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### A Critical Diagnosis of Challenges in Translating French Specialized Texts: Perspectives from Iranian University Professors and Students

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#### ABSTRACT

**Objective:** In today's increasingly interconnected academic and professional landscape, the ability to translate specialized texts with accuracy has become an essential skill for aspiring translators. This importance stems from the fact that French, as one of the major international languages, is widely used in numerous scientific and professional disciplines. However, students frequently encounter substantial obstacles when dealing with technical discourse. This study aims to investigate the nature of these difficulties in order to improve the effectiveness of teaching and learning practices in specialized translation classrooms at Iranian universities. The guiding research question is: What kinds of challenges do students face while translating specialized texts in French courses? Drawing on the works of Rybar (1993), Federica Scarpa (2010) and Mshvenieradze (2022), the research emphasizes the importance of terminological mastery, contextual interpretation, and progressive specialization in translator education.

**Method:** This descriptive-analytical study employs a mixed-methods design. Data were collected through direct classroom observations of specialized translation courses, as well as the administration of two separate questionnaires, one for students and one for instructors. The integration of qualitative and quantitative data allowed for a comprehensive analysis of both observed teaching practices and the perceptions of learners and teachers.

**Results:** The research findings indicate that 43% of students' challenges occur at the linguistic level, while 57% are attributed to extra-linguistic components. Within the linguistic sphere, the highest frequency of learning obstacles pertains to lexical and terminological structures, accounting for 75%, followed by discursive-syntactic issues at 25%. Furthermore, the primary extra-linguistic challenges arise from a lack of correct understanding of ideological components and implicit elements, with a distribution of 57%, and socio-cultural references, with a frequency of 43%.

**Conclusions:** The study underscores the necessity of adopting competence-based pedagogical approaches and updating instructional resources to improve the quality of specialized translation training in French language classrooms.

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## Introduction

Specialized translation, as an independent branch of translation studies, has a prominent position in the contemporary world. A world in which intercultural and interdisciplinary communication is a fundamental condition for all-round progress. This field, which encompasses a range of scientific, technical, legal, medical, etc. texts, requires extra care in using precise terminology, appropriate syntactic structures, and observing the discourse requirements of each discipline due to its professional sensitivities and the legal and executive consequences of its texts. Scarpa (2010) states that specialized translation goes beyond simple linguistic transfer; it requires deep expertise in the subject matter, mastery of modern computer tools, and dynamic adaptation to terminological changes. Scarpa's definition of specialized translation as «interlingual communication through texts written in specialized languages» (Bizo, 2022: 56) highlights the importance of a deep understanding of the specialized field and its terminological dynamics. Technology also plays a central role in this model; as researchers influenced by Scarpa's ideas have examined the use of linguistic corpora and new computer tools in specialized translation teaching and research: (Laviessa, 2023; Quinci, 2023). Also, artificial intelligence-based tools, especially neural machine translation and large language models, have not only improved the learning experience for students, but also increased their level of independence and self-confidence (MoulaviNafchi, Madahiian, and Hosseini, 2025). At the same time, «the increasing demand for this type of translation in the labor market has led translation instructors in specialized academic centers to pay special attention to specialized translation training in the process of training professional translators» (Papkov, 2008:264). However, in a situation where the need for specialized translation is continuously increasing, the difficulties of learners are becoming more and more apparent. According to statistics, «90 percent of global production in the translation industry is specialized translation» (Latoracca, 2024: 40), and this rapid growth has doubled the need to pay attention to the quality of education. Numerous studies have addressed these challenges in recent years. Mcheimer's (2025) study in Egypt shows that students face significant difficulty in mastering specialized terminology. Milivojević Petrović (2025) also emphasizes that there is a significant gap between students' perceptual familiarity with specialized terminology and their actual ability to use it. Also, Haddadi (2025) in Morocco pointed out the gap between theory and practice in translation education and showed that students face difficulties in applying theoretical principles to practical activities.

These findings confirm that with the increasing need for specialized translation, educational deficiencies and challenges for learners become more apparent. At the same time, the diversity and breadth of different fields of knowledge in specialized texts requires that students, in

addition to having a deep command of the source and target languages, also have a precise and specialized understanding of the concepts and terminology of each discipline. In this regard, Kim, citing Lehman (1986), emphasizes that a specialist in a field may understand a specialized text better than a professional translator who lacks that knowledge (Kim, 2006). Tairova (2024), referring to the diversity of fields such as law, medicine, and technology, emphasizes the complexity of the specific language of each field and the enormous amount of knowledge required to master specialized terminology. In this regard, researchers warn against the danger of focusing solely on linguistic skills and translation techniques at the expense of general and specialized knowledge, and emphasize the role of «cognitive complements» and the ability to recall extralinguistic knowledge in a timely manner (Collombat, 2006). Furthermore, the acceleration of changes in specialized terms and vocabulary (Peckman, 2025), which is, on the one hand, dependent on social developments and the emergence of semantic neologisms (Cui, Li, & Zhuang, 2025), and on the other hand, resulting from new communication and information technology and tools such as the emergence of artificial intelligence (Kayimova & Abdirasulov, 2025), has exacerbated the challenges in translating specialized texts. This is often accompanied by an inability to identify exact equivalents, confusion over polysemantic words, and challenges in understanding the conceptual context of specialized texts. Given the importance of the topic and the multiplicity of research levels regarding the translation of specialized texts, the present study is organized with a focus on the following topic: What are the linguistic and metalinguistic challenges in translating specialized texts in French language classes in Iranian universities?

The fundamental assumption of this article is that linguistic challenges are mostly related to students' lack of proper understanding of lexical-terminological and verbal-grammatical structures. Metalinguistic challenges also manifest themselves in the form of ideological components, implicit and invisible elements, socio-cultural references, and so on. To examine the validity of this hypothesis, an integrated approach was adopted. First, Scarpa's (2010) findings were used, which focus on the textual, syntactic, and lexical features of specialized texts and the challenges of their translation. Next, Raybar's (1993) approach was used to analyze the obstacles faced by students in translating scientific and technical texts; a study that places special emphasis on the lack of terminological knowledge and weakness in logical analysis of the text. Finally, Mshvenieradze's (2022) views have been added to this theoretical framework to explain cross-cultural problems, structural differences, and the necessity of using documented sources to find accurate equivalence. In the present study, we used quantitative and qualitative analysis to better understand the disadvantages and challenges of translating specialized texts from the perspectives of professors and students. Data collection methods

included designing and distributing a questionnaire (appropriate to the above-mentioned question and hypothesis), direct observation of classrooms, examining translation samples of translation students, and studying library and supplementary resources. Quantitative data were analyzed using SPSS statistical software and the results were interpreted. Finally, based on the findings, a pathology of the prominent and frequent obstacles of students during specialized translation was conducted.

### **Research background**

Translation of specialized texts and the challenges inherent in it have always been a major focus of attention in translation studies. The importance of this area is especially doubled in the case of French as a reference language in various scientific and academic fields. A review of the evolution of the research literature also shows that the difficulties of specialized translation have consistently been raised as one of the central and challenging topics in academic circles.

In «Specialized Languages» (1995), Pierre Lera, with the aim of explaining the linguistic nature of technical and scientific texts and distinguishing them from general language, rejects the reductionist view of reducing specialized language to a set of difficult vocabulary and considers it a complex system of signs, conceptual relations, and syntactic structures that make understanding and reproducing meaning difficult for the translator. His analytical framework is based on applied linguistics and terminology, and through this approach, it becomes clear how concepts are redefined in specialized contexts. Finally, Lera introduces ambiguity and the overlap between general and technical language as the most important issue in specialized translation, and emphasizes the need for targeted training of translators and their mastery of complex syntactic structures and semiotic systems to prevent semantic slippages in the process of finding equivalents.

The study «Translating Media Texts and the Problems of Iranian Students» by Nahid Djalili (2006) sheds light on the various dimensions of these difficulties by examining the obstacles faced by students in translating these texts. Relying on the views of Reiss (2002), the author emphasizes the role of text function and the need to achieve a natural and contextual equivalent, and classifies errors at two main levels: linguistic deficiencies and knowledge and cultural deficiencies. The result of the research is to draw a systematic picture of the origin of errors and to present solutions such as expanding the scope of vocabulary, continuously following the news, and strengthening public awareness to improve the quality of translation.

Lavault-Olléon (2007), in *Specialized Translation: Procedures, Theories and Didactics*, brings together fourteen contributions by leading scholars and specialists in the field of translation to examine the multiple dimensions of specialized translation. The volume presents the principal theoretical foundations and practical applications of specialized translation while

emphasizing its increasingly significant role in addressing the communicative needs of contemporary societies. According to Lavault-Olléon, the processes of globalization and the rapid development of information technologies have substantially increased the demand for highly qualified specialized translators. Consequently, specialized translators are expected not only to possess advanced linguistic and cultural competence but also to demonstrate methodological, technical, writing, pragmatic, and communicative competences. The book further explores the professional challenges encountered by specialized translators and analyzes the impact of economic and technological developments on their professional practice.

In « Subject matter and domain in specialized translation: a pedagogical perspective» (2012), Mariana Pitar examines lexical and textual barriers, focusing on identifying the root causes of students' errors, and seeks to counter the tendency toward literal translation and the inability to distinguish between «common words» and «specialized terminology». Drawing on the theoretical framework of Daniel Gouadec (1999) and utilizing the models of “sign-based translation” and “summary translation,” she emphasizes strengthening students' conceptual understanding. The results of the study show that the quality of specialized translation depends not only on linguistic knowledge, but also on a systematic methodology that includes accurate identification of the specialized domain, resource management, and final revision based on textual coherence.

In the study « Challenges of translating medical texts and the role of translation methods in solving it» by Ahmadi and Djafari (2021), obstacles to the translation of scientific texts are examined, emphasizing structural ambiguities, the ambiguity of specialized terms, and the difficulty of finding equivalents for Latin words; fundamental issues that hinder the accurate transmission of the message. Relying on the theoretical framework of Wiene and Darbelne (1960), the authors assess the effectiveness of the seven translation processes in resolving these problems. The results show that medical translation, in addition to linguistic proficiency, requires basic knowledge of medical sciences and an understanding of the cultural context of the two languages, and the conscious use of strategies such as “change of expression” and “content equivalence” plays a decisive role in reducing stylistic and terminological complexities.

In the article entitled «Translation in Specialized Contexts: Challenges and Risks», Postolea (2016) examines the complex nature of specialized translation and the factors influencing its quality. The findings indicate that specialized translation extends far beyond the mere replacement of words and terminology, requiring translators to possess specialized domain knowledge, advanced linguistic competence, and strong analytical skills for addressing translation problems. The author emphasizes that the challenges of specialized translation

involve not only terminological equivalence but also issues related to terminology management, neologisms, lexical collocations, language styles, and textual genres. Furthermore, the study demonstrates that reliance solely on dictionaries and terminological resources is insufficient for producing high-quality specialized translations. Instead, translators must engage in research, analyze the specialized context, and make informed decisions when selecting or creating appropriate equivalents. Overall, the study characterizes specialized translation as a complex and highly demanding process in which linguistic accuracy and conceptual precision are essential, as translation errors may lead to the inaccurate transfer of specialized knowledge.

In his article «Challenges in translating scientific texts: Problems and reasons» (2022), Al-Samadi examines the practical obstacles to transferring specialized concepts from English to Arabic, with the aim of finding the root of students' frequent errors, and emphasizes the sensitivity of scientific texts to the smallest semantic slips. Relying on the model of Vinay and Darbelnet (1958/1998), he analyzes the process of finding equivalents at two lexical levels, including specialized and syntactic terms in passive structures and verb tenses. The findings show that excessive dependence on literal translation and ignorance of the stylistic characteristics of scientific texts are the most important sources of errors; therefore, emphasis is placed on strengthening students' practical experience and increasing their sensitivity to accuracy, consistency, and coherence in translating specialized terms.

In the article «An Overview of the Problems of Specialized Text Translation», Meshoniradze (2022) examines the major issues associated with the translation of specialized texts across various scientific and professional domains. The study demonstrates that specialized translation is confronted with several fundamental challenges, including the conceptual complexity of specialized texts, lexical ambiguity, the difficulty of conveying meaning accurately without semantic loss, and structural differences between the source and target languages. These factors may hinder translators' comprehension of specialized messages and consequently affect the overall quality of the translation. The author further emphasizes that one of the most significant challenges in specialized translation is the identification of accurate equivalents while maintaining semantic coherence in the target text, as even minor translation errors may alter the scientific or technical meaning of the original text. Therefore, specialized translation requires a high degree of precision as well as an in-depth understanding of the scientific context in which the text is situated.

The present study focuses on the challenges of translating French specialized texts among translation students within the context of Iranian higher education, an area that, despite its growing importance for scientific knowledge transfer and meeting labor market demands, has not yet been systematically and comprehensively investigated. Moreover, unlike many previous

studies that relied exclusively on the perspectives of either students or instructors and were limited to questionnaire-based data, the present research adopts a mixed-methods approach, combining classroom observations with questionnaire data. This approach enables a comparison between perceived translation challenges and the realities observed in the process of specialized translation instruction. Consequently, the findings reflect the specific characteristics of the target population and aim to contribute to improving the quality of specialized translation teaching in Iranian higher education while supporting the training of competent and professionally qualified translators of specialized texts.

### **Method**

The body of this article is a collection of quantitative and qualitative data collected from Iranian academic environments. The quantitative data was obtained through two separate questionnaires for professors and students of specialized text translation classes at both undergraduate and graduate levels in July 2025. The first questionnaire, consisting of 16 statements (15 items on a 5 point Likert scale and one semi-open question), was distributed to 40 students, and the second questionnaire, consisting of 6 statements on a 5 point Likert scale, was distributed to 6 professors of the aforementioned classes and departments. SPSS software was used to analyze the obtained data; first, Cronbach's alpha coefficient was calculated to measure the internal reliability of the instrument, then descriptive statistics indices were extracted, and finally, t-test and chi-square ( $\chi^2$ ) inferential tests were conducted to test the responses and examine the relationships between variables. In the qualitative part, data were collected through direct and non-intrusive observation. This process took place over seven weeks **during november, december, and january of the 2024–2025 academic year** in specialized translation classes at four universities : Tehran, Shahid Beheshti, Allameh Tabatabaei and Al-Zahra. The students' performance was recorded in the form of detailed field notes.

### **Theoretical framework**

In the contemporary world, mastery of specialized translation in fields such as technical sciences, engineering, medicine, law, and the humanities has become an undeniable necessity. Scarpa (2010:93) defines specialized translation as: the transmission of information to relatively specific groups of audiences through texts written in specialized languages. According to him, this type of translation is part of the flow of scientific-technical transfer at the transnational level and plays an essential role for the proper functioning of modern society. In this type of texts, clear and precise transmission of information is a priority. Some texts are designed primarily for the transmission of information and the aesthetic aspect does not play a dominant role in them (Delisel, 1980:22). In this regard, Scarpa emphasizes that specialized language is



not simply a collection of technical terms, but rather a structured and complex system based on criteria such as «noun formation», «impersonal constructions», «high vocabulary density», «specific syntactic structures», and «neutral and objective style». He argues that specialized translation is never reduced to the mere transfer of words, but requires the ability to analyze language accurately and master the discursive uses specific to each field. Scarpa also provides an in-depth analysis of the linguistic indices of specialized texts, highlighting the close relationship between social norms, the cultural system, and the textual structure in specialized languages. He examines its characteristics in three main axes: textual, syntactic-functional, and lexical-terminological indices.

### **Linguistic features of specialized languages**

**Textual indicators:** According to Scarpa, specialized texts have characteristics such as precise organization of text units, explicit or implicit references to principles and assumptions, formal definitions, use of symbols, figures, tables, and diagrams, as well as semantic coherence mechanisms such as repetition or the use of hyperboles. These texts, unlike relatively specialized writings (such as textbooks and treatises), avoid the use of synonyms as well as intra- and extra-textual references. In this regard, he echoes the views of Beaugrande and Dressler (1981: 3), who define a text as a «communicative event»; an event that must satisfy seven criteria: «cohesion», «coherence», «**intentionality**», «acceptability», «informativity», «**situationality**», and «intertextuality». In specialized texts, compliance with these criteria ensures the logical coherence and communicative function of the discourse.

**Syntactic-Phonological Indicators:** Scarpa believes that specialized languages do not have unique syntactic rules, but rather their differences appear in the high frequency of use of certain syntactic structures found in general language. The most important of these are: «nominal structure» (predominance of noun over verb), «simplification of sentences», «extensive use of passive voice», «avoidance of subjective elements» (such as first person, emotional tones, direct question and exclamation), and «predominance of the present adverbial tense».

**Lexical-terminological indicators:** She reflects the fundamental characteristics of specialized vocabulary in such cases as «metaphorization», «transparency», «**concision**», «**monoreferentiality**», and «**normalization**», and also introduces lexical challenges in «false friends», «polysemy» and structures that do not yet have an equivalent in the target language.

Scarpa also divides the types of problems faced by translators into two general categories: linguistic problems include «lexical polysemy», «phrases without direct equivalents», «complex syntactic structures» and «morphological-syntactic differences» between languages, and metalinguistic problems include «cultural norms», «communication situations», «audience expectations» and «unfamiliarity with specialized concepts».



## **The challenges of specialized translation**

### **1. Language challenges**

Jean Rybar (2012) conducted an empirical study on 130 students of technical and engineering disciplines to examine the difficulties of specialized translation in an academic environment. By presenting a specialized text to students and analyzing their translations, he identified several key challenges:

1. Weakness in translating specialized structures of the relevant field: Rebar concludes that general mastery of the language is not enough and that a deep knowledge of specialized vocabulary of the field is necessary. This problem often occurs when the student does not know the meaning of the word correctly in his native language.

2. Inability to recognize the specialized use of general language words: Words that have a meaning in general language acquire a different meaning in a specialized context. Rebar calls this phenomenon overlap between general language and specialized language.

3. Over-reliance on bilingual dictionaries: When the dictionary suggests an equivalent for a word, the student loses the ability to make a conscious choice, leading to inaccurate or incorrect translations.

4. Lack of logical analysis of texts: Rebar emphasizes that students should have the ability to reconstruct the overall meaning of a paragraph, but many lack this analytical capacity due to their desire to preserve the original structure.

Mshvenieradze (2022), in her article titled «**Overview of the problems in translating specialised texts**» also addresses the linguistic issues inherent in specialized translation and emphasizes that this type of translation goes beyond mere linguistic transfer and requires precise mastery of the terminology of the relevant field as well as in-depth knowledge of the source and target cultures. Therefore, he emphasizes the importance of using specialized documentary sources such as encyclopedias, reference books and dictionaries to obtain reliable terminological equivalents. He also points out the problem of polysemy, especially in the legal and economic fields, where a word can have different meanings depending on the context. This semantic ambiguity requires constant vigilance on the part of the translator, as misinterpretation of words can lead to stylistic or semantic errors and, as a result, jeopardize the quality of the target text.

### **2. Metalinguistic challenges**

Scarpa considers metalinguistic problems to be one of the main challenges of the specialized translation process and divides them into two main groups: pragmatic challenges and cultural problems. These problems are related to the change in the communicative situation between the source and target text, including the change in the audience, the communication medium, and

the communicative intention, as well as to the difference in the norms of specialized discourse and its discursive types in the two linguistic cultures (160).

In the category of pragmatic problems, Scarpa refers to socio-verbal difficulties that arise from divergences in stylistic norms or expectations specific to each type of text. In this context, Portaleon (1996: 330) cites some translation difficulties in medical texts, where the coexistence of different styles (such as scientific and literary styles) can confuse the translator if there is no clear distinction between them. This type of mixed coding makes it difficult to discern the communicative function of the text and requires special care in choosing the appropriate tone and style in the target language.

Regarding cultural problems, translation involves difficult intercultural mediation in which the translator must manage and interpret numerous cultural differences in order to establish effective communication between cultures. Balboni (2000: 25-28) emphasizes that in the era of globalization of production and research, the role of culture in commercial, diplomatic, military, academic and scientific-technical communication, even beyond the purely verbal dimensions, is becoming increasingly evident.

In addition to cultural differences at the «formal» level, Scarpa also addresses the challenges associated with «informal culture». This level includes implicit and often unconscious cultural elements that influence attitudes, beliefs, and values without being explicitly expressed in language. Despite not being obvious, these elements can have a profound impact on the interpretation and translation of a text.

In the field of metalinguistics, Rebar (2012:6) emphasizes the importance of «conceptual knowledge». In his view, mere mastery of the language is not enough to translate a specialized text; the student must also understand the scientific and technical concepts involved in the text. He also points out the lack of logical analysis among many students, and believes that «logical talent and the ability to think about the text can be recognized from the very first reading» (4). A student who is unable to identify the logical structure of a text cannot reconstruct its meaning, and this weakness in analysis adds to linguistic deficiencies, severely disrupts the translation process, and jeopardizes the final quality of the target text.

Another prominent challenge in the field of metalanguage is the institutional and conceptual differences between countries' legal and economic systems. Mshvenieradze (2022: 103) believes that the translation of medical texts, which usually deal with diseases, anatomy, and pathology, is less difficult due to the reference to the same and universal scientific concepts in all languages, and in principle, suitable equivalents can be easily found in foreign languages. However, in the translation of legal and economic texts, the translator is faced with institutional

differences between countries' legal and financial systems, which makes the activity of translation more difficult.

## Results

In this section, the findings from two questionnaires for students and professors and classroom observations are presented. To this end, the statistical data are first organized in clear tables and then analyzed and interpreted qualitatively using graphical diagrams. Finally, the results from direct observations will be reflected in order to complete and deepen the research.

### 1/ Analysis of student questionnaire data

The student questionnaire consisted of 16 items, including 15 statements rated on a five-point Likert scale and one semi-open-ended question. It was administered to 40 undergraduate and master's students enrolled in specialized translation courses at four Iranian universities: the University of Tehran, Shahid Beheshti University, Allameh Tabataba'i University, and Alzahra University.

#### 1/1 Quantitative analysis

##### 1.1/1 Descriptive analysis

Descriptive analysis of the items allows for measuring the level of acceptance and attitude of the participants towards each of the statements and reveals the diversity of students' perceptions regarding the difficulties of specialized translation. Table 1 shows the mean and standard deviation calculated for each item of the questionnaire.

**Table 1. Descriptive statistics**

| Item Number | Item Title                                                      | Mean | Standard deviation |
|-------------|-----------------------------------------------------------------|------|--------------------|
| Q1          | Translation of polysemantic words                               | 3/60 | 0/744              |
| Q2          | translation of complex syntactic structures                     | 2/90 | 0/955              |
| Q3          | Translation of cultural, social and ideological references      | 4/03 | 0/891              |
| Q4          | Translation of hidden and implicit concepts                     | 3/33 | 0/997              |
| Q5          | Translation of specialized and scientific terms                 | 2/95 | 1/037              |
| Q6          | Understanding of writing and discourse style                    | 3/15 | 1/145              |
| Q7          | Recognizing the purpose and audience of the translation         | 2/07 | 0/888              |
| Q8          | Level of linguistic knowledge                                   | 2/28 | 0/905              |
| Q9          | The impact of linguistic challenges on translation              | 2/83 | 1/010              |
| Q10         | Extent of use of various terminological resources               | 2/53 | 1/261              |
| Q11         | Extent of familiarity with terminological resources             | 2/67 | 1/309              |
| Q12         | Extent of reliance on literal translation                       | 2/13 | 1/042              |
| Q13         | Translation of linguistic context and specialized field         | 2/40 | 1/033              |
| Q14         | Overall understanding of the text with situation analysis       | 3/88 | 0/966              |
| Q15         | Attention to cultural and linguistic differences in translation | 4/35 | 0/662              |

Preliminary analysis shows that items 3 and 15, with the highest means (with the lowest standard deviation in the case of item 15), reflect the highest level of agreement and convergence of views; while items 7, 8, and 12 have the lowest means and limited support. The means range from 2.07 to 4.35, and the relatively high standard deviations, especially in items 5, 10, and 11, indicate a diversity of perceptions and lack of consensus among respondents; a diversity that can be attributed to differences in practical translation experience, level of translation competence, level of motivation and interest in specialized translation, learning styles, unequal access to resources, and level of benefit from educational guidance, as well as time constraints or unfamiliarity with some concepts.

### 1.2/1 One-sample t-test

A one-sample t-test was used to examine whether the mean of responses in each item was significantly different from the theoretical value of 3 (the middle limit of the Likert scale). This analysis shows that the students' views on each component were significantly higher or lower than the average. The complete results of the test, including t-values, degrees of freedom, and significance level (p-value) for all items, are presented in Table 2.

**Table2. t test**

| Item Number | Item Title                                                      | t-values | Significance level | result          |
|-------------|-----------------------------------------------------------------|----------|--------------------|-----------------|
| Q1          | Translation of polysemantic words                               | 5/099    | <0/001             | significant     |
| Q2          | translation of complex syntactic structures                     | -0/662   | 0/512              | non significant |
| Q3          | Translation of cultural, social and ideological references      | 7/274    | <0/001             | significant     |
| Q4          | Translation of hidden and implicit concepts                     | 2/061    | 0/046              | significant     |
| Q5          | Translation of specialized and scientific terms                 | -0/305   | 0/762              | non significant |
| Q6          | Understanding of writing and discourse style                    | 0/829    | 0/412              | non significant |
| Q7          | Recognizing the purpose and audience of the translation         | -6/586   | <0/001             | significant     |
| Q8          | Level of linguistic knowledge                                   | -5/064   | <0/001             | significant     |
| Q9          | The impact of linguistic challenges on translation              | -1/096   | 0/280              | non significant |
| Q10         | Extent of use of various terminological resources               | -2/383   | 0/022              | significant     |
| Q11         | Extent of familiarity with terminological resources             | -1/571   | 0/124              | non significant |
| Q12         | Extent of reliance on literal translation                       | -5/309   | <0/001             | significant     |
| Q13         | Translation of linguistic context and specialized field         | -3/674   | <0/001             | significant     |
| Q14         | Overall understanding of the text with situation analysis       | 5/730    | <0/001             | significant     |
| Q15         | Attention to cultural and linguistic differences in translation | 12/894   | <0/001             | significant     |

In 10 items 1, 3, 4, 7, 8, 10, 12, 13, 14 and 15, a statistically significant difference was observed compared to the reference value of 3 ( $p < 0.05$ ), indicating that the participants' views on these statements were significantly different from the neutral position. In contrast, in 5 items 2, 5, 6, 9 and 11, there was no significant difference ( $p \geq 0.05$ ) and the mean of the responses

remained close to the reference value. This could indicate the lack of a firm opinion among the respondents or a high dispersion of the responses, such that the deviation of the mean from the reference value can be considered to be simply due to random factors and not a stable thought pattern.

### 1.3/1 Chi-square test ( $\chi^2$ )

To examine the existence of a significant relationship between the variables, the chi-square test was used. This test indicates whether the participants' response pattern is random or whether the responses are concentrated around specific and directional patterns, despite the mean not deviating from the average. The results of this test are presented in Table 3.

**Table 3. Chi-square test ( $\chi^2$ )**

| Item Number | Item Title                                                      | ( $\chi^2$ ) | Degree of freedom | Significance level | result          |
|-------------|-----------------------------------------------------------------|--------------|-------------------|--------------------|-----------------|
| Q1          | Translation of polysemantic words                               | 20/000       | 3                 | <0/001             | significant     |
| Q2          | translation of complex syntactic structures                     | 19/000       | 4                 | <0/001             | significant     |
| Q3          | Translation of cultural, social and ideological references      | 32/750       | 4                 | <0/001             | significant     |
| Q4          | Translation of hidden and implicit concepts                     | 18/250       | 4                 | 0/001              | significant     |
| Q5          | Translation of specialized and scientific terms                 | 14/750       | 4                 | 0/005              | significant     |
| Q6          | Understanding of writing and discourse style                    | 9/750        | 4                 | 0/045              | significant     |
| Q7          | Recognizing the purpose and audience of the translation         | 54/250       | 4                 | <0/001             | significant     |
| Q8          | Level of linguistic knowledge                                   | 8/200        | 3                 | 0/042              | significant     |
| Q9          | The impact of linguistic challenges on translation              | 18/250       | 4                 | 0/001              | significant     |
| Q10         | Extent of use of various terminological resources               | 7/750        | 4                 | 0/101              | non significant |
| Q11         | Extent of familiarity with terminological resources             | 7/750        | 4                 | 0/101              | non significant |
| Q12         | Extent of reliance on literal translation                       | 35/750       | 4                 | <0/001             | significant     |
| Q13         | Translation of linguistic context and specialized field         | 4/800        | 3                 | 0/187              | non significant |
| Q14         | Overall understanding of the text with situation analysis       | 6/600        | 3                 | 0/086              | non significant |
| Q15         | Attention to cultural and linguistic differences in translation | 9/800        | 2                 | 0/007              | significant     |

In most items, the distribution of responses differs significantly from the expected distribution; this means that participants did not respond randomly and had clear tendencies towards some options. In particular, items 1, 3, 7 and 12 show highly significant differences, indicating clear positions and strong preferences of the respondents. Items 2, 5, 6, 8 and 9 also have significant differences, although the intensity is less. In contrast, items 10, 11 and 15 do not have significant differences, indicating a relatively uniform distribution of responses and the absence of a dominant preference. Overall, the findings indicate that most items evoked distinct reactions among the participants.

#### 1.4.1 Cronbach's Alpha Test

Cronbach's Alpha test was used to measure the internal consistency of the items. The value obtained for the total of 15 items of the questionnaire is  $\alpha=0.725$ , which indicates the acceptable reliability of the instrument used. This value exceeds the accepted threshold of 0.7.

#### 2.1 Qualitative analysis

Next, five prominent items from the student questionnaire are analyzed qualitatively to gain a more accurate understanding of the respondents' perspectives and to link quantitative data with the conceptual dimensions of the research.

One of the main challenges for professional translators is dealing with polysemous words. The first statement in the student questionnaire states: «I get confused when translating polysemous words». Figure 1 shows that a significant majority of participants, 55 percent (22 people), have difficulty dealing with these words, with 45 percent choosing the option «agree» and 10 percent choosing «completely agree». In contrast, only 5 percent (2) chose the option «disagree» and 40 percent (16) took a «neutral» position. These results confirm that polysemy is one of the main and recurring obstacles to student learning. According to Laufer (1997), language learners who are familiar with one of the meanings of a polysemous word often resist giving up that meaning and tend to stick to the original, known meaning even if the context requires another meaning.

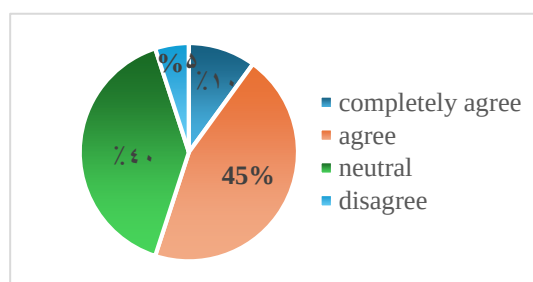
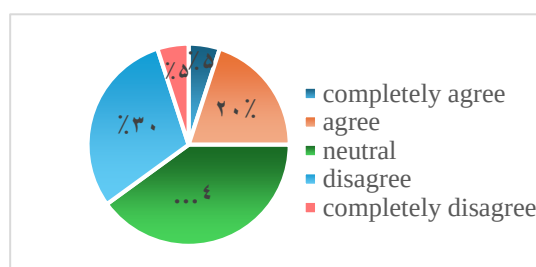


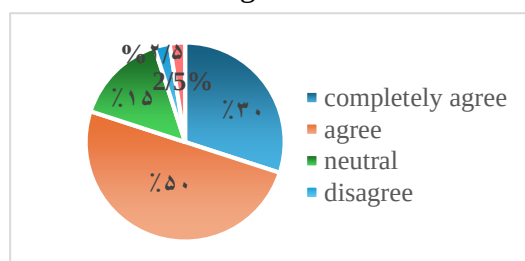
Figure1. Translation of polysemantic words

Another focus of the study is the learners' skills in processing complex syntactic structures in translation. For this purpose, the statement «I have no problem in analyzing and translating the syntactic structures of complex sentences» was assessed. The results show that only 25 percent of the participants (10 people) are confident in their abilities; 20 percent (8 people) chose «agree» and 5 percent (2 people) chose «completely agree». In contrast, 35 percent (14 people) disagreed with the statement; 30 percent (12 people) voted «disagree» and 5 percent (2 people) voted «completely disagree».



**Figure2. translation of complex syntactic structures**

The cultural and social components of specialized texts were also examined as an important and influential factor in the difficulties of specialized translation. The statement «Translating parts of the text that have unfamiliar social, cultural, and ideological references is challenging for me» received 80 percent of the positive votes of the participants (32 people); such that 50 percent (20 people) “agreed” and 30 percent (12 people) «completely agree». In contrast, only 5 percent (2 people) disagreed and 15 percent (6 people) had a neutral vote. These results indicate that a precise understanding of the cultural and social context of the source text plays a fundamental role in the translation process and the lack of this understanding can lead to inaccurate or distorted transmission of meaning.

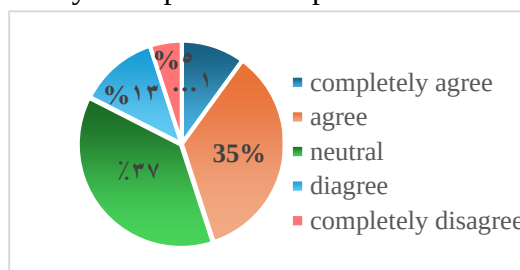


**Figure3. Translation of cultural, social and ideological references**

One of the fundamental skills in specialized translation is the ability to recognize and convey the implicit semantic layers of a text; layers that are not directly expressed at the lexical level, but are present in the structure of discourse and communicative context. The following statement addresses this challenge: «I do not know how to reflect the hidden and implicit components of the text in my translations». The findings provide a meaningful picture of the state of this skill. As much as 45 percent (18 people) admitted that they face difficulties in



representing implicit elements; the distribution of these votes is as follows: 35 percent (14 people) «agree» and 10 percent (4 people) «completely agree». On the other side of the spectrum, 18 percent of students (7) did not agree with this difficulty, 13 percent of this group (5) had a «disagree» view, and 5 percent (2) had a «completely disagree» point of view. In addition, 38 percent of learners (15) took a middle position and marked the «neutral» option, which could indicate a kind of uncertainty or cautious self-assessment of their level of mastery in this area. Such a distribution of responses shows that the skill of interpreting and conveying implicit meanings has not yet reached a stable and reliable level for a significant portion of students; an issue that can impair the accurate translation of concepts in the translation of specialized texts, given the density of implicit concepts and scientific assumptions.



**Figure 4. Translation of hidden and implicit concepts**

After examining the index votes, the semi-open statement of the questionnaire titled “I often encounter difficulties in translating specialized texts because [...]” received 31 responses, which were classified into three categories based on content: linguistic, metalinguistic, and personal challenges. Most responses were dedicated to linguistic problems, such as lack of specialized vocabulary, unfamiliarity with technical terms, difficulty in finding exact equivalents, especially when there is no appropriate equivalent in the target language, and structural differences between French and Persian, which indicate the dominance of lexical and terminological challenges. At the metalinguistic level, students emphasized a lack of subject knowledge, unfamiliarity with specialized concepts, the need for pre-translation research, and limited access to reliable sources, which indicates the role of a lack of background knowledge and insufficient use of virtual resources and parallel corpus texts. In addition, some responses referred to personal factors such as lack of time and lack of interest in translation, which indicates that these personal factors also contribute to difficulties in specialized translation.

After examining sixteen statements related to linguistic and metalinguistic challenges from the perspective of learners of this specialized branch, the views of professors are also evaluated with the aim of achieving a comprehensive and accurate study.

## **2/ Data Analysis of the Faculty Questionnaire**

The instructor questionnaire consisted of six items rated on a five-point Likert scale. It was administered to six instructors teaching undergraduate and master's specialized translation courses at four Iranian universities: Tehran, Shahid Beheshti, Allameh Tabataba'i, and Alzahra.

## 1.2 Quantitative Analysis

In the following sections, the data obtained will be evaluated using statistical methods similar to those used for the student questionnaire, including descriptive statistics and t-test. It is worth noting that due to the limited sample size, the necessary conditions for conducting the Chi-square and Cronbach's alpha tests were not available, and for this reason, these tests were excluded from the data analysis process.

### 1.1.2 Descriptive Analysis

The means and standard deviations of the six items of the questionnaire were calculated.

**Table 4. Descriptive statistics**

| Item Number | Item Title                                                      | Mean | Standard deviation |
|-------------|-----------------------------------------------------------------|------|--------------------|
| Q1          | Level of language proficiency                                   | 4/33 | 0/516              |
| Q2          | Over-focus on linguistic structures                             | 3/67 | 0/516              |
| Q3          | Difficulty understanding and translating specialized vocabulary | 3/33 | 0/816              |
| Q4          | Translating meaning, context, and style                         | 3/50 | 0/837              |
| Q5          | Translating cultural, social, and implicit elements             | 4/33 | 0/816              |
| Q6          | Over-reliance on the dictionary as the sole translation tool    | 3/67 | 0/816              |

This table clearly shows that the highest mean scores belong to items 1 and 5, indicating the most important challenges for students. Items 2 and 6 are in the next position, and the lowest means are assigned to items 4 and 3. These findings indicate that language and cultural barriers play a prominent role in the professional translation process of students.

### 1.2/2 One-Sample T-Test

The numerical values of each item can be seen in the table below.

**Table 5. t test**

| Item Number | Item Title                                                      | t-values | significance level | result          |
|-------------|-----------------------------------------------------------------|----------|--------------------|-----------------|
| Q1          | Level of language proficiency                                   | 6/325    | 0/001              | significant     |
| Q2          | Over-focus on linguistic structures                             | 3/162    | 0/025              | significant     |
| Q3          | Difficulty understanding and translating specialized vocabulary | 1/000    | 0/363              | non significant |
| Q4          | Translating meaning, context, and style                         | 1/464    | 0/203              | non significant |
| Q5          | Translating cultural, social, and implicit elements             | 4/000    | 0/010              | Significant     |

|    |                                                              |       |       |                 |
|----|--------------------------------------------------------------|-------|-------|-----------------|
| Q6 | Over-reliance on the dictionary as the sole translation tool | 2/000 | 0/102 | non significant |
|----|--------------------------------------------------------------|-------|-------|-----------------|

Items 1, 2, and 5 are significantly away from the theoretical value of 3 ( $p < 0.05$ ), while items 3, 4, and 6 remain within the reference value range and do not show a significant difference ( $p \geq 0.05$ ).

## 2.2 Qualitative Analysis

In this section, we focus on a qualitative examination of the four statements in the faculty questionnaire to more accurately explain the respondents' perspectives and strengthen the validity of the findings.

The first item of the questionnaire was dedicated to assessing the students' level of proficiency in the source and target languages and stated: «It seems that many students lack sufficient proficiency and knowledge in the foreign and native languages». The results obtained indicate a complete consensus among the professors present in the study; in such a way that 67 percent (4 people) declared themselves «agree» and 34 percent (2 people) declared themselves «completely agree». Therefore, the data confirm a strong consensus among the professors regarding the lack of linguistic proficiency of students in the native and foreign languages.

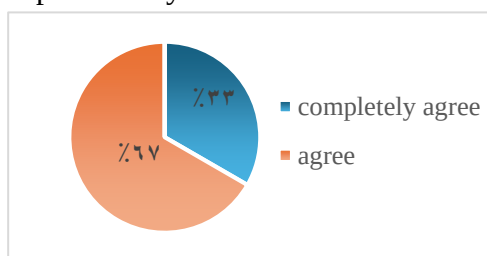
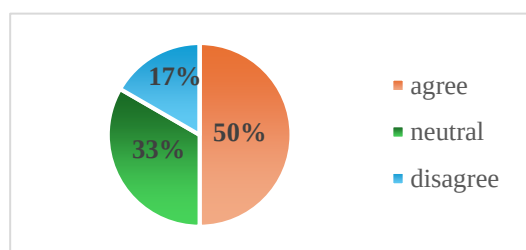


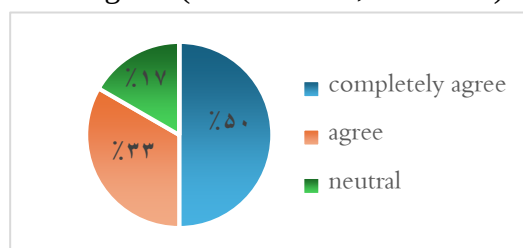
Figure 5. Level of language proficiency

Specialized vocabulary plays an important role in accurately conveying professional concepts in specialized translation. Another statement in the questionnaire was designed to investigate the difficulty of this issue from the professors' perspective as follows: «Understanding and translating specialized vocabulary is difficult for students». Figure 10 shows that 50 percent of the professors (3 people) agreed with the statement and 17 percent (1 person) disagreed, while no response was recorded in the «completely disagree» option. Also, 33 percent of the respondents (2 people) had a neutral view. This pattern shows that the difficulty of understanding and translating specialized vocabulary is considered a major challenge for students, and most professors also confirm the existence of this problem, although its severity is not the same for everyone.



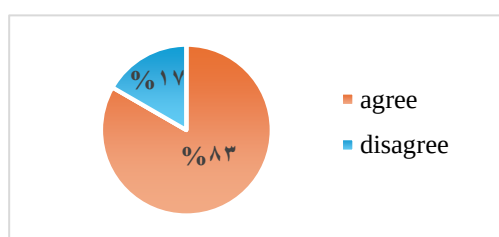
**Figure 6. Difficulty understanding and translating specialized vocabulary**

Another issue that did not receive any opposition from professors was the difficulty of students in translating cultural, social, and implicit references in specialized texts, which was titled: «Students often face challenges in translating social, cultural, and implicit and invisible elements of the text». 83% of the participants (5 people) confirmed this statement and stated that mastering the cultural and invisible concepts of the specialized text is still one of the fundamental obstacles in the path of students' learning. Of these, 33% (2 people) expressed "agree" and 50% (3 people) expressed "strongly agree". Also, 17% of the votes (1 person) took a neutral position. The process of translating a reproduced text cannot be separated from the cultural concepts represented in the target text. [...] Due to cultural differences, the translator faces difficulties in translating this type of vocabulary into another language, such as lexical gaps and referential gaps. It is observed that among the translation problems, the share of problems related to culture is the highest (Sassani et al., 2023:584).



**Figure 7. Translating cultural, social, and implicit elements**

The next item deals with «the role of the dictionary in the process of translating specialized words and terms by students, and its purpose is to measure the degree of their reliance on this tool». Based on the data obtained, 84 percent of the votes (5 people) are allocated to the option «agree». In contrast, 17 percent (1 person) opposed this view and chose «disagree». This result shows that from the perspective of the majority, the dictionary has a central and even inevitable position in the specialized translation process of students. However, excessive focus on this tool can lead to a decrease in the use of other scientific and professional resources and, as a result, limit the development of strategic competencies in translation.



**Figure 8. Over-reliance on the dictionary as the sole translation tool**

Following the analysis of the quantitative and qualitative data obtained from the questionnaires, this section presents the findings derived from direct classroom observations conducted in specialized translation courses. The classroom observations were carried out over a seven-week period during November, December, and January of the 2024–2025 academic year in undergraduate and master's specialized translation classes at four Iranian universities: Tehran, Shahid Beheshti, Allameh Tabataba'i, and Alzahra. The observed courses included the Translation of Islamic Texts, Media Translation, Audiovisual Translation, and the Translation of Documents and Contracts.

To identify students' linguistic and extralinguistic challenges accurately, the classroom observations were conducted according to a set of systematic, scientifically established, and predefined criteria, thereby enabling a more objective analysis of learners' performance. Table 6 presents these criteria in detail.

| Assessment Domain     | Subcategories                                                 | Assessment Criteria                                                                                                                                                                                                                          |
|-----------------------|---------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Linguistic Competence | Specialized terminology equivalence                           | Accuracy in selecting appropriate and conventional target-language equivalents; suitability of terminology for the specialized field; identification of accurate equivalents for polysemous terms; translation of abbreviations and acronyms |
|                       | Translation of specialized expressions and idiomatic language | Translation of metaphors, idiomatic expressions, figurative language, culture-specific expressions, untranslatable expressions, and wordplay                                                                                                 |
|                       | Textual coherence and cohesion                                | Maintenance of logical relationships between sentences, semantic coherence, and consistency of discourse and writing style                                                                                                                   |
|                       | Analysis of syntactic structures                              | Comprehension of complex sentences, subordinate structures, verb tenses, and passive constructions                                                                                                                                           |
|                       | Level of linguistic competence                                | Overall command of the source and target languages, including grammar, vocabulary, and the ability to comprehend and produce texts                                                                                                           |

|                            |                                                                  |                                                                                                                                                              |
|----------------------------|------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Extralinguistic Competence | Intercultural issues                                             | Consideration of cultural differences and cultural connotations; accurate transfer of historical, social, and ideological references                         |
|                            | Consideration of the communicative context                       | Identification of the purpose of the text, target audience, and communicative function of the translation                                                    |
|                            | Domain-specific knowledge                                        | Familiarity with the scientific and specialized concepts of the texts being translated                                                                       |
|                            | Ability to infer and convey meaning                              | Accurate representation of both explicit and implicit meanings; avoidance of semantic ambiguity; appropriate reproduction of the source text's tone          |
|                            | Use of supplementary specialized resources                       | Effective use of dictionaries, language corpora, terminology databases, and scholarly resources throughout the translation process                           |
|                            | Student participation and interaction in the translation process | Active participation in classroom discussions, collaborative translation activities, and the ability to analyze, justify, critique, and compare translations |

**Table 6. Observation and Assessment Criteria for Students' Specialized Translation Competences**

At the outset, the classroom observations revealed several noteworthy strengths in the students' performance. One of the most significant was their perseverance and commitment to analyzing specialized texts, as reflected in their continuous efforts to achieve a more accurate understanding of specialized concepts, their repeated revision and refinement of translations, their use of supplementary resources to resolve lexical ambiguities, and their search for more appropriate and precise equivalents. Throughout the course, the students also demonstrated active engagement in the learning process by raising questions about problematic aspects of the texts, completing assignments consistently, and striving to improve the quality of their translations.

Furthermore, the observations indicated that the students exhibited a satisfactory level of creativity in translation. During classroom discussions and translation activities, they proposed a variety of perspectives and translation solutions for conveying specialized meanings and frequently generated innovative ideas that were appropriate to the textual context when confronted with translation problems.

Another notable strength was the students' systematic approach to dealing with linguistic and syntactic structures. This was evident in their methods of text analysis, organization and classification of information, attention to the logical and semantic relationships between textual elements, maintenance of textual coherence and cohesion, and successful reconstruction of

complex source-language structures in forms that were both coherent and consistent with the conventions of the target language.

Participants in these learning environments also demonstrated a critical approach when comparing existing translations and expressed a strong willingness to understand complex concepts. Moreover, their ability to engage constructively with diverse and occasionally conflicting viewpoints, together with their effective use of collaborative learning to exchange ideas, created a productive environment for enhancing translation competence within the classroom.

Nevertheless, the classroom observations also revealed a number of specific challenges encountered during the specialized translation courses.

In the course of "Translation of Islamic Texts", the fundamental obstacle is the inability to find equivalents and simultaneously convey lexical and grammatical components in concepts that have a special semantic, cultural and jurisprudential load. The lack of an exact equivalent in the target language causes learners to hesitate and be ambiguous in their choice of words, and the weakness in recognizing the semantic and functional context of words reduces the transparency and reliability of their translations. Instead of a holistic approach, students usually settle for reductionist and fragmentary readings; this approach, combined with the polysemy of Islamic terms, blurs the boundaries between explicit, metaphorical and symbolic meanings and leads to the production of inaccurate translations that undermine the spiritual authenticity of the source text. Furthermore, the cultural untranslatability of some religious concepts, even when using approximate equivalents, is unable to represent the semantic associations and nuances of the original text, increasing the risk of message distortion and misunderstanding by the audience.

In the Audiovisual Translation unit, the obstacles are mainly structural and content-based. Long sentences, disjointed phrases, and contradictory clauses make it difficult to understand and accurately convey meaning. In addition, finding equivalents for proper nouns (people, places, works of art) and maintaining a balance between spelling, pronunciation, and cultural connotations requires extensive knowledge that is beyond the current capabilities of students. Translating allusions, language games, neologisms, and implicit cultural references also pose a major challenge for learners. Finally, a significant portion of the obstacles are tied to the technical limitations of subtitling, which impose the necessity of shortening and brevity of vocabulary; success in this field requires, in addition to linguistic proficiency, the ability to recreate the tone and aesthetics of the work in order to convey the mood of the film and its communicative details into the target language.



In translating “official documents and contracts,” the precise and formal nature of these texts made the students’ translation process a highly sensitive and error-prone activity. Reproducing established terms and transferring concepts from one legal system to another required a high level of legal precision and awareness that was often not evident in the students’ writing. Since these types of texts reflect the legal and cultural structures of each society, students could undermine the legal validity of the entire document by making even minor errors in punctuation, dates, or proper names in their translations. . The abundance of national and international abbreviations and acronyms also increases the interpretive burden of the text, and any incorrect reading of these elements by the student leads to a change in the legal meaning of the document. In addition, young translators sometimes rely on literal translation in dealing with the terminology of this field, changing the provisions of contracts. The set of these considerations shows that learners in the course of legal document translation face a significant challenge in mastering comparative law and specialized vocabulary in this field to present a text that is accurate, reliable, and faithful to the author's intention.

### **Conclusion**

The present study was written with the aim of diagnosing the challenges in specialized French translation in Iranian universities. The main concern of this paper is to identify the key obstacles that students face when translating specialized texts, as well as the challenges that professors mention. We assume that the obstacles appear at two macro-linguistic levels, which are lexical-terminological and verbal-grammatical structures, and metalinguistic in the form of ideological components, implicit and hidden elements, socio-cultural references, etc. To test this hypothesis, a combination of quantitative and qualitative methods (questionnaire and direct classroom observation) was used, relying on the theoretical views and approaches of Rybar (1993), Scarpa (2010), and Mshvenieradze (2022). The results of the study show that 43 percent of students' challenges are linguistic and 57% are meta-linguistic. At the linguistic level, a significant portion of students' failures in translation, with a distribution of 75 percent, are due to poor mastery of vocabulary and specialized terms, and 25 percent to the inability to recognize fixed combinations and difficulty in processing complex syntactic structures. In addition, the weakness in identifying conceptual networks and the cognitive structure of professional concepts turns specialized translation into a superficial and unstable process for students. This is often accompanied by a lack of skills in searching for reliable sources and insufficient familiarity with specialized text analysis methods. In addition to these factors, metalinguistic challenges also play a decisive role in the quality of translations. 57 percent of these problems arise from the inability to recognize implicit elements, cultural and ideological references, and 43 percent from the lack of sufficient understanding of the context of production and reception

of the text, which as a result seriously impairs the reconstruction of meaning in the target language. The results show that specialized translation is not simply the transfer of linguistic units, but rather requires the reconstruction of a complete conceptual and discursive framework, which would not be possible without analytical and intercultural training. This study, by confirming the views that consider specialized translation as a cognitive and intercultural activism, emphasizes the necessity of integrating specialized language training, discourse analysis, research skills, and familiarity with the conceptual backgrounds of each field. From the perspective of scientific contribution, the present article adds to the richness of the discourse on specialized translation education by presenting an analysis based on field data from the Iranian academic environment and shows that many of the results of previous research on translator competencies and problems are also applicable in the Iranian educational context. Finally, the findings of the present study can be a basis for future studies. Investigating appropriate educational solutions and efficient teaching strategies to overcome the challenges of specialized translation and improve students' linguistic and metalinguistic competencies is one of the research paths that can be pursued in the continuation of this research. At the same time, future research could examine the role of new technologies, especially artificial intelligence, in reducing the linguistic and metalinguistic challenges of specialized translation. It also seems necessary to design educational models based on problem solving and translational thinking, considering the differences in specialized fields (medicine, law, technical). In addition, developing evaluation tools appropriate to the multi-layered nature of these challenges and conducting comparative studies with regional universities to distinguish local from global challenges are other significant research areas.

### **Research Limitations**

Among the limitations of the present study was the difficulty of gaining access to faculty members teaching specialized translation courses during the data collection period, as well as the limited extent of their participation in the research process. Owing to practical and time constraints, it was not feasible to conduct follow-up interviews or to design and administer qualitative instruments based on open-ended questions for all instructors. Consequently, the data from this group were collected exclusively through questionnaires, resulting in a relatively small instructor sample compared with the target population.

In addition, the data collection process encountered several challenges among the student participants. Some students completed the questionnaires with considerable delay, while others declined to participate altogether. As a result, the overall data collection process required a longer period than initially anticipated.

### Ethical considerations

CRedit authorship contribution statement

Nosrat Hejazi, research design, supervising the research stages, reviewing and controlling the results, revising, reviewing and finalizing the article

Mobina Zali: Preparation and preparation of samples, conducting experiments and collecting data, performing calculations, statistical analysis of data, analyzing and interpreting information and results, preparing the draft of the article

### AI

Declaration of Generative AI and AI-assisted technologies in the writing process

The author did not use any artificial intelligence tools or artificial intelligence-based technologies in the writing and preparation of this article.

### Conflict of interest

The authors declare no conflict of interest.

### Ethical considerations

The authors avoided data fabrication, falsification, and plagiarism, and any form of misconduct.

### Data availability statement

Data available on request from the authors.

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