approached with flexible, student-centered instructional strategies that encourage problem-solving, whereas Mayer (2004) argued that students need instructional guidance to establish foundational knowledge and develop cognitive processes. These findings align with recent research in cognitive load theory, which emphasizes the value of guided instruction and structured support as learners develop expertise in complex domains (Sweller, 2023). Therefore, COTA combines both: novice students receive structured input from objectivist elements, and, through constructivist elements, they can explore, apply, and understand real-world applications. It is a practical and malleable model for teaching and addressing translation issues, particularly those affecting non-specialists.

Beyond improving translation competence, the COTA model also supports the development of intercultural competence. Through engagement with authentic texts, collaborative tasks, and reflection on meaning across linguistic and cultural contexts, students develop greater awareness of cultural nuances and communicative intent. Even in classroom settings, this exposure encourages learners to consider how language choices reflect cultural values, nuances, and perspectives, thereby strengthening their ability to navigate cross-cultural communication in academic and professional contexts.

5.2.2. Practical Implications

The results have implications for the development of translation education both in China and internationally. First, the COTA model provides a framework for developing or revising curricula for non-English majors that integrates theoretical concepts (e.g., translation methods, genre conventions) with practical project tasks, thereby providing students with real-world experience while collaborating with peers to solve problems related to professional practice. Current translator education frameworks also emphasize integrating technological literacy, collaborative practice, and professional competencies into training programs (European Commission EMT Expert Group, 2022).

Second, the findings underscore the importance of providing teachers with training in integrated translation pedagogical approaches that prioritize scaffolding, real-world project assignments, and genuine collaborative processes among students (Kelly, 2005; Risku & Rogl, 2021). By leveraging technology, authentic resources, and opportunities for students to receive constructive criticism, the COTA model improves instructional quality. The study also emphasizes the need for assessment techniques that go beyond product accuracy; these should include process-based metrics, such as student journals that document students' strategies and reflect on their thinking about their learning. These additional factors make higher-level cognitive abilities such as problem-solving, situational flexibility, and resourcefulness measurable.

Finally, the relative success of the COTA model has implications for policymakers at the institutional and national levels. For example, policymakers may encourage pedagogical innovations at all levels by supporting teachers' professional development and revising curricula and assessments to evaluate multidimensional competencies.

5.2.3. Pedagogical Implications

This study advances translation pedagogy by integrating theory and practice into instructional design, building on previous Chinese research (e.g., Dai & Lin, 2025; Jiang, 2023; X. Li, 2019; Q. Liu, 2025; Tao, 2016; Mei & Chen, 2022; Zhou & Zou, 2017). The COTA model demonstrates that instructors can provide the structure needed for authentic learning. At the beginning of a course, instructors can introduce students to the structural components of language, teach them to analyze texts, and build procedural knowledge. As the course progresses, instructors can shift from instructor-centered tasks to student-centered, project-based tasks that reflect professional translation. This progression will enable novice translators to develop the foundational knowledge necessary for success, as well as the autonomy and reflective skills required to complete complex translation tasks.

Additionally, trainer-educators can use the COTA model as a flexible, modular planning tool for trainers teaching students to translate texts across disciplines using a variety of translation technologies. The model helps students understand that translation is an iterative, problem-solving process rather than merely a product-oriented one. Professional translators' social construction of expertise is supported by the COTA model's emphasis on peer collaboration and guided reflection (Kelly, 2005; Kiraly, 2014; Risku & Rogl, 2021).

From a curriculum design perspective, it provides educators with a method for creating curricula aligned with multidimensional frameworks such as the PACTE Group (2003, 2005) model. Educators can use process-oriented tools, such as portfolios, self-evaluation logs, and collaborative projects, alongside product-based evaluation tools to assess student progress more holistically. Consequently, workshops should focus on balancing constructivist and objectivist approaches, incorporating translation technology into classes, and encouraging students to engage in reflective discourse, all of which should be part of training and development programs. When educator-trainers combine structured instruction with experiential learning, they provide their students with the training needed to become successful professional translators while maintaining academic standards.

5.3. Limitations

While the findings demonstrate the effectiveness of the COTA model, several limitations in its implementation should be acknowledged. The model requires considerable instructional planning, access to authentic materials, and familiarity with both constructivist and objectivist strategies, which may pose challenges for some instructors with limited training or resources. Moreover, the emphasis on active and collaborative learning may not align with all students' preferences, particularly in contexts where learners are accustomed to more structured, teacher-led approaches. These considerations suggest that, although COTA is pedagogically beneficial, its implementation must be adapted to local settings and supported by appropriate teacher training and institutional resources.

At the same time, because all data were collected from a single institution and the sample of medical students was relatively homogeneous, it is difficult to generalize these results to other institutions or contexts. Likewise, although the sample size (n = 110) was adequate for an exploratory investigation, it would likely be considered small for confirmatory analysis; thus, larger studies across multiple institutions will provide a more robust understanding of the educational intervention's effectiveness. Furthermore, because the educational intervention occurred over a single semester, we were unable to assess its long-term effects. Additionally, the educational assessment used in this study (CET-4) assessed only a limited range of competencies. Orozco and Hurtado Albir (2002) have recommended process-oriented measures, whereas Göpferich (2009) emphasized the need to examine skill transfer to unfamiliar or professional contexts, which this study did not address. Finally, the use of technology in COTA was not scientifically quantified, although it is an increasingly significant area of translation research (e.g., Bowker & Buitrago Ciro, 2020; Briva-Iglesias et al., 2023; Man et al., 2020). Future research should extend the duration, diversify samples and measures, and examine more extensive technology integration.

5.4. Recommendations for Future Research

Recommendations for future research include replicating COTA studies across Chinese universities, in non-English disciplines, and in diverse global settings. Future studies should also examine the extent to which the COTA framework can be adapted to institutionally and culturally diverse settings. Additionally, researchers should investigate whether the long-term effects of the COTA approach influence students' professional preparedness and employability. Longitudinal studies can assess how students retain translation skills over time and account for differences in initial proficiency. Developing and using assessment instruments that measure all aspects of translation competence is also important. Orozco and Hurtado Albir (2002) argued for tools to evaluate cognitive processes such as strategic thinking and psychophysiological responses to better understand how students use the COTA approach in real time. Furthermore, technology-enhanced COTA research should investigate how CAT tools can be effectively integrated into the COTA approach

(Bowker & Buitrago Ciro, 2020; Briva-Iglesias et al., 2023; Jia et al., 2025; Lyu & Han, 2023; Man et al., 2020). Studies of teacher cognition should focus on how teachers make decisions when implementing the COTA approach. Göpferich (2009) emphasized the need to investigate how sub-competences, such as strategic and instrumental skills, transfer from the classroom to professional settings. By investigating these dimensions, researchers can develop an empirically grounded, highly valid model, assess its scalability, and support a broader range of applications for the COTA model.

6. Conclusions

The COTA model improved the translation proficiency of non-English-major students. Objectivist views of teaching shaped the structure of knowledge transfer, whereas constructivist views influenced how students were engaged through real-world problems and collaborative settings. Evidence from test results, survey data, interview responses, and observational data collectively supports the model's effectiveness and ease of implementation, and students' positive perceptions. From a theoretical perspective, the study provides evidence for a hybrid pedagogical model that lies outside the traditional paradigms of translation studies, while offering practical, theoretically sound advice for curriculum development for teacher educators seeking to enhance their pedagogical approaches and for policymakers seeking to implement reforms grounded in empirical research. Moreover, the combination of structured classroom instruction (objectivism) and experiential learning (constructivism) creates a balanced pedagogy that improves translation pedagogy. The COTA model was successful in a Chinese non-English-major context; thus, it has potential for use in other contexts. The design of the COTA model supports the development of students' practical translation abilities, and institutions should consider similar innovative models to enhance their students' translation training and, ultimately, foster globally competent graduates. Building on these findings, educators should consider adopting integrated approaches such as COTA that combine structured instruction with authentic, collaborative learning, while adapting implementation to local contexts and learner needs. Given the study's limitations, future research should examine larger and more diverse samples, longitudinal effects, and broader dimensions of translation and intercultural competence to further assess the scalability and impact of COTA.

Author Contributions: Conceptualization, Z.L.; Methodology, Z.L.; Software, Z.L.; Validation, Z.L., D.L. and N.G.; Formal Analysis, Z.L., D.L. and N.G.; Investigation, Z.L. and D.L.; Resources, Z.L.; Data Curation, Z.L.; Writing—Original Draft, Z.L., D.L. and N.G.; Writing—Review & Editing, Z.L., D.L. and N.G.; Visualization, Z.L.; Supervision, Z.L. and D.L.; Project Administration, Z.L., D.L. and N.G. All authors have read and agreed to the published version of the manuscript.

Funding: The authors have no sources of funding to declare.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki, and approved by the SEGi Research Ethics Committee on 1 July 2023 (Approval no. SEGiEC/SR/FOELPM/238/2023-2024).

Informed Consent Statement: Informed consent was obtained from all study participants.

Data Availability Statement: The data supporting the findings of this study are available from the authors upon request. The data are not publicly available due to privacy or ethical restrictions.

Acknowledgments: The authors thank the participants for making this research possible.

Conflicts of Interest: The authors declare no conflicts of interest.

References

Aladini, A., & Gheisari, A. (2025). Exploring motivation, willingness to communicate, and intercultural competence development in digital language exchanges: An integrative theoretical approach. *Computers in Human Behavior Reports*, *20*, 100819. [CrossRef]

Albir, A. H. (2007). Competence-based curriculum design for training translators. *The Interpreter and Translator Trainer*, *1*(2), 163–195. [CrossRef]

Amini, M., Ravindran, L., & Lee, K. F. (2022). A review of the challenges and merits of collaborative learning in online translation classes. *Journal of Research, Policy & Practice of Teachers and Teacher Education*, *12*(1), 69–79. [CrossRef]

Anderson, J. R. (1976). *Language, memory, and thought*. Lawrence Erlbaum Associates.

Atkinson, R. C., & Shiffrin, R. M. (1968). Human memory: A proposed system and its control processes. In K. W. Spence, & J. T. Spence (Eds.), *Psychology of learning and motivation* (Vol. 2, pp. 89–195). Academic Press. [CrossRef]

Babbie, E. R. (2020). *The practice of social research* (15th ed.). Cengage.

Bland, J. M., & Altman, D. G. (1997). Statistics notes: Cronbach's alpha. *BMJ*, *314*(7080), 570–572. [CrossRef]

Bowker, L., & Buitrago Ciro, J. (2020). *Machine translation and global research: Towards improved machine translation literacy in the scholarly community*. Emerald.

Braun, V., & Clarke, V. (2008). Using thematic analysis in psychology. *Qualitative Research in Psychology*, *3*(2), 77–101. [CrossRef]

Briva-Iglesias, V., O'Brien, S., & Cowan, B. R. (2023). The impact of traditional and interactive post-editing on machine translation user experience, quality, and productivity. *Translation, Cognition & Behavior*, *6*(1), 60–86. [CrossRef]

Brown, J. S., Collins, A., & Duguid, P. (1989). Situated cognition and the culture of learning. *Educational Researcher*, *18*(1), 32–42. [CrossRef]

Century, J., Rudnick, M., & Freeman, C. (2010). A framework for measuring fidelity of implementation: A foundation for shared language and accumulation of knowledge. *American Journal of Evaluation*, *31*(2), 199–218. [CrossRef]

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches* (5th ed.). Sage.

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). Sage Publications.

Dai, T., & Lin, S. E. (2025). Integrating scientific rigor and practicality: Developing a translation test to screen translation undergraduates' ability in a public university in China. *Humanities and Social Sciences Communications*, *12*(1), 1662. [CrossRef]

Delice, A. (2003). The sampling issues in quantitative research. *Educational Sciences: Theory & Practice*, *10*(4), 2001–2018.

Dignath, C., & Veenman, M. V. J. (2021). The role of direct strategy instruction and indirect activation of self-regulated learning—Evidence from classroom observation studies. *Educational Psychology Review*, *33*(2), 489–533. [CrossRef]

European Commission EMT Expert Group. (2022). *EMT competence framework 2022*. Available online: https://commission.europa.eu/document/download/b482a2c0-42df-4291-8bf8-923922ddc6e1_en?filename=emt_competence_fwk_2022_en.pdf (accessed on 30 March 2026).

Field, A. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage Publications.

Fraenkel, J. R., Wallen, N. E., & Hyun, H. H. (2015). *How to design and evaluate research in education* (9th ed.). McGraw-Hill.

Gagné, R. M., Briggs, L. J., & Wager, W. W. (1992). *Principles of instructional design* (4th ed.). Harcourt Brace.

Gagné, R. M., Wager, W. W., Golas, K. C., & Keller, J. M. (2004). *Principles of instructional design* (5th ed.). Wadsworth Publishing.

González-Davies, M. (2004). *Multiple voices in the translation classroom: Activities, tasks, and projects*. John Benjamins.

González-Davies, M. (2020). Developing mediation competence through translation. In S. Laviosa, & M. González-Davies (Eds.), *The Routledge handbook of translation and education* (pp. 434–450). Routledge.

Göpferich, S. (2009). Towards a model of translation competence and its acquisition: The longitudinal study TransComp. In S. Göpferich, A. L. Jakobsen, & I. M. Mees (Eds.), *Behind the mind: Methods, models and results in translation process research* (pp. 11–38). Samfundslitteratur.

Hao, Y., & Pym, A. (2021). Translation skills required by Master's graduates for employment: Which are needed, which are not? *Across Languages and Cultures*, *22*(2), 158–175. [CrossRef]

He, J., Wang, H., Xia, J., & He, X. (2024). An ecological perspective on learner agency: The case of Chinese tertiary-level EFL students in peer reviews. *System*, *121*, 103222. [CrossRef]

Hodell, C. (2025). *ISD from the ground up: A no-nonsense approach to instructional design* (4th ed.). American Society for Training and Development.

Hua, Z., Harris, A., & Ollin, R. (2011). Student autonomy and awareness: Vocational education and student-centred learning in China. *Journal of Vocational Education and Training*, *63*(2), 191–203. [CrossRef]

Jia, L., Qi, C., Wei, Y., Sun, H., & Yang, X. (2025). Fine-tuning large language models for educational support: Leveraging Gagne's nine events of instruction for lesson planning. *arXiv*, arXiv:2503.09276. [CrossRef]

Jiang, C. (2023). Effect of learner factors on Chinese undergraduates' translation learning performance: A moderated mediation model. *Sage Open*, *13*(2), 1–12. [CrossRef]

Jonassen, D. H. (1991). Objectivism versus constructivism: Do we need a new philosophical paradigm? *Educational Technology Research and Development*, *39*(3), 5–14. [CrossRef]

Jonassen, D. H. (1994). Thinking technology: Toward a constructivist design model. *Educational Technology*, *34*(4), 34–37.
Jonassen, D. H. (1999). Designing constructivist learning environments. In C. M. Reigeluth (Ed.), *Instructional-design theories and models: A new paradigm of instructional theory* (Vol. 2, pp. 215–239). Lawrence Erlbaum Associates.
Kelly, D. (2005). *A handbook for translator trainers: A guide to reflective practice*. Routledge.
Kiraly, D. (2014). *A social constructivist approach to translator education: Empowerment from theory to practice*. Routledge. [CrossRef]
Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge University Press. [CrossRef]
Li, J. (2021). Perceived effects of CET4 test preparation, language ability, and test performance: An exploratory study of Chinese EFL learners. *Language Education & Assessment*, *4*(2), 38–58. [CrossRef]
Li, X. (2019). Material development principles in undergraduate translator and interpreter training: Balancing between professional realism and classroom realism. *The Interpreter and Translator Trainer*, *13*(1), 18–43. [CrossRef]
Lister, R. F., & Leaney, J. R. (2003). Bad theory versus bad teachers: Towards a pragmatic synthesis of constructivism and objectivism. In *Higher education research and development society of Australasia annual conference*. Higher Educational Research and Development Society of Australasia. Available online: https://opus.lib.uts.edu.au/bitstream/10453/2096/3/2003002004..pdf (accessed on 10 May 2026).
Liu, Q. (2025). The influence of autonomous learning on English majors' Chinese-English translation competence in China: A case study. *AWEJ for Translation & Literary Studies*, *9*(3), 55–70. [CrossRef]
Liu, X. M., & Liu, J. L. (2013). The problems and countermeasures in college English translation teaching. *Shandong Foreign Languages Teaching Journal*, *156*(5), 71–75.
Liu, Y., & Zheng, B. (2022). Comparability of difficulty levels of translation tasks in CET-6 parallel test forms: Evidence from product and process-based data. *The Interpreter and Translator Trainer*, *16*(4), 428–447. [CrossRef]
Lyu, Y., & Han, Z. (2023). Applying data-driven learning in self-translation of academic discourse: A case study of a Chinese medical student. *Frontiers in Psychology*, *14*, 1071123. [CrossRef]
Man, D., Mo, A., Chau, M. H., O'Toole, J. M., & Lee, C. (2020). Translation technology adoption: Evidence from a postgraduate programme for student translators in China. *Perspectives*, *28*(2), 253–270. [CrossRef]
Mayer, R. E. (2004). Should there be a three-strikes rule against pure discovery learning? The case for guided methods of instruction. *American Psychologist*, *59*(1), 14–19. [CrossRef]
McNeill, L., & Fitch, D. (2023). Microlearning through the lens of Gagne's nine events of instruction: A qualitative study. *TechTrends*, *67*(3), 521–533. [CrossRef] [PubMed]
Mei, H., & Chen, H. (2022). Assessing students' translation competence: Integrating China's standards of English with cognitive diagnostic assessment approaches. *Frontiers in Psychology*, *13*, 872025. [CrossRef]
Neves, J. (2022). Project-based learning for the development of social transformative competence in socially engaged translators. *The Interpreter and Translator Trainer*, *16*(4), 465–483. [CrossRef]
Orozco, M., & Hurtado Albir, A. (2002). Measuring translation competence acquisition. *Meta*, *47*(3), 375–402. [CrossRef]
Ouyang, G. (2024). Study on the interaction between teachers and students in English translation teaching in Yunnan colleges and universities from the perspective of constructivist theory. *Frontiers in Educational Research*, *7*(4), 132–137. [CrossRef]
Paas, F., & Van Merriënboer, J. J. G. (2020). Cognitive-load theory: Methods to manage working memory load in the learning of complex tasks. *Current Directions in Psychological Science*, *29*(4), 394–398. [CrossRef]
PACTE Group. (2003). Building a translation competence model. In F. Alves (Ed.), *Triangulating translation: Perspectives in process oriented research* (pp. 43–66). John Benjamins Publishing Company. [CrossRef]
PACTE Group. (2005). Investigating translation competence: Conceptual and methodological issues. *Meta*, *50*(2), 609–619. [CrossRef]
Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed-method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *42*(5), 533–544. [CrossRef]
Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). Sage Publications.
Piaget, J. (1970). *Genetic epistemology* (E. Duckworth, Trans.). Columbia University Press. [CrossRef]
Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, *29*(5), 489–497. [CrossRef]
Pourfarhad, M., Davoudi, M., Zareian, G., & Amirian, S. M. R. (2018). Translation strategies used in behaviourist, cognitive, and constructivist approaches to translation instruction. *International Journal of Instruction*, *11*(4), 139–158. [CrossRef]
Risku, H., & Rogl, R. (2021). Translation and situated, embodied, distributed, embedded and extended cognition. In F. Alves, & A. Jakobsen (Eds.), *The Routledge handbook of translation and cognition* (pp. 478–499). Routledge.
Saleem, A., Kausar, H., & Deeba, F. (2021). Social constructivism: A new paradigm in teaching and learning environment. *Perennial Journal of History*, *2*(2), 403–421. [CrossRef]
Savery, J. R., & Duffy, T. M. (1996). Problem-based learning: An instructional model and its constructivist framework. In B. G. Wilson (Ed.), *Constructivist learning environments: Case studies in institutional design* (pp. 135–150). Educational Technology Publications.

Shadish, W. R., Cook, T. D., & Campbell, D. T. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin.

Skinner, B. F. (1953). *Science and human behavior*. Macmillan.

Sweller, J. (2023). The development of cognitive load theory: Replication crises and incorporation of other theories can lead to theory expansion. *Educational Psychology Review*, *35*, 95. [CrossRef]

Taber, K. S. (2024). Educational constructivism. *Encyclopedia*, *4*(4), 1534–1552. [CrossRef]

Tao, Y. (2016). Translator training and education in China: Past, present and prospects. *The Interpreter and Translator Trainer*, *10*(2), 204–223. [CrossRef]

Tracy, S. J. (2010). Qualitative quality: Eight "big-tent" criteria for excellent qualitative research. *Qualitative Inquiry*, *16*(10), 837–851. [CrossRef]

Tyler, R. W. (1949). *Basic principles of curriculum and instruction*. University of Chicago Press.

Von Glasersfeld, E. (1989). Cognition, construction of knowledge, and teaching. *Synthese*, *80*(1), 121–140. [CrossRef]

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes*. Harvard University Press.

Williams, M., & Burden, R. (1997). Motivation in language learning: A social constructivist approach. *Les Cahiers de l'APLIUT*, *16*(3), 19–27. [CrossRef]

Yang, R. (2008). Transnational higher education in China: Contexts, characteristics and concerns. *Australian Journal of Education*, *52*(3), 272–286. [CrossRef]

Zhou, Y., & Zou, L. (2017). Cultivation of translation competence—A study on translation teaching in college English teaching in Leshan Normal University, Sichuan, China. *Journal of Language Teaching and Research*, *8*(4), 756–760. [CrossRef]