

# The Effect of Critical Thinking on Translation Technology Competence Among College Students: The Chain Mediating Role of Academic Self-Efficacy and Cultural Intelligence

Xiang Li , Zhaoyang Gao, Hong Liao 

School of Foreign Languages and Cultures, Panzhihua University, Panzhihua, 617000, People's Republic of China

Correspondence: Zhaoyang Gao, School of Foreign Languages and Cultures, Panzhihua University, Panzhihua, 617000, People's Republic of China, Email [gavinstudy@126.com](mailto:gavinstudy@126.com)

**Background:** It is increasingly essential for translators to possess a high level of technological proficiency to succeed in their work, as technology is becoming an integral part and common practice of the translation industry. Several previous studies found that critical thinking, academic self-efficacy, and cultural intelligence independently influenced the translation competence of college students. However, the underlying psychological mechanism through which these salient factors affect student translators' technology competence has not been fully explored. Therefore, this research sought to examine the systematic interactions between critical thinking, academic self-efficacy, cultural intelligence, and translation technology competence among college students.

**Methods:** This study adopted an empirical approach to collect data from 663 seniors from 7 colleges in China. The questionnaires of the Critical Thinking Disposition Scale (CTDS), General Academic Self-Efficacy Scale (GASE), Short Form measure of Cultural Intelligence (SFCQ), and Translation Technology Competence Scale (TTCS) were used for the online survey. The quantitative data were investigated by employing descriptive statistics with SPSS 27, covariance-based structural equation modelling with AMOS 24 to test the proposed hypotheses by assessing relationships between observed and latent variables, and bootstrap method with PROCESS 3.5 to examine the mediating effects.

**Results:** Critical thinking, academic self-efficacy, and cultural intelligence were significant predictors of students' translation technology competence. Additionally, academic self-efficacy and cultural intelligence acted as independent and chain mediators in the relationship between critical thinking and student translators' technology competence.

**Conclusion:** The findings provide valuable insight into how psychological factors, including critical thinking, academic self-efficacy, and cultural intelligence, can impact students' competence in translation technology. This study contributes to future research and practices that seek to understand how these psychological factors can be leveraged to promote students' success in translation technologies.

**Keywords:** academic self-efficacy, critical thinking, cultural intelligence, student translator, translation technology competence

## Introduction

Translation plays an increasingly crucial role in the exchanges between different cultures and peoples as the world economy continues to expand and communication becomes more accessible.<sup>1</sup> It is critical to nurture professional and qualified translators to meet the growing demand from society and facilitate the sustainable development of the translation industry. Researchers and educators have made a large number of efforts in identifying and developing translation competences,<sup>2-5</sup> among which translation technology competence is receiving growing attention because the conventional manual translation is no longer able to keep up with modern demands due to its inefficiency and high cost.<sup>6</sup> In contrast, the constant advancements of information technology and computer science, particularly the breakthroughs in the application of artificial intelligence in natural language processing, brought machine translation into a new stage.<sup>7</sup>

The language service industry is witnessing the indispensable use of translation technologies in its business practices.<sup>8</sup> The industrial transformation poses intrinsic requirements for translators to have sufficient related technology competencies. Nonetheless, there is a paucity in terms of what makes the specific translation technology competence that modern translators should be equipped with. To address such a research gap, the present study proposes practical and systematic constituents of translation technology competence of student translators, the major potential workforce in the translation businesses.

At the same time, the psychology of translators is pertinent to translation tasks because they involve social, emotional, behavioral, and cognitive processes.<sup>9</sup> Beyond general language undertaking, scholars have investigated translation as a complicated cognitive endeavor.<sup>10–12</sup> The process of translating and the development of translators' skills and career all involve cognitive psychology, which investigates the enigmatic functions of the human mind that is unable to be observed directly.<sup>13</sup> However, few efforts have been made in the academic community to examine the psychological factors that impact student translators' translation technology competence. Meanwhile, the existing research mostly concentrated on the direct effects of some cognitive psychology constructs, such as critical thinking, self-efficacy, cultural intelligence, etc., on translation performance or competence, neglecting to investigate and pinpoint the underlying psychological mechanism for the specific technology competence.

A few studies confirmed that critical thinking had a positive and significant influence on translation competence.<sup>14–16</sup> The act of translating may be perceived as a problem-solving process in which the translator comes across issues from multiple sources and employs resources and methods to address them.<sup>17</sup> Translation involves the thinking of translators, while critical thinking is extremely important from this perspective. It necessitates the capacity to analyze and evaluate information, make informed judgements and draw reasoned conclusions.<sup>18</sup> No computer program or machine translation engine can generate perfect translation output so far. Translators must make complicated decisions in response to a variety of challenges while engaging in the sophisticated decision-making process of translation.<sup>19,20</sup> They have to critically choose the best results from the various possible translation alternatives and perform proper postediting.

Translation and interpreting academics have taken a keen interest in the concept of self-efficacy, a critical construct of cognitive psychology.<sup>21,22</sup> A person's self-confidence, motivation, choice-making, perseverance in the face of challenges, and performance can all be influenced by this fundamental explanatory concept.<sup>23</sup> Self-efficacy is a key component of human agency and self-control, and it affects a person's expectations and commitment to specific tasks.<sup>24</sup> Self-efficacy in translation refers to the translators' belief in their competence to translate a certain text under a given set of contexts and conditions.<sup>25</sup> High degrees of self-efficacy in translation increase translators' confidence in their capacity to carry out translation tasks.<sup>26</sup> When they encounter setbacks or challenges during translation endeavors, they are more likely to repeat efforts and generate satisfying translation performance. Self-efficacy is essential in the translation process as it has shown positive correlations with reading comprehension in the source language, perceptions of translation demands, and the ability to solve translation-related issues.<sup>27</sup> However, these prior studies showed that self-efficacy is positively related to overall translation competence, but few studies were found to explore the relationship between academic self-efficacy, a specific domain of self-efficacy in education context, and translation technology competence, a sub-competence of general translation competence.

Cultural intelligence of translators was also proved to positively affect their translation competence.<sup>28,29</sup> Translation is a cognitive process that necessitates the utilization of innovative solutions to tackle textual, social, and cultural challenges.<sup>30</sup> It involves the linguistic conversation between at least two languages, while culture is an essential constituent of any language. Since rendering a text into another language while preserving the intended message is the essence of translation,<sup>31</sup> the act of translating can be viewed as a bilateral endeavor that requires the practitioners to have sufficient cultural knowledge to fully comprehend the meaning and generate culturally-accepted translations.<sup>32</sup> Translation quality is maintained by the translators' ability to draw upon their understanding of both the source and target cultures when conveying the cultural elements present in the original text.<sup>33</sup> Translators with strong cultural intelligence will encounter fewer cultural barriers in the translation process and facilitate the application of translation technologies in cross-cultural contexts.

The above brief literature review demonstrated that critical thinking, self-efficacy, and cultural intelligence had a positive influence on translation competence. However, limited research has been done on the interactions between

these cognitive psychological factors and translation technology competence. Since student translators' technology competence plays an increasingly critical role in their translation performance and future career prospects, a systematic investigation into the influencing factors would facilitate the effective development of translation talents, enhance their domain-specific competence and provide insights for pedagogical practices. The necessity of a structural model in this specific research area stems from the intricate interconnections of critical thinking, academic self-efficacy, and cultural intelligence, as they are deemed to be independently associated with translation technology competence. However, the existing literature has yet to provide a thorough understanding of how these constructs jointly contribute to students' competences in utilizing translation technology. The proposed structural model aims to bridge this gap and provides several theoretical, practical and methodological benefits.

In the meanwhile, the existing studies primarily focused on general translation competence. Various researchers have proposed the constituents of overall translation competence and developed multi-factor translation competence models. Some models included technology-related sub competences such as instrumental competence,<sup>34,35</sup> tools and research competence,<sup>2</sup> and technology.<sup>36</sup> Little attention has made in detecting the specific elements of translation technology competence of student translators.

To address the gaps in the existing studies and provide references for future research and practices, the current study seeks to answer the following questions:

1. What are the specific elements of student translators' translation technology competence?
2. How do critical thinking, academic self-efficacy, and cultural intelligence systematically interact with the translation technology competence of student translators?
3. How can higher education institutions and translation trainers improve students' translation technology competence through the interference of critical thinking, academic self-efficacy, and cultural intelligence?

To achieve these research objectives, Section 2 identifies the translation technology competence and develops a sub-scale to measure it on the basis of the prior studies. It also proposes the hypothesis to be examined in the empirical investigation through literature review. Section 3 presents the research methods, instruments and procedure with the help of SPSS 27, Amos 24, and PROCESS 3.5. Section 4 reports the results of the survey and the hypothesis. Section 5 and 6 discuss the implications of these test results and offers feasible suggestions for improving student translators' translation technology competence based on the findings. Section 7 and 8 points out the limitations for future research and briefly concludes the research.

## Literature Review and Hypothesis Development

### Translation Competence

Translation competence entails a multifaceted complexity, necessitating a range of procedures and elements.<sup>4,37,38</sup> It is defined as "the underlying system of knowledge, abilities, and attitudes required to be able to translate".<sup>3</sup> It refers to the capabilities to effectively and accurately translate a source text from one language to another with a variety of skills, from knowledge of the source language to an understanding of the target language, expressing complex ideas clearly and faithfully and meeting specific requirements of the translation tasks.<sup>5</sup> From the linguistic point of view, translation competence is seen as the combination of abilities required to complete reading, writing, and conversion tasks between different languages.<sup>9</sup> Such competence is essential to generate high-caliber target texts that follow all the standards of the translation industry from a product viewpoint.<sup>39</sup>

Many researchers have endeavored to identify the elements of translation competence and recommended various sets of criteria, indicating that the construct of translation competence is still evolving and not established yet.<sup>38,40-44</sup> Several multi-dimensional models of translation competence have been examined and validated by different empirical evidence regarding the actions and cognitive activities of translators and interpreters. For example, the PACTE model suggests that translation competence is composed of "bilingual, extra-linguistic, knowledge of translation, instrumental, strategic sub-

competences, and psycho-physiological components”.<sup>34,35</sup> Kelly<sup>45</sup> identified two more components in her translation competence model than what the PACTE group did, which include

communicative and textual competence, subject area competence, professional and instrumental competence, psycho-physiological or attitudinal competence, interpersonal competence, strategic competence, and cultural and intercultural competence.

Göpferich<sup>2</sup> proposed a translation competence model that consists of

strategic competence and motivation, communicative competence in source and target language, domain competence, tools, and research competence, translation routine activation competence, and psycho-motor competence.

The EMT competence framework developed by an expert group of European Masters in Translation in 2009 and updated by the EMT Board includes “language and culture, translation, technology, personal and interpersonal, and service provision” that equips and enables graduates of translation studies to possess the essential expertise and competences for the future workplace.<sup>36</sup> It is evident that these models propose varied facets of translation competence, each with its own distinct emphasis, but possessing some common elements.<sup>9</sup>

## Translation Technology Competence

Over the past few years, tremendous strides have been made in the field of language and translation technology as a result of the accelerated progress of computer science, information technology, artificial intelligence, and big data.<sup>46,47</sup> Such technological advancements have led to more sophisticated and efficient language and translation systems than ever before, which are proving to be a powerful tool for improving translation performance.<sup>48</sup> The capability to employ such tools has become a critical skill that associates with other competences to promote translation proficiency.<sup>49</sup> This transition has been a significant change in the field of translation, allowing more efficient and effective translation practices. As an integral component of translation competence, technology competence enables translators to attain better results in a shorter amount of time. Furthermore, it provides a range of options that may otherwise not be available in the traditional manual translation context, allowing translators to broaden their range of services. Drawing on the findings of the existing studies, the present research proposes a translation technology competence with six elements, ie, machine translation, post-editing, information literacy, terminology management, translation memory, and computer-aided translation.

### Machine Translation

Traditionally, machine translation has been associated with the technology competence of translators.<sup>50</sup> The employment of machine translation as a part of the translation process has enabled translators to increase their production in a multitude of areas within the language service business.<sup>51</sup> In certain areas of language services, translators are expected to take advantage of machine translation as a helpful assistant in producing the target text, as it can result in more accurate translations and improve the efficiency of translators.<sup>52</sup> In light of the increasing prevalence of machine translation in the translation sector, higher education institutions providing translation programs have added machine translation to the curriculum so that translation students can become competitive in the job market.<sup>53</sup> The widespread application of machine translation in educational endeavors showed that machine translation has contributed to the growth and acquisition of students’ translation competence.<sup>48</sup> It increases students’ knowledge of the source and target languages and their ability to transfer information between them.<sup>54</sup>

### Post-Editing

The increasing acknowledgment of machine translation from both the providers and users of translation services has opened up the potential for post-editing machine translation results as a profitable venture for translation businesses.<sup>55</sup> Post-editing is a sophisticated linguistic undertaking of revising a text that has been generated by a machine translation program.<sup>56</sup> It involves reviewing and improving machine translation output to guarantee that it is accurate, consistent, and fit for purpose. Post-editing is the most effective approach for ensuring that the translated text meets the needs of the clients and reflects the intended meaning with the right tone and style.<sup>57</sup> The use of post-editing is prevalent in improving

computer-assisted translation tools through the utilization of machine translation technology, with human translators making the necessary changes to machine-generated translations.<sup>58</sup> Researchers and businesses have found that post-editing is more efficient than traditional human translation without sacrificing the quality of the output.<sup>59-61</sup> As a result, the growing demand for language services has led to translation agencies relying more heavily on post-edited machine translation systems,<sup>62</sup> which requires translators to take on the role of post-editors.<sup>63,64</sup>

### Information Literacy

Practitioners, educators, and researchers have generally accepted information literacy as a crucial component of translation competence.<sup>65</sup> The ability to find and utilize information is acknowledged as an essential competence in a variety of translation models, such as the PACTE Model or EMT translation competence framework. Since translators need to acquire intra- and extra-linguistic knowledge by seeking information to make decisions and address issues in the process of translation, information literacy is critical to translation careers and serves as the foundation for translators' lifelong learning.<sup>66</sup> When faced with ambiguities or difficulties during translation, translators can find feasible and quick solutions with the help of electronic dictionaries, online knowledge-sharing platforms, and search engines.<sup>67,68</sup> The introduction of the internet has also dramatically expanded the information sources accessible to translators, transformed the way of searching for information in translation activities, and improved the effectiveness and efficiency of the information-seeking process.<sup>69,70</sup>

### Terminology Management

Terminology management in translation is the process of identifying, extracting, collecting, applying, storing, and keeping term records up to date.<sup>71</sup> The utilization of accurate terminology and their effective management are proved to be critical components of the quality control system for translation production and multilingual services.<sup>72,73</sup> Organizing terms into the pertinent conceptual frameworks helps translators build up their expertise in the specialized field, thus facilitating faithful translation of the source text.<sup>74,75</sup> Using a bilingual corpus to access existing translations to extract domain-specific terms enables translators to rapidly and effectively obtain relevant terminology for their translation tasks.<sup>76</sup> Incorrect use of terminology by the translator can lead to major problems in the translation process because a single mistake in terminology can have an effect on future translations as it is used as a basis for translation programs.<sup>53</sup> Since terminological analysis provides the foundation for recognizing fundamental ideas in a specific field and the language resources necessary to render them, students are instructed to construct terminological databases and acquire terminology management skills in the related domain to grow the relevant competences that will empower them to reach professional-level translations.<sup>77</sup>

### Translation Memory

Translation memory is a kind of assistance to translators which retains source and target-language sentences in a database and can automatically locate the translations of those sentences in a new document if they exist in the database.<sup>78,79</sup> Translators are provided with a source-target segment pair when a pertinent match is identified between the segments of the new text to be translated and the source text segments of the database during the process of translation.<sup>80</sup> Translation memory tools have become popular solutions for increasing productivity and quality in translation practices since it allows users to leverage previous work and ensure consistency across multiple projects.<sup>81,82</sup> Translation memory is a useful asset for translators by referencing, reusing, and customizing existing human-translated texts when creating new translations.<sup>53</sup> It is especially advantageous in areas with a high frequency of specialized language and textual structures, such as legal documents and technical materials.<sup>83</sup>

### Computer-Aided Translation

A high level of translation technology competence implies the capacity to proficiently utilize computer-assisted translation software and other computer programs that help translators process computer files in various formats, search documents, and leverage databases.<sup>84</sup> The growing complexity of translation projects and the heightened specialization in translation businesses have made it essential for translators to utilize computer-assisted translation tools to meet the demands of their tasks<sup>85</sup> and efficiently fulfill translation processes.<sup>58</sup> These tools enable translators to build their own

sets of saved translations that can be reused in their projects, shared with peers, and utilized for both business and academic applications.<sup>86</sup> The majority of professional translators favor computer-assisted translation for repetitive tasks, and it is possible for them to reuse existing translations efficiently.<sup>87,88</sup> At the same time, most translators employed in major organizations and corporations have adopted computer-assisted translation programs in their translation practices because these tools can create an efficient workspace for the successful management and execution of translation projects.<sup>89</sup> In the school context, computer-aided translation courses of a high standard are indispensable to develop translators with various capabilities because they provide students with the opportunity to acquire the skills and knowledge necessary to become successful professionals in the field of translation and keep them updated with the latest technologies and methods that are being used in the industry.<sup>90</sup> For example, Rodríguez-Castro<sup>85</sup> adapted the conventional translation syllabus to integrate extra translation competences that close the space between school education and current industry requirements and expedite the attainment of technical abilities through the most popular computer-aided translation tools in the translation business: SDL Trados Studio, MemoQ and WordFast. It is acknowledged that the proficiency of computer-aided translation tools forms a crucial part of the translator's skill set, which reinforces the value of these tools in the training of translators.<sup>91</sup>

## Critical Thinking and Translation Technology Competence

The ability to think critically is the key to improving college student translators' translation competence<sup>14,92</sup> since the assessment of the expectations of the target readers and the appropriate selection of translation strategies or methods are both closely tied to the critical examination of resources.<sup>93</sup> Critical thinking is proven to be crucial in today's society since it helps individuals arrive at the optimal option by weighing the possibilities.<sup>94</sup> It is highly correlated with translation performance, and students' greater critical thinking skills lead to higher performance on translation tasks and tests.<sup>15,95-97</sup> For example, empirical studies conducted at Chifeng University in China,<sup>98</sup> King Khalid University in Saudi Arabia,<sup>16</sup> and a Thai university<sup>99</sup> revealed that critical thinking significantly enhanced students' translation skills from Chinese, Arabic, and Thai to English. The postgraduates pursuing degrees in the Master of Translation and Interpreting program gained a significant amount of critical thinking and problem-solving skills based on an interactive teaching and learning model, which accordingly promoted their translation competence as future professional translators.<sup>100</sup> Through the "data-driven learning college English translation teaching model", students were open to discussing their answers and looking for justifications for their choices, which greatly enhanced their translation capabilities.<sup>101</sup> As a sub-competence of translation competences, translation technology competence is also impacted by critical thinking skills. When given the responsibility of reviewing machine translation work, students are expected to acquire critical thinking ability<sup>102</sup> because the performance of machine translation post-editing was affected by translator's critical thinking through self-regulation.<sup>62</sup> Thus, the following hypothesis was put forward:

H1: Student translators' critical thinking has a positive and significant impact on their translation technology competence.

## Academic Self-Efficacy and Translation Technology Competence

Self-efficacy refers to a person's ability to perform a particular activity according to their own assessments using their existing talents.<sup>103</sup> People's preconceptions about their own abilities to effectively accomplish specific tasks tend to have a significant impact on the subsequent results.<sup>104</sup> Individuals with higher levels of self-efficacy are more likely to be motivated to hold on to a goal for a longer time and spend more effort once they have begun pursuing the goal.<sup>23</sup> Additionally, self-efficacy aids in quicker recovery after setbacks.<sup>105</sup> In the translation context, self-efficacy refers to a translator's confidence in their ability to carry out the steps necessary to effectively generate appropriate results for a specific translation task.<sup>21</sup> Since perceptions of hardship in comprehending source texts and the capacity to bear cognitive burdens can be advantageous to translation, general self-efficacy and the capability to execute complicated translation tasks are closely correlated.<sup>106</sup> Self-efficacy can affect the way cognitive resources are allocated as well as how much work and tenacity are used to fulfill the translation.<sup>21</sup> It is vital for process-focused research on translation that takes into account a translator's ability to read fluently in the original language, their level of ambiguity tolerance, and their documentation skills.<sup>27</sup> When it comes to utilizing problem-solving tactics to complete a translation project, the

group of college students who specialized in translation studies with higher levels of self-efficacy produced more text per minute than the low-efficacy group.<sup>107</sup>

In terms of translation technology competence, training in translation technology may produce better learning results for students who have stronger self-efficacy in their capacity to develop skills.<sup>22</sup> Students with higher self-efficacy may feel less anxious and more confident when completing translation tasks and acquiring translation technology competence.<sup>108</sup> In addition to predicting learning achievements, self-efficacy measures can also be used to predict machine translation performance after launching a statistical machine translation course for translation students for master's degrees.<sup>109</sup> With increased self-efficacy, student translators gained a greater understanding and confidence in using machine translation in general and statistical machine translation in particular.<sup>110</sup> In the meanwhile, self-efficacy is a domain-specific indicator of efficacy rather than a general one across all domains.<sup>25</sup> In the educational context of the current study, academic self-efficacy refers to the belief that students can complete complex tasks and overcome obstacles in their studies.<sup>111</sup> Such belief can motivate students to choose effective strategies for tackling challenging situations and help them persist in their academic tasks,<sup>112</sup> which enhances their acquisition of translation technology competence through various pedagogical endeavors. Based on these arguments, Hypothesis 2 was proposed as follows:

H2: Student translators' academic self-efficacy has a positive and significant impact on their translation technology competence.

## Cultural Intelligence and Translation Technology Competence

Cultural intelligence is defined as "a set of cognitive, affective, and behavioral skills and characteristics that support effective and appropriate interaction in a variety of cultural contexts"<sup>113</sup> from a psychological perspective. The four components of cultural intelligence are cognitive, metacognitive, motivational, and behavioral elements,<sup>114</sup> and the construct concentrates on the distinct situation of intercultural communication where protocols and regulations for social interaction differ significantly.<sup>115</sup> It is also known as cultural competence or intercultural communication and involves the ability to recognize and respect cultural differences, as well as understand, appreciate, and interact effectively with different cultures. In the translation field, cultural competence refers to translators' ability to identify, compare, and contrast cultural differences between the source and target languages to produce an appropriate result of cultural phenomenon in the target text.<sup>66</sup> It is essential to accurately interpret the culture-loaded text and determine the best way to communicate it to the target audience.<sup>116</sup>

Having a strong grasp of cultural intelligence contributes to the enhancement of translation competence.<sup>28</sup> A thorough understanding of the close relationship between language and culture is essential for effective translation, which involves more than just linguistic and stylistic decisions.<sup>117</sup> With the roots firmly entrenched in the cultural environment from which the text originates, translation is a bridge between cultures, and the role of a translator is not limited to only closing linguistic gaps but also cultural ones.<sup>29</sup> Possessing cultural awareness can enhance translation-linked communications and capabilities.<sup>118</sup> Cultural intelligence is also positively linked to translation technology-related abilities. Given the vast number of cultural elements available, it appears unfeasible for translators to rely solely on their internalized cultural knowledge to address translation issues related to culture. Translators should be equipped with adequate information literacy to access external sources to ensure that translations are accurate and appropriate.<sup>119</sup> Therefore, Hypothesis 3 was proposed as follows:

H3: Student translators' cultural intelligence has a positive and significant impact on their translation technology competence.

## Critical Thinking and Academic Self-Efficacy

The more adept a person is at synthesizing data from a range of sources, the better he/she can form an accurate understanding of his/her own self-efficacy, as assimilating information from multiple sources is integral to the development of self-efficacy.<sup>120</sup> Engaging in critical thinking can lead to an increase in self-efficacy and in turn to better academic performance due to the fact that critical thinking encourages individuals to reflect on their own learning process, and in doing so, they gain confidence in their own abilities. There are several empirical studies showed that

academic self-efficacy was positively influenced by critical thinking. For example, questionnaire surveys on middle school students revealed that critical thinking skills helped them feel more confident in their ability<sup>121</sup> to undertake a task in a creative manner<sup>122</sup> and utilize information technology and their expertise to comprehend problems and find solutions.<sup>123</sup> A strong correlation was observed between the critical thinking skills and self-efficacy of advanced English as a Foreign Language students in Iran,<sup>124</sup> both of these constructs had a positive effect on self-directed learning.<sup>125</sup> An experimental study of 71 nursing seniors at a Turkish university revealed a moderate association between critical thinking and self-efficacy in the post-test results.<sup>126</sup> However, the results of an empirical study on 95 nurses did not support the hypothesis that more outstanding critical thinking capabilities were associated with increased self-efficacy beliefs.<sup>127</sup> Therefore, Hypothesis 4 was proposed in the present study to test the relationship between critical thinking and academic self-efficacy.

H4: Student translators' critical thinking has a positive and significant impact on their academic self-efficacy.

## Academic Self-Efficacy and Cultural Intelligence

The development of cultural intelligence can be positively impacted by self-efficacy, which is pertinent to cross-cultural interactions, education, and adaptation.<sup>128</sup> The inner strength of self-efficacy is the driving factor that enables people to effectively deal with intercultural risks and uncertainties, as it encourages them to set ambitious objectives in the face of adversity and strive to reach their desired outcomes.<sup>129</sup> Having a solid belief in one's own capabilities is the most prominent factor that encourages people to confront the challenges of intercultural experiences, as it gives them the confidence to tackle various problems.<sup>130</sup> Yalim et al<sup>131</sup> found that healthcare professionals must have a high level of self-efficacy and cultural understanding when providing mental health services for refugees, which enables them to communicate effectively with patients from diverse cultural backgrounds. In the school setting, both multicultural and monocultural students with stronger self-efficacy were more successful in adapting to different cultures because people with higher self-efficacy are usually more capable of managing their emotions and dealing with challenges in an intercultural setting.<sup>132</sup> Students' cultural competence also showed a strong link with their increased self-belief after participating in service-learning abroad.<sup>133</sup> Hence, the following hypothesis was proposed:

H5: Student translators' academic self-efficacy has a positive and significant impact on their cultural intelligence.

## Critical Thinking and Cultural Intelligence

Critical thinking is an essential skill in cross-cultural contexts as it allows individuals to consider a range of perspectives, reflect on their own opinions, and be aware of potential biases.<sup>134</sup> Students may face challenges when translating cultural information, or in multicultural settings due to the differences in languages, customs, and values between their own culture and the culture they are interacting with. They need to employ their powers of critical thinking to effectively interpret, analyze, and evaluate the cultural elements of a given text because, most of the time, there is no ready or single answer in the translation practices.<sup>135</sup> The ability to think critically helps them understand the cultural connotations of the source language and apply that knowledge to accurately render the intended meaning into the target language. Through this process, students become more aware of the nuances of language and its cultural implications and make more informed decisions when translating,<sup>136</sup> which enhances their cultural intelligence and provides them with the necessary skills to effectively interpret and translate texts. However, a few studies showed that cultural competence had a play in intensifying critical thinking abilities.<sup>137-139</sup> Therefore, the current study proposed the following hypothesis to test the positive influence of critical thinking on cultural competence:

H6: Student translators' critical thinking has a positive and significant impact on their cultural intelligence.

## Academic Self-Efficacy, Critical Thinking, and Translation Technology Competence

Academic self-efficacy is a crucial construct for students to take on challenging tasks, persist in the face of difficulty, and develop the necessary skills to succeed. By affecting the degree of determination and perseverance when confronted with challenges, self-efficacy also mediates the influence of skills on subsequent performance.<sup>103</sup> Students with higher levels of academic self-efficacy has greater chance of engaging in higher-level thinking and problem-solving activities, which leads to better understanding and use of translation technology to aid in their understanding and rendition of texts. Academic self-efficacy can also help to foster an environment of resilience, motivation, and confidence for college students. They can approach the challenge of mastering translation technology with the belief that they can successfully achieve the desired outcome. Their success in translation was found to be correlated with their online information searching, in part through the mediation of their self-efficacy in fulfilling translation tasks.<sup>140</sup> The amount of typing and computer use was also significantly predicted by the self-efficacy of translation students.<sup>25</sup> According to these arguments, the following hypothesis was put forward:

H7a: Student translators' academic self-efficacy plays a mediating role in the relationship between critical thinking and translation technology competence.

## Cultural Intelligence, Critical Thinking, and Translation Technology Competence

Critical thinking could help college undergraduates keep a critical outlook on cultural knowledge and contexts and be more sensitive to cultural information, which improves their performance in adopting translation technology.<sup>141</sup> A good understanding of cultural intelligence enables students to apply their critical thinking skills and translation technology competence more effectively.<sup>136</sup> Students' ability to recognize and interpret cultural cues is essential to apply their critical thinking skills and translation technology competence in different contexts.<sup>142</sup> Specifically, students who demonstrate cultural competence can draw on a range of experiences and perspectives to make informed decisions, which can help them develop better translation technology skills. Moreover, culturally competent students are more likely to think critically about the material they are translating, which makes it easier for them to use translation technologies more efficiently.<sup>143</sup> These arguments indicated that stronger critical thinking ability positively predicted student translators' cultural intelligence, which in turn resulted in high levels of translation technology competence. Therefore, the following hypothesis was proposed:

H7b: Student translators' cultural intelligence plays a mediating role in the relationship between critical thinking and translation technology competence.

## Self-Efficacy, Cultural Intelligence, Critical Thinking, and Translation Technology Competence

Academic self-efficacy has been defined as an individual's belief in their ability to succeed in an academic setting and is believed to be a significant predictor of academic performance.<sup>144</sup> Cultural intelligence, on the other hand, is a set of cognitive and motivational abilities that help individuals adjust to and perform effectively in culturally diverse situations.<sup>145</sup> Prior studies showed that academic self-efficacy is a strong predictor of translation technology competence, as it allows students to build the necessary skills and confidence to use the technology effectively.<sup>109</sup> Academic self-efficacy is also related to cultural intelligence, as it improves students' confidence in bridging cultural differences and developing an understanding of the target culture.<sup>132</sup> Both of these constructs have been found to have a positive effect on students' performance, and they can work together to mediate the relationship between critical thinking and translation technology competence. Academic self-efficacy and cultural intelligence are both associated with students' perception of their ability to succeed in an academic setting and their ability to process diverse cultural information.<sup>146,147</sup> Students with stronger academic self-efficacy and cultural intelligence tend to develop the necessary critical thinking skills to use translation technology effectively. Additionally, students who have higher academic self-efficacy and cultural intelligence may also be better equipped to assess and adapt to the cultural context of the translation technology they are using. These positive relationships indicate that academic self-efficacy and cultural intelligence might play chain mediators in the correlation between critical thinking and translation technology competence among student translators. Accordingly, the following hypothesis was proposed:

H8: Student translators' self-efficacy and cultural intelligence have a chain mediating effect on the relationship between critical thinking and translation technology competence.

An overall research model of the present study based on the nine hypotheses is presented in Figure 1.

## Materials and Methods

### Pilot Test

The initial questionnaire was formulated on the basis of prior studies. A pilot study was performed to ensure the reliability and validity of the questionnaire in November 2022 at the School of Foreign Languages and Cultures at Panzhihua University, a Chinese state-owned university. The survey employed a convenience sampling method and yielded 232 valid questionnaires. The reliability was assessed using Cronbach's alpha and further analyzed with SPSS 27.0 and AMOS 24 through both exploratory and confirmatory factor analyses. The ultimate questionnaire was comprised of 29 items in contrast to the initial 32. The pilot test additionally led to 2 items being reworded for clarity.

### Participants

Altogether, 663 senior students from 7 Chinese colleges with a comparable degree of translation proficiency participated in this investigation on a voluntary basis. All the individuals were native Chinese and specialized in English-related disciplines, including English Language and Literature, Business English, and Translation. Since most Chinese universities offer translation training courses that integrate translation technology in the third or fourth year, the present study only recruited college seniors to ensure that they have engaged in the related classes and were equipped with translation technology competence. As shown in Table 1, among these participants, 73 were males (11%) and 590 females (89%). 25.5% of them were from urban backgrounds (n=169), and 74.5% were from rural areas (n=494). 384 participants majored in English Language and Literature (57.9%), 209 in Translation (31.5%), and 70 in Business English (10.6%).

### Measures

The items of the questionnaire employed in this study were adapted from established scales that had been previously validated, except for the self-developed translation technology competence sub-scale. The overall questionnaire was comprised of critical thinking, academic self-efficacy, cultural intelligence, and translation technology competence to investigate the proposed hypotheses.

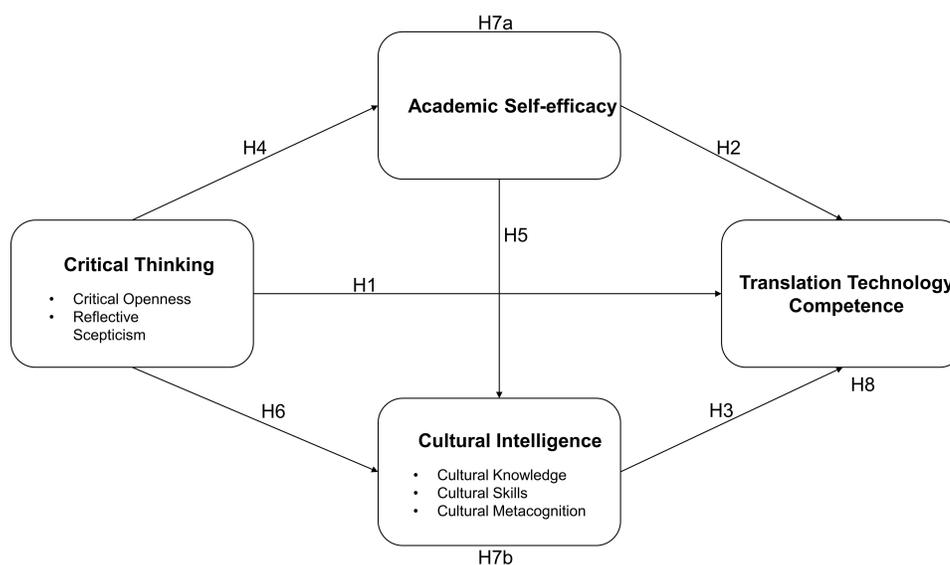


Figure 1 Research model.

**Table 1** Basic Description of the Sample

Variable	Category	N	Percent
Gender	Male	73	11.0
	Female	590	89.0
Family Residence	Urban	169	25.5
	Rural	494	74.5
Discipline	English Language and Literature	384	57.9
	Translation	209	31.5
	Business English	70	10.6

### Critical Thinking Scale

Critical thinking was measured by the Critical Thinking Disposition Scale (CTDS) developed by Sosu.<sup>148</sup> It had 11 items with two dimensions: critical openness (7 items) and reflective scepticism (4 items). The results of the multigroup confirmatory factor analysis indicated that the two-factor model was applicable to both undergraduate and graduate groups (n = 371). However, after running a confirmatory factor analysis in the pilot test, we decided to remove two items of the critical openness dimension from the current study based on their low factor loadings. Each item was assigned a score from 1 to 5 using the Likert system.

### Academic Self-Efficacy Scale

Academic self-efficacy was evaluated by the 5-item General Academic Self-Efficacy scale (GASE) developed by Nielsen et al.<sup>149</sup> Akanni and Oduaran<sup>150</sup> found the internal consistency of the scale to be satisfactory, as indicated by a Cronbach's alpha of 0.81. Van Zyl et al<sup>144</sup> reported that the scale demonstrated adequate levels of internal consistency and reliability at both time points, with Cronbach's alpha of 0.74 and 0.78.

### Cultural Intelligence Scale

Cultural intelligence was assessed by the Short Form measure of Cultural Intelligence (SFCQ) developed by Thomas et al.<sup>151</sup> It had 10 items with three intermediate facets: cultural knowledge (2 items), cultural skills (5 items), and cultural metacognition (3 items). The scale's reliability and validity were verified through the contributions of 3, 526 individuals from five different linguistic backgrounds worldwide<sup>151</sup> and by other empirical research.<sup>152</sup> The confirmatory factor analysis in the pilot test revealed that one item of the Cultural Skills had insufficient factor loadings and was thus excluded from the current study.

### Translation Technology Competence Scale

The research team developed the sub-scale to measure the translation technology competence of student translators based on the previous literature. The scale consists of 6 items to test participants' machine translation, post-editing, information literacy, terminology management, translation memory, and computer-aided translation. It showed great reliability and validity in the pilot study with a Cronbach's alpha of 0.917, and the factor loading of each item was greater than 0.5.

## Procedure and Data Analysis

Before the research was conducted, the Ethics Committee of the School of Foreign Languages and Cultures at Panzhihua University granted the ethical approval under the framework of the 1964 Declaration of Helsinki and confirmed that this study adhered to both domestic and international protocols regarding research involving humans (Grant number: HRECA22-002). The questionnaire was subsequently sent to the senior college students in 7 Chinese universities. Prior to taking part in the survey, the students were informed of the background and aims of the research, as well as the privacy and anonymity of their answers, and provided their informed consent. They filled out the questionnaire on the Chinese website "Wenjuanxin" (also referred to as

China's Qualtrics) by a convenience sampling approach between November 29, 2022, and December 13, 2022. The data obtained from the questionnaire was investigated utilizing SPSS 27, Amos 24, and PROCESS 3.5. SPSS was utilized to process the data and perform descriptive analysis. Amos was employed to carry out a confirmatory factor analysis and structural equation modelling. PROCESS was adopted to examine the mediation effects with the Bootstrap method.

## Results

### Common Method Deviation Test

Harman single-factor test is the most popular approach to evaluating common method deviation.<sup>153,154</sup> The analysis extracted four principal components, with the first factor explaining 41.136% of the variance, lower than the 50% threshold typically used to suggest the presence of a common method bias,<sup>155</sup> which suggests no major issues with common method bias in this research.

### Validity and Reliability

AMOS 24.0 was utilized to conduct the confirmatory factor analysis. Items with a loading factor higher than 0.5 were deemed to have a substantial contribution to the related construct.<sup>156</sup> Table 2 shows that the factor loadings of all items were within a reasonable range between 0.60 and 0.95.

Cronbach's  $\alpha$  was commonly employed to measure the internal consistency of scales. The overall scale in the current study has a Cronbach's  $\alpha$  coefficient of 0.946. Table 3 reveals that the Cronbach  $\alpha$  values of each subscale were all above 0.8, ranging from 0.881 to 0.93, suggesting that the scales had satisfactory reliability.<sup>157</sup> The validity of the construct was evaluated by

**Table 2** Factor Loadings of the Items

Item	Factor Loading	p	Item	Factor Loading	p
CT1	0.693	***	CI1	0.707	***
CT2	0.836	***	CI2	0.741	***
CT3	0.799	***	CI3	0.756	***
CT4	0.677	***	CI4	0.722	***
CT5	0.784	***	CI5	0.726	***
CT6	0.721	***	CI6	0.790	***
CT7	0.862	***	CI7	0.855	***
CT8	0.733	***	CI8	0.750	***
CT9	0.835	***	CI9	0.763	***
Item	Factor Loading	p	Item	Factor Loading	p
ASE1	0.830	***	TTC1	0.715	***
ASE2	0.849	***	TTC2	0.675	***
ASE3	0.744	***	TTC3	0.750	***
ASE4	0.861	***	TTC4	0.907	***
ASE5	0.744	***	TTC5	0.644	***
			TTC6	0.753	***

Note: \*\*\*p < 0.001.

**Table 3** Reliability and Convergent Validity Analysis of the Scale

Variable	Mean	S.D.	Cronbach's $\alpha$	CR	AVE	1	2	3	4
1.CT	3.929	0.455	0.926	0.930	0.599	1			
2.ASE	3.951	0.515	0.900	0.903	0.652	0.576**	1		
3.CI	3.923	0.498	0.922	0.924	0.574	0.611**	0.594**	1	
4.TTC	4.315	0.475	0.877	0.881	0.556	0.367**	0.350**	0.365**	1

Note: \*\*p < 0.01.

Abbreviations: CT, critical thinking; ASE, academic self-efficacy; CI, cultural intelligence; TTC, translation technology competence.

**Table 4** Discriminant Validity of the Scale

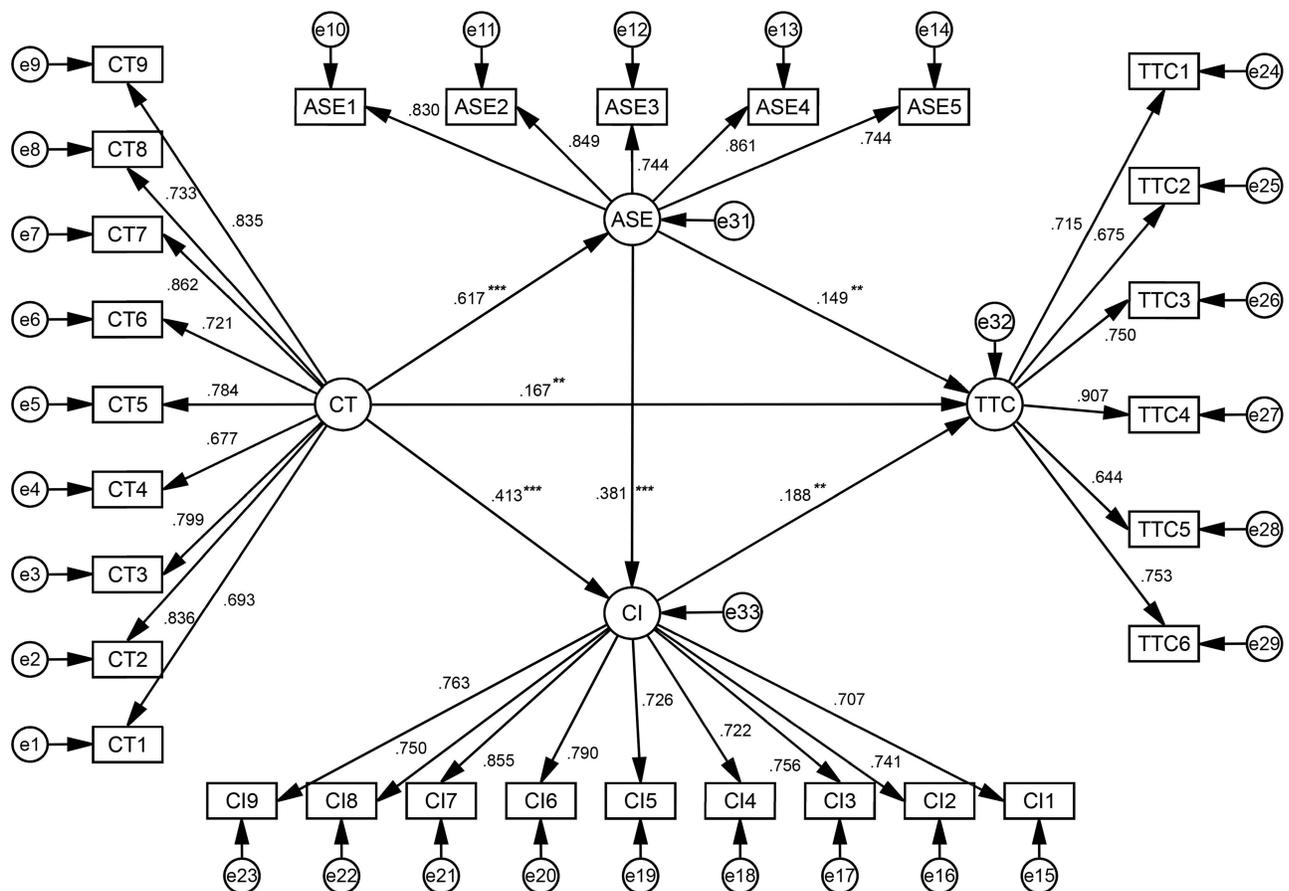
Items	CT	ASE	CI	TTC
CT	0.774			
ASE	0.617***	0.807		
CI	0.648***	0.636***	0.758	
TTC	0.381***	0.372***	0.391***	0.745

Note: \*\*\*p < 0.001.

assessing convergent and discriminant validity. The results of the AVE and CR showed that all values were higher than 0.5 and 0.7, respectively, indicating that the scale had good convergent validity.<sup>158,159</sup> There were greater square roots of the AVE values for each variable than the correlation between them, demonstrating that the scale had good discriminant validity (see Table 4). The evidence as a whole indicates that the scales are reliable and valid for further investigation.

### Model Estimates and Hypothesis Testing Direct Effect on Translation Technology Competence

The findings from the assessment of the research model’s fitting index demonstrated that the model of the current study has a good overall fit ( $\chi^2/df=2.538$ , SRMR=0.0365, RMSEA=0.048, GFI=0.907, NFI=0.927, IFI=0.954, TLI=0.950, CFI=0.954). AMOS 24.0 was adopted for structural equation modeling and path analysis to test the proposed hypothesis (see Figure 2). A summary of the results of hypothesis testing for direct effects is provided in Table 5. The path



**Figure 2** Result of the path analysis.

Notes: \*\*p < 0.01; \*\*\*p < 0.001.

Abbreviations: CT, Critical Thinking; ASE, Academic Self-efficacy; CI, Cultural Intelligence; TTC, Translation Technology Competence.

**Table 5** Results of the Proposed Hypothesis Testing for Direct Effects

Hypothesis	Path	Coefficient	S.E.	C.R.	P-value	Test Results
H1	TTC←CT	0.167	0.057	2.914	0.004	Supported
H2	TTC←ASE	0.149	0.044	2.599	0.009	Supported
H3	TTC←CI	0.188	0.057	3.163	0.002	Supported
H4	ASE←CT	0.617	0.059	13.58	***	Supported
H5	CI←ASE	0.381	0.036	8.412	***	Supported
H6	CI←CT	0.413	0.049	8.746	***	Supported

Note: \*\*\*p < 0.001.

**Table 6** Results of the Proposed Hypothesis Testing for Indirect Effects

Effect	Hypothesis	Model Pathways	Indirect Effect Value	Boot SE	BootLLCI	BootULCI	Effect of the Amount	Test Results
Total indirect effect			0.195	0.040	0.284	0.120	50.78%	
Path 1	H7a	CT-ASE-TTC	0.088	0.030	0.032	0.149	22.92%	Supported
Path 2	H7b	CT-CI-TTC	0.070	0.024	0.030	0.125	18.23%	Supported
Path 3	H8	CT- ASE-CI-TTC	0.036	0.014	0.013	0.068	9.38%	Supported

coefficient of CT to TTC was 0.167 ( $p < 0.01$ ), ASE to TTC 0.149 ( $p < 0.01$ ), CI to TTC 0.188 ( $p < 0.01$ ), CT to ASE 0.617 ( $p < 0.001$ ), ASE to CI 0.381 ( $p < 0.001$ ), and CT to CI 0.413 ( $p < 0.001$ ). Thus, Hypotheses 1, 2, 3, 4, 5, and 6 were all supported. The study showed that critical thinking, academic self-efficacy, and cultural intelligence have positive and significant impacts on translation technology competence among college students.

### Mediating Effect of Academic Self-Efficacy and Cultural Intelligence

This study used PROCESS 3.5, an IBM SPSS macro, to analyze the mediating effect of academic self-efficacy and cultural intelligence on the relationship between college students' critical thinking and translation technology competence. Model 6 was chosen from a Bootstrap sample of 5000 in the PROCESS. The Bootstrap CI method was selected, and all intervals of confidence were set to 95%.

Table 6 shows that the total indirect effect of critical thinking on translation technology competence of college students was 0.195 (BootLLCI= 0.284, BootULCI= 0.120). If the range between BootLLCI and BootULCI does not encompass 0, the corresponding variable plays a significant mediator in the proposed relationship.<sup>160</sup> Critical thinking and translation technology competence were mediated by academic self-efficacy by 0.088 (BootLLCI= 0.032, BootULCI= 0.149). Hence, H7a was supported. Critical thinking was found to impact students' translation technology competence through academic self-efficacy. The indirect effect of cultural intelligence on the prediction of critical thinking on translation technology competence was 0.07 (BootLLCI= 0.030, BootULCI= 0.125). Therefore, H7b was supported. It was found that cultural intelligence played a mediation role in the relation between critical thinking and translation technology competence among college students. The indirect effect of academic self-efficacy and cultural intelligence on the relationship between critical thinking and translation technology competence was 0.036 (BootLLCI= 0.013, BootULCI= 0.068). As a result, H8 was supported in this study. Critical thinking and translation technology competence were correlated through a chain mediating effect of academic self-efficacy and cultural intelligence.

## Discussion

This paper endeavored to explore the relationship between critical thinking, academic self-efficacy, cultural intelligence, and translation technology competence among college students and how academic self-efficacy and cultural intelligence serve as mediators in this relationship. The results indicated that critical thinking, academic

self-efficacy, and cultural intelligence are significant predictors of students' translation technology competence. Furthermore, academic self-efficacy and cultural intelligence appear to act as independent and sequential mediators in the relationship between critical thinking and students' translation technology competence.

## Direct Relationships

### Critical Thinking → Translation Technology Competence

The present study echoed the findings of several prior studies in terms of the direct influence of critical thinking on the translation technology competence of college students.<sup>62,102</sup> Student translators are often presented with assorted documents that necessitate the ability to apply both critical thinking and translating skills at the same time.<sup>161</sup> When facing a specific translation task, students might be bewildered by the multiple choices of feasible strategies or techniques. They need to mobilize their professional knowledge, linguistic competence, and psychological resources to make the best choice in choosing the translation technologies and achieving the translation Skopos.<sup>48</sup> The effectiveness of unseen processes and activities in the translator's mind is largely dependent on critical thinking. By engaging in this cognitive process, students are better able to identify and solve problems and make decisions that are based on reasoned arguments and evidence.<sup>16</sup> Having a strong critical thinking skill set enables students to better comprehend the differences between machine translation and human translation, or understand the implications of using language-specific translation technologies in different cultural settings. They could evaluate translation technology's effectiveness, explore its potential applications, and develop strategies to ensure its successful use. Additionally, students with strong critical thinking skills can better identify and avoid potential pitfalls when using translation technology, such as translating the wrong content or misinterpreting a text due to language-specific nuances. The ability to identify patterns, draw connections between texts, and accurately predict future outcomes<sup>162</sup> enables them to make better-informed decisions that lead to successful translation technology projects. Finally, strong critical thinking skills can help students to develop new approaches to translation technology and propose innovative solutions to existing translation problems. This could include developing new tools or techniques to improve the accuracy of machine translation or creating more efficient workflows for human translation.

### Academic Self-Efficacy → Translation Technology Competence

College students' academic self-efficacy directly impacts their translation technology competence. It often requires considerable commitment and patience to become proficient in the technical aspects of translation, which can be quite daunting for student beginners. They need strong self-efficacy in their abilities to acquire translation technologies and persist in learning and practicing when confronted with setbacks. Academic self-efficacy has the potential to boost students' motivation to learn over the long run<sup>163,164</sup> and lead to higher levels of engagement with the task and a greater likelihood of successful completion. When they have strong belief in their ability to complete an academic task successfully, they are more likely to be motivated to put in the effort to learn translation technology and apply it to the translation tasks. Students with insufficient self-efficacy tend to give up on a translation task before completing it because self-efficacy has a significant influence on the commitment and effort domains.<sup>165</sup> Students with higher self-efficacy have a greater sense of control over their learning environment, which leads to an increased willingness to take on the challenges of learning and using translation technology. Additionally, having a higher level of academic self-efficacy is beneficial for students as it reduces the stress associated with acquiring translation technology competence.

### Cultural Intelligence → Translation Technology Competence

Culturally intelligent students tend to have more substantial translation technology competence in the present study, which confirms the previous studies in the result that cultural intelligence is positively linked with general translation competence.<sup>28</sup> Students with higher cultural intelligence are more familiar with the cultural conventions and nuances of the language they are translating, allowing them to make more informed decisions when using translation technologies. Without the ability to accurately interpret and evaluate the cultural aspects of a text, translation technology may lead to misinterpretation and miscommunication of the intended message.<sup>166</sup> Taking machine translation for example, even the most advanced neural machine translation has an inherent defect in processing cultural-loaded information.

Consequently, students need to utilize their cultural competence to post-edit the translation texts to make them culturally right. They may draw upon their cultural understanding acquired through experience or research to resolve cultural issues in translation by utilizing a combination of both their personal insight and information-seeking strategies.<sup>119</sup> Students with higher cultural intelligence can better recognize the cultural aspects of the text they translate and select the more appropriate technology for their task. Cultural intelligence helps to ensure that the translation technology is used in a culturally appropriate manner and that the user can interpret and use the output of the technology in a meaningful way.

## Mediated Relations

### Critical Thinking → Academic Self-Efficacy → Translation Technology Competence

Self-efficacy is an essential factor in understanding the relationship between critical thinking and translation technology competence among college students. As a prominent construct in social cognitive theory, self-efficacy interprets human behavior through self-regulation, and it is linked to numerous psychological processes such as motivation and performance.<sup>167,168</sup> It can influence how individuals approach the translation task, as it can shape how they perceive their own ability to use translation technology.<sup>169</sup> When students have higher academic self-efficacy, a specific domain of general self-efficacy, they are more likely to take on challenging tasks in the process of learning and using translation technology. They would persist in the face of difficulty and have greater motivation to seek out and use resources that can help them master the technology.<sup>170</sup> By having a positive attitude and feeling confident in their ability to use translation technology, students can develop the capacity to effectively process and translate text, as well as to gain a better understanding of the underlying principles of translation technology. Academic self-efficacy can also lead to higher performance in translation technology, as students are more likely to use the technology in creative ways and explore different strategies to complete a task successfully. The findings of the current study demonstrated that academic self-efficacy not only directly and positively influences the translation technology competence of college students, but also enhances the effect of critical thinking on such competence. It can serve as a bridge in helping individuals understand how to apply their critical thinking skills in order to gain proficiency in translation technology. Critical thinking is a cognitive process that encourages students to consider evidence, question assumptions, and reflect on the validity of conclusions. It helps them develop a better understanding of the connections between their own thoughts and beliefs and those of others. This encourages students to be more open-minded and consider alternative perspectives. Engaging in critical thinking also allows students to understand the implications of their decisions and recognize and challenge their own biases and preconceptions, which can lead to increased self-efficacy among college students.

### Critical Thinking → Cultural Intelligence → Translation Technology Competence

The results showed that students who are more culturally intelligent would be more capable of applying their critical thinking skills to different cultural contexts, which in turn leads to better translation technology competence. Cultural intelligence provides students with the necessary knowledge and understanding of cultural differences to translate information effectively. It involves understanding the customs, norms, and values of different cultures.<sup>29</sup> This includes being able to recognize and adjust to cultural differences, as well as being able to apply critical thinking skills to analyze and evaluate different cultural contexts. It is an essential factor in helping students gain the essential skills to successfully use translation technology. Cultural intelligence can help students to better understand the implications of the translated text by machine translation and how to postedit the results accordingly. This allows students to create translations that are more accurate and effective in different contexts,<sup>145</sup> further enhancing their performance in translation technology. Critical thinking was found to have a direct effect on cultural intelligence, as it encourages individuals to be more open-minded and less biased in their judgments.<sup>136</sup> It also helps students to understand and assess information and the cultural differences between them and others more accurately and efficiently. Through cultural intelligence, students can better understand how to use their critical thinking skills to effectively translate texts across different cultures and use translation technology tools to bridge the language barrier and cultural gaps.

## Chain Mediating Relation

This study revealed that academic self-efficacy and cultural intelligence played chain mediators in the relationship between critical thinking and translation technology competence. It has been shown that academic self-efficacy, which is the belief in one's capability to complete academic tasks successfully,<sup>111</sup> and cultural intelligence, which is the ability to recognize and interpret cultural connotations,<sup>171</sup> can work together to boost translation technology competence. Individuals with a strong belief in their own capabilities are better able to manage stress, adapt to new cultural surroundings, and show openness to other cultures and ideas, thus enhancing their cultural awareness.<sup>172</sup> On the one hand, academic self-efficacy and cultural intelligence serve as important psychological resources, helping individuals to better comprehend the complexities of translation technology and to understand the implications of their decisions. On the other hand, these two factors also provide the necessary motivation to pursue and practice the skills required to use translation technology effectively. Cultural intelligence is an important factor in developing the skills necessary to interact with people and interpret texts from different backgrounds, which can in turn increase the understanding of different cultures.<sup>142</sup> Through increased critical thinking ability, students can understand the implications of different cultures and translation technologies. In addition, thinking critically helps students to explore new ideas and develop new ways of accomplishing translation tasks and applying translation technologies in different contexts. Through the process of academic self-efficacy and cultural intelligence, students are able to intensify the association between their critical thinking skills and their proficiency in translation technology.

## Implications

### Theoretical Implications

The current study provides valuable insight into how psychological factors such as critical thinking, academic self-efficacy, and cultural intelligence can impact students' competence in translation technology. The results revealed that cognitive processes are linked to the acquisition of translation technology competence among college students. Specifically, higher levels of critical thinking, academic self-efficacy, and cultural intelligence are associated with more outstanding achievements in translation technologies. The use of cognitive strategies can enable students to evaluate their own understanding and performance and adjust their strategies as necessary to achieve better outcomes in terms of translation technology competence. By combining psychological and translation theories, this study can help researchers gain a deeper comprehension of the relationships between these two disciplines. It allows for a more comprehensive approach to the study of translation technology competence, as well as a better understanding of the underlying psychological factors that contribute to its development. The findings could lay an essential foundation for future research that seeks to understand how psychological factors can be leveraged to promote students' success in translation technologies.

### Practical Implications

The direct effect of critical thinking, academic self-efficacy, and cultural intelligence on translation technology competence and the mediating role of academic self-efficacy and cultural intelligence in the relationship between critical thinking and translation technology competence among college student translators have important implications for educators and practitioners. How to enhance college students' technology competence has emerged as one of the major issues in translation education since translation technology is becoming a vital part of translation practice.<sup>173</sup> By understanding the underlying interacting mechanism between these variables, educators can better design curricula and activities that promote the development of these psychological constructs to enhance students' translation technology competence.

In addition to developing students' traditional translation competences, higher education institutions and translator trainers have to realize the significance of improving students' critical thinking skills. Incorporating critical thinking into the curriculum can be an effective way to help students develop their professional skills related to translation technology. By teaching students how to think critically, educators can help them to understand the intricacies of translation technology and ensure that they can make the best use of the tools available to their fullest potential. Additionally,

students should be encouraged to explore and experiment with different methods of using translation technology in order to develop their critical thinking skills. Instructors should provide students with opportunities to reflect on the use of translation technology and the implications of the translation process for their own learning and development. By having students work on projects that require translation technology, instructors can offer students the chance to practice their problem-solving skills by identifying and addressing potential problems or obstacles in their translations.

The findings highlight the need for educational institutions to create programs and initiatives that encourage students to develop their academic self-efficacy. It is of great possibility for students to meet various challenges during the translation tasks due to deficiency in language knowledge, translation techniques, technology competence, or cultural barriers. If students are equipped with strong beliefs that they can achieve the prescribed goals through consistent efforts, they will rise up to these challenges and persevere in the frustrations of learning and using translation technologies. Educators should strive to create a supportive environment that encourages students to develop and maintain a high level of self-efficacy by providing constructive feedback, establishing clear learning objectives and expectations, and designing tasks that are both challenging and achievable. They can provide students with guidance on how to effectively use translation technology, as well as how to develop strategies for dealing with any challenges they may face.<sup>174</sup> Furthermore, they can provide students with opportunities to work on authentic translation tasks, which can help them develop their confidence in their own capabilities. Finally, it is important to emphasize the importance of developing a positive attitude towards translation technologies to enable students to develop a sense of self-efficacy and be motivated to continue learning. This can be done by introducing students to the various aspects of translation technology, such as machine translation, post-editing, information literacy, terminology management, translation memory, and computer-aided translation identified in the current study, and then offering them chances to practice and apply these skills.

Cultural intelligence should also be integrated into translation teaching, as it will help students better understand the cultural context of their translations and become more proficient in using translation technology. Cultural intelligence can be developed through a variety of activities, such as translating cross-cultural texts, taking part in cultural exchange programs, and participating in intercultural dialogues. It is also important to incorporate discussions about the implications of cultural differences for translation technology use. By engaging in such conversations, students can gain a better comprehension of how cultural context affects their adoption of translation technologies. Through purposeful practice in class activities and active participation in translation tasks, translation students can pick up cultural information.<sup>175</sup> Educators can also create an atmosphere conducive to cross-cultural learning by incorporating culturally diverse perspectives into course material and engaging in activities that allow students to practice their cultural intelligence skills.

## Research Limitations and Future Research Directions

Despite the fact that this study has made valuable contributions to the understanding of translation technology competence of university students from both a theoretical and practical standpoint, there are still certain restrictions that should be taken into account for future research. First, the sample size is relatively small for the population of college students in China, which might limit the generalizability of the findings. Second, this research only adopts a quantitative method by questionnaire survey. This approach can provide useful data, but may not capture the full range of perspectives and experiences of the participants. Qualitative research methods such as interviews, focus groups, and observation can also provide valuable insights into this research topic. Thus, it may be beneficial for future research to include qualitative methods to gain a more comprehensive understanding.

## Conclusion

This study empirically investigated the correlations between critical thinking, academic self-efficacy, cultural intelligence, and translation technology competence of college students. The results showed that these psychological constructs all have significant and positive impact on students' translation technology competence. At the same time, academic self-efficacy and cultural intelligence have independent and chain mediating effects on the relationship between critical thinking and translation technology competence. Specifically, academic self-efficacy is the first link in the chain and plays a role in promoting the development of cultural intelligence, which then facilitates college students' proficiency in translation technology. Additionally, the higher levels of cultural intelligence further enhance students' translation

technology competence. This study revealed the underlying psychological mechanism through which these factors interact with translation technology competence. It has important implications for researchers, educators, and practitioners, who should be more aware of the importance of critical thinking, academic self-efficacy, and cultural intelligence in promoting college students' translation technology competence.

## Data Sharing Statement

The dataset supporting the conclusions of this article will be made available from the corresponding author upon request.

## Ethics Approval

The Institutional Ethics Committee of the School of Foreign Languages and Cultures at Panzhuhua University reviewed and granted the ethical approval for the research (Code No.: HRECA22-002). The questionnaire started with a section that introduced the objectives of the survey and assured participants that their responses would be kept anonymous and confidential.

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## Disclosure

The authors report no conflicts of interest in this work.

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