Exploring the Challenges Faced by Translator Trainees in Translating Scientific and Technical Texts between Arabic and English: An Error Analysis Approach

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Received: 12 July 2024
Revised: 11 August 2024
Accepted: 21 August 2024

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Abstract:

This study investigated the challenges faced by translator trainees in translating scientific and technical texts between Arabic and English. A mixed-methods approach was utilized for this purpose. At first a structured questionnaire was administered to 46 trainees from three Yemeni universities to collect data on their translation experiences and challenges. Following this, a translation test was conducted with 40 trainees to generate a corpus of translation samples, comprising excerpts from a variety of scientific and technical texts. A total of 724 errors were identified through an error analysis of those translations, with 228 errors in English-to-Arabic and 496 in Arabic-to-English translations. The results indicated that lexical errors were most frequent, along with significant syntactic and orthographic errors. Findings suggest that linguistic, cultural, and cognitive factors contribute to these challenges. The analysis revealed that strengthening vocabulary and syntactic skills, alongside media-specific training, is critical for improving translation accuracy. The study underscores the need for specialized training programs addressing these identified areas, emphasizing that concerted efforts from both training institutions and researchers are essential to enhance the competencies of translator trainees working with the Arabic-English language pair.

Keywords: *translator trainees, scientific translation, Arabic-English, error analysis, training programs.*

استكشاف التحديات التي يواجهها متدربو برامج الترجمة في ترجمة النصوص العلمية والتقنية بين العربية والإنجليزية: منهجية تحليل الأخطاء

سمير حميد أحمد سعيد [1،*]

الملخص:

تناولت هذه الدراسة التحديات التي يواجهها المترجمون المتدربون في ترجمة النصوص العلمية والتقنية بين اللغتين العربية والإنجليزية باستخدام منهجية الأساليب المتعددة. تم إجراء استبيان على 46 متدربًا من ثلاث جامعات يمنية لجمع بيانات حول تجاربهم في الترجمة والتحديات التي يواجهونها. بعد ذلك، تم إجراء اختبار ترجمة مع 40 متدربًا للحصول على مجموعة من عينات الترجمة، تتضمن مقتطفات من النصوص العلمية والتقنية. تم تحديد إجمالي 724 خطأً من خلال تحليل الأخطاء لهذه الترجمات، منها 228 خطأً في الترجمات من الإنجليزية إلى العربية و496 خطأً في الترجمات من العربية إلى الإنجليزية. أشارت النتائج إلى أن الأخطاء المعجمية كانت الأكثر تكرارا، إلى جانب الأخطاء النحوية والإملائية. وتشير النتائج إلى أن العوامل اللغوية والثقافية والمعرفية تساهم في هذه التحديات. وكشف التحليل أن تعزيز المفردات والمهارات النحوية، إلى جانب التدريب الخاص بالوسائط، أمر بالغ الأهمية لتحسين دقة الترجمة. تؤكد الدراسة على الحاجة إلى برامج تدريبية متخصصة تتناول هذه المجالات المحددة، مؤكدة على أن الجهود المتضافرة من كل من مؤسسات التدريب والباحثين ضرورية لتعزيز كفاءات المتدربين المترجمين العاملين مع اللغتين العربية والإنجليزية.

الكلمات المفتاحية: ***المترجمون المتدربون، الترجمة العلمية، عربي-انجليزي، تحليل الأخطاء، البرامج التدريبية.***

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Introduction

In the context of scientific and technical translation, translator trainees, confront a multitude of challenges when tasked with rendering such specialized texts from English into another language, particularly when translating between languages from distinct origins. The global exchange of scientific and technical knowledge relies heavily on the accuracy and precision of translation. As the world becomes increasingly interconnected, the need for effective translation in scientific and technical domains has never been more pressing. Translation plays a vital role in facilitating the dissemination of knowledge and information across linguistic boundaries, enabling researchers and professionals to communicate complex ideas and advancements to a global audience. The accurate and precise translation of specialized terminology and concepts is essential to ensure comprehension and transfer of scientific innovations, ultimately driving progress and development.

According to Lahlali and Abu Hatab (2014, p. 89), "Scientific texts are considered the most challenging for the translator." This assertion is substantiated by the fact that scientific and technical texts constitute a significant proportion of the corpus of texts translated today, necessitating specialized training in these areas for translators.

In response to the growing demands of scientific and technical translation, translator-training programs have emerged as a critical component in preparing professionals for this specialized field. These programs aim to enhance linguistic skills, cultural competence, and domain-specific knowledge, thereby improving the quality and accuracy of translation services. As Saeed (2010) notes, technical texts and scientific texts require particular attention when designing materials for translation classes, highlighting the importance of tailored training programs.

Jibreel (2023) notes that English-Arabic translation is becoming a widespread area for work and learners in various fields, including cross-cultural purposes. This trend underscores the importance of examining the challenges faced by translator trainees in this language pair, particularly when translating scientific and technical texts.

In the context of translator training, trainees confront a multitude of challenges when tasked with rendering scientific and technical texts into another language, particularly when translating between language pairs such as Arabic and English. The disparities in linguistic structures, syntactic conventions, and cultural norms between these two languages present substantial obstacles for trainees seeking to convey the precise meaning and technical accuracy of the original text. Consequently, it is essential to scrutinize the errors committed by translator trainees in order to identify and address the linguistic discrepancies that impede their translation quality. This will enable researchers to develop targeted training programs and instructional materials that can facilitate translators' ability to overcome these challenges and produce high-quality translations.

To address these challenges, a thorough examination of the specific errors and difficulties encountered by translator trainees is essential. Previous research in the field of translation studies has predominantly focused on error analysis within Applied Linguistics contexts, such as English as a Foreign Language (EFL) or English as a Second Language (ESL) settings, or in translation studies with different language pairs other than Arabic and English. However, it is clear that these studies have limitations when applied to the specific context of translator trainees in scientific and technical areas, particularly within the Arabic-English language pair. As such, this study aims to contribute to the existing body of research by examining the errors and challenges faced by translator trainees in this specific context.

Research Questions

This study seeks to answer the following research questions:

1. What are the most common types of errors made by translator trainees when translating scientific and technical texts between Arabic and English, and how do these errors differ between these two domains?
2. What are the underlying factors that contribute to the occurrence of these errors, including linguistic and contextual variables?
3. What are the most commonly translated genres of scientific and technical texts in translator training programs, and what are their linguistic characteristics?
4. How does the proficiency of translator trainees vary in translating between Arabic and English, and what factors contribute to any observed differences in their performance in each translation direction?

Research Objectives

Based on these research questions, the objectives of this study can be formulated as follows:

1. To identify and categorize the most prevalent types of errors committed by translator trainees when translating scientific and technical texts between Arabic and English, and to analyze how these errors differ across the two domains.
2. To investigate the linguistic and contextual factors contributing to the occurrence of these errors, providing insight into the challenges faced by translator trainees.
3. To examine the most commonly translated genres of scientific and technical texts within translator training programs, and to analyze their linguistic characteristics.
4. To assess the proficiency levels of translator trainees in translating between English and Arabic in both directions, identifying potential factors influencing any observed differences.

LITERATURE REVIEW

Theoretical Framework

Domains of Scientific and Technical Translation

Scientific and technical translation is a multifaceted discipline that necessitates the translation of complex, specialized information across linguistic boundaries. The domains of scientific and technical translation are intertwined, as they often share similar textual features and confront analogous challenges during the translation process. Consequently, it is essential to examine the commonalities and differences between these two domains.

Scientific Translation Texts

Scientific translation demands a profound understanding of various scientific disciplines, including medicine, biology, chemistry, physics, engineering, environmental sciences, and mathematics. As Awadh (2024) notes, scientific translation involves rendering complex scientific texts, documents, and materials from one language to another, requiring a high level of technical proficiency, precision, and expertise. This involves not only a solid foundation in the relevant scientific field but also exceptional writing and communication skills to effectively convey the intended meaning and accuracy of the original text. In accordance with Hatem and Nihad (2022), scientific language is characterized by simplicity, correct grammar, and sentences in the correct order to ensure comprehension of the information. This simplicity and correctness are crucial in ensuring that the translated text accurately conveys the intended meaning to the target audience.

Technical Translation Texts

Technical Translation necessitates the translation of technical information disseminated through various text formats, including user manuals, instructional guides, and patent descriptions. Farghal and Shunnaq (1992) posits that technical translation encompasses specialized literature emanating from diverse disciplines, including sciences such as chemistry, physics, industries, and medicine (p. 203). Ghazala (1995) corroborates this notion by affirming that technical translation involves the translation of scientific and technical terminology across various disciplines.

Byrne (2006) offers a more sophisticated understanding of technical translation by defining it as a specialized type of translation that requires the rendering of documents generated by technical writers. Moreover, Williams and Chesterman (2002) underscore the importance of technical translation in conveying specialized knowledge across fields such as science, technology, economics, and medicine. Notably, they also emphasize the crucial role of subject expertise and command of relevant terminology in facilitating accurate and effective translation.

Challenges of Translating Scientific and Technical Texts

The translation process involves navigating various challenges that can compromise the accuracy and effectiveness of the target text. These challenges arise from the complexities of text type/genre-specific features, and disparities between language pairs used as source and target languages. Nida's (1976) seminal work

identified two fundamental categories of translation problems: content-based and form-based issues, which are intricately linked to the structure of the source text, message comprehension, and the need for well-structured sentences.

Scientific and technical texts present unique translation challenges due to their formal tone and specialized vocabulary. The lack of direct equivalents for specialized terminology in other languages necessitates accurate translation strategies. Nord's (1991) framework highlights four categories of translation problems: text-specific, pragmatic, cultural, and linguistic issues that arise from the source text's features, translation task requirements, cultural differences, and structural language disparities.

Text Type/Genre-Specific Challenges

Scientific and technical texts are characterized by their formal tone and specialized vocabulary, which often lack direct equivalents in other languages. Olohan (2015) notes that these genres rely heavily on specialized vocabulary inaccessible to outsiders (p. 35), emphasizing the need for translators to possess a deep understanding of the subject matter. Byrne (2012) underscores the complexity, specificity, and technicality of these texts, while Tolibayeva and Akhmedov (2021) highlight their precision, logical sequencing, conciseness, coherence, clarity, and objectivity (p. 64).

Language Pair-Specific Challenges

The choice of language pair significantly impacts translation outcomes, presenting unique obstacles that must be addressed. The Arabic-English language pair poses significant challenges due to linguistic and cultural differences. The translation process from English to Arabic or vice versa is challenging due to the languages' different and distant origins (Abdelmajd & Akan, 2018).

Additionally, disparities arise from variations in vocabulary, syntax, idiomatic expressions, cultural norms, and worldview (Ali & Al-Rushaidi, 2017). Farghal (2009) underscores the complexities of translating between Arabic and English, citing discrepancies in vocabulary, syntax, and translator proficiency as fundamental barriers. Akki & Larouz (2021) aptly state that translation is a complex issue (p. 35), while Ghazala (1995) attributes translation problems to grammatical, lexical, stylistic, and phonological issues (p. 18).

When translating scientific and technical texts from Arabic into English, translators must contend with a range of issues that can lead to errors if not carefully addressed. One of the primary challenges lies in the lexical differences between Arabic and English. Arabic has a distinct vocabulary that is not always directly translatable to English. For instance, the concept of "science" is represented by the word "علم" (ʿilm) in Arabic, which has connotations of knowledge or wisdom that are not entirely captured by the English equivalent. Similarly, technical terms like "بيئة" (biyāʾah) for "environment" or "تكنولوجيا" (tunkenalujīyah) for "technology" may not

have direct equivalents in English. This lack of direct translation can lead to errors or ambiguities in the target text.

Syntactic Differences

Furthermore, the syntactic structures of Arabic and English differ significantly. Arabic is a Semitic language with a subject-verb-object word order, whereas English is an Indo-European language with a subject-verb-object word order. This difference can result in awkward phrasing or ungrammatical sentences in the target text. For example, the sentence "المركز العلمي" (al-markaz al-ʿilmi) meaning "the scientific center" would be translated to "the center scientific" in English, which sounds unnatural and may require rephrasing to maintain grammatical accuracy.

Orthographic Differences

Orthographic differences also pose significant challenges for translators. As confirmed by Abu-Salem and Chan (2006), the Arabic language's unique features, including its right-to-left orientation, multiscript system, and frequent omissions of vowels in orthography, among others, contribute to the challenges encountered in English-Arabic translation. This can lead to difficulties in formatting and layout, particularly in technical texts that require precise diagrams and illustrations. Furthermore, Arabic has a complex system of diacritical marks that are essential for conveying the correct pronunciation and meaning of words, but are often lost in translation.

To overcome these challenges, translators must possess a deep understanding of both languages and cultures, as well as specialized knowledge in the field being translated. They must also be familiar with the conventions and terminology used in scientific and technical writing in both languages. By taking these factors into account, translators can ensure that the final product is accurate, clear, and effective in communicating complex ideas across linguistic and cultural boundaries.

Error Analysis as a Research Methodology

Definition and Significance

Error analysis is considered a fundamental research methodology in Applied Linguistics that involves is a systematic examination of errors committed by language learners or non-native speakers in their language production. This approach has been defined and refined by various scholars and dictionaries over time, with Richards and Schmidt (2010) describing it as a crucial aspect of second language acquisition research involving the study and analysis of errors made by learners (p. 201). Brown (2000) further elucidates the process, describing it as the observation, analysis, and categorization of deviations from linguistic rules to reveal the underlying systems and strategies employed by learners (p. 166).

Evolution of Error Analysis: From SLA to Translation Research

Error analysis has undergone a significant evolution since its inception in the 1950s and 1960s. Initially, it emerged as a distinct area of research in Second Language Acquisition (SLA), driven by the need to understand learner's errors in order to develop more effective language teaching methods. Scholars such as Chomsky (1957) and Quirk et al. (1972) played a crucial role in establishing error analysis as a cornerstone of SLA research, focusing on identifying and explaining the errors made by learners at different proficiency levels.

In recent years, error analysis has shifted its focus to translation research, reflecting the growing importance of accurate and efficient translation practices in global communication. This shift is driven by the increasing need for high-quality translations in many specialized translation areas including scientific and technical domains. The classification of errors is diverse and complex specifically when applied to foreign language learning and human translation evaluation. By applying error analysis to translation research, scholars can better understand the challenges faced by translators and identify areas for improvement in translation training programs. This evolution has led to the development of new methodologies and tools for analyzing errors in translation, enabling researchers to provide more effective support for translators and improve the overall quality of translations.

Adaptation of Error Analysis Approach

As outlined by Ellis (1994, p. 48), S. P. Corder's EA model comprises five steps: collecting samples of learner language, identifying errors, describing errors, explaining errors, and evaluating/correcting errors. This study adopted this model to investigate the challenges faced by translator trainees.

The following steps were taken in this study:

1. **Error Sample Collection**: A corpus of translations produced by translator trainees was analyzed to collect error samples. Samples were selected based on representativeness and relevance to the research questions.
2. **Error Categorization:** Errors were categorized into lexical, grammatical, and orthographic types to identify patterns and trends.
3. **Error Analysis**: Each error sample was analyzed to identify underlying causes, including linguistic, cultural, and cognitive factors, considering context and translator background and experience.
4. **Pattern Identification and Error Factors**: Through error analysis, patterns of errors, their causes, and contributing factors were identified, informing understanding of the challenges faced by translator trainees when translating scientific and technical texts between Arabic and English.
5. **Implications for Translator Training:** Findings have implications for translator training programs, including development of targeted training modules addressing specific error types and factors.

Previous Relevant Studies

The literature addressing translation errors and the challenges faced by translator trainees, particularly in Arabic-English contexts, is expansive. This section provides a concise overview of studies that specifically examine translation challenges within this language pair.

Al-Smady (2022) conducted a qualitative analysis of the primary challenges encountered by translator trainees when translating scientific texts from English to Arabic. Through the examination of a 938-word scientific document translated by twenty undergraduate students, the study identified key issues, including lexical and syntactic difficulties, such as word choice, terminological consistency, and grammatical agreement. It concluded that a lack of experience in the subject area and an over-reliance on literal translation significantly exacerbated these challenges.

Elkateb (2017) focused on areas of difficulty in scientific and technical translation, emphasizing syntactic, lexical, and stylistic equivalence. The research underscored the importance of grasping the author's intent and the necessity of accurately conveying messages across linguistic boundaries. The study also highlighted the complexities of specialized technical terminology and advocated for collaboration between translators and subject-matter experts to enhance translation precision.

Investigating the difficulties faced by senior translation students, Ashuja'a et al. (2021) explored the translation of English scientific metaphors into Arabic. The findings revealed linguistic variations and insufficient experience in scientific translation as major obstacles, further stressing the importance of cultural awareness in the translation process.

Al Zahrani and Al Qahtani (2021) analyzed errors made by female Saudi university students in the translation of medical texts from English to Arabic. The study classified errors into three categories: linguistic, comprehension, and translation errors, with translation errors being the most prevalent. It emphasized the need for increased training in translation and a deeper understanding of medical terminology to improve students' translation skills.

Mounassar (2021) examined the challenges underlying Yemeni students' translation of scientific texts from English to Arabic, noting difficulties in finding equivalent terms, selecting appropriate translation methods, and familiarizing themselves with scientific vocabulary. The study advocated for enhanced training and education in technical translation to improve the competence and performance of students in this field.

Mohammed (2021) identified common challenges among Saudi English language students at Prince Sattam Bin Abdulaziz University during the translation of Arabic texts into English. Issues such as word selection and identifying suitable equivalents were prevalent, reflecting broader concerns regarding translation proficiency.

The research by Alfadly and Aldeibani (2013) explored linguistic challenges faced by undergraduates at Hadramout University in Arabic-English translation. The study revealed fundamental grammatical weaknesses among students, which hindered

their comprehension and translation accuracy across both languages. It proposed pedagogical recommendations aimed at enhancing grammatical knowledge and syntactic understanding.

In another study, Al-Sohbani and Muthanna (2013) examined the challenges encountered by Yemeni students in Arabic-English translation, highlighting deficiencies in lexical knowledge, grammar, cultural background, and teaching methodologies. This research underscored the need for systematic reforms in translation education.

Additionally, Solaiman (2021) investigated the grammatical challenges faced by M.A. Arabic students in India when translating from English to Arabic. The study identified recurrent grammatical issues, including difficulties with definite and indefinite articles, grammatical agreement, case, tense, and prepositions. Notably, 98% of participants struggled with article translation, often misusing articles or applying the Arabic definite article to proper nouns. These findings indicate the necessity of explicit instruction for trainees concerning the nuances of Arabic.

While the literature has explored various aspects of translation challenges, significant gaps remain regarding the specific difficulties faced by translator trainees in translating scientific and technical texts between Arabic and English. This study aims to address this gap by employing error analysis as a methodological framework. By identifying error patterns, causes, and contributing factors, this research will offer valuable insights into the complexities faced by translator trainees in these specialized domains.

RESEARCH METHODOLOGY AND PROCEDURES

Research Population and Sample Selection

The research population consisted of 46 translator trainees from the University of Science and Technology, Alwatanya University, and Al-Yamania University in Hodeida, Yemen, during the second semester of the academic year 2023/2024. The selection of these universities was based on their sole offering of translation training programs during the research period. A review of the curricula revealed a standardized 4-year structure recommended by the Ministry of Higher Education in Yemen, focusing on language and translation courses.

For the sample selection, 46 translator trainees were selected from level 3 and level 4 of the 4-year translator training programs. They were actively enrolled during the second semester during the period of survey and test administration. This selection criteria ensured that participants had the necessary proficiency and knowledge in language and translation, including familiarity with scientific and technical texts and translation challenges.

Research Design

This study employed a mixed-methods design, combining both quantitative and qualitative methodologies to investigate the challenges faced by trainee translators in translating scientific and technical texts. The Error Analysis Model was chosen for analyzing the translation errors obtained by means of a translation test due to its systematic approach in categorizing and analyzing errors. The mixed-methods design allowed for the integration of both qualitative and quantitative data, providing a comprehensive understanding of the research problem.

Data Collection tools

Two primary data collection instruments were used: a questionnaire and a piloted translation test.

Questionnaire Design and Administration

A questionnaire, see (Appendix A) was designed to collect data on participants' language skills in scientific and technical translation. The questionnaire consisted of ten questions addressing important aspects related to translation-training programs, types of texts translated, language proficiency, areas of difficulty, factors contributing to challenges, subject matter knowledge, and strategies employed to overcome translation challenges.

Before administering the questionnaire, it was sent to three university professors specialized in educational assessments and evaluation to check the surface and content validity and reliability of questionnaire and its adequacy to the level of the participants. Then the research questionnaire was administered to the participants personally with the help of some instructors in those departments.

Test Design and Administration

The translation test (Appendix B) was structured into two primary sections: English to Arabic translation and Arabic to English translation. Each section comprised ten sentences extracted from various texts in scientific and technical domains.

Prior to administering the test, the researcher ensured its validity and reliability by consulting three experts in the fields of testing and evaluation. With their feedback incorporated, the translation test was conducted on 40 translator trainees selected from level 3 and level 4 within their respective translation departments with the aid of some experienced instructors in each department.

Following the completion of the questionnaire and translation test administration, the gathered data underwent a rigorous error analysis process .The results from both the questionnaire and translation test will be discussed in detail in the upcoming section, providing a comprehensive analysis of the trainees' language skills, areas of difficulty, and the strategies they employed to overcome translation challenges.

RESULTS AND DISCUSSION

Analysis of Questionnaire Responses

The survey responses from 46 translator trainees provided valuable insights into their demographic and training backgrounds, linguistic and translation competences, and perceptions of the challenges involved in translating scientific and technical texts.

Demographic and Training Background

As shown in Table 1, the respondents were distributed unevenly across training institutions and levels. The majority (60.87%) came from the University of Science and Technology, followed by Al-Watanya University (23.91%) and Al-Yamanya University (15.22%).

Table 1: The scores of the control and experimental translation groups

Training Institution	Level 3	Level 4	Total	Percentage
University of Science and Technology	13	15	28	60.87%
Al-Yamanya University	4	3	7	15.22%
Al-Watanya University	5	6	11	23.91%
Total	22	24	46	100%

Translation Practice and Text Types

The results showed that research papers (40%) were the most commonly translated scientific and technical texts, followed by manuals (43%), reports (35%), and academic articles (38%). These findings suggest that trainees are exposed to a variety of scientific and technical texts, with a focus on research papers and manuals.

Translator Trainees' Proficiency

The analysis of responses to questions 5 and 6 revealed varying proficiency levels among translator trainees in translating scientific and technical texts from Arabic to English and from English to Arabic. The majority of participants rated themselves as beginners in translating from Arabic to English, indicating a potential need for further training in this direction.

Challenges and Factors

The responses for questions 7 and 8 indicated that terminology (46%) and specialized vocabulary (43%) were the most challenging areas in translating scientific and technical texts. Furthermore, the majority of respondents (71%) rated their knowledge of subject matter in the scientific and technical domains as limited.

Strategies for Overcoming Translation Challenges

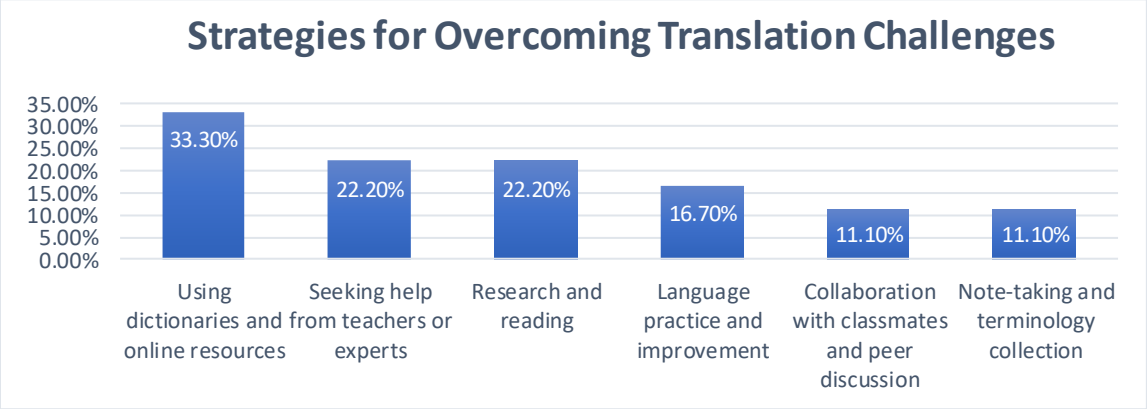


Figure 1: Strategies for Overcoming Translation Challenges

Figure 1 presents a clustered column chart illustrating the percentage of strategies used by respondents to overcome translation challenges. The chart reveals that using dictionaries and online resources is the most popular strategy (33.3%), followed by seeking help from teachers or experts (22.2%), research and reading to improve understanding (22.2%), language practice and improvement (16.7%), collaboration with classmates and peer discussion (11.1%), note-taking and terminology collection (11.1%). These findings suggest that respondents face significant challenges in translating scientific and technical texts and therefore employ a range of strategies to overcome them.

Findings of the Error Analysis

A thorough examination of the translations collected from the translator trainees participated in the pilot test revealed a total of 724 errors in all their translations in both directions, with 228 errors occurring in English-Arabic translations and 496 errors arising in Arabic-English translations. These errors were subsequently categorized and subcategorized based on their forms and linguistic components to facilitate further analysis and elucidate their underlying patterns and characteristics.

Direction-specific analysis

Distribution of Errors in English to Arabic Direction

The investigation into translation errors from English to Arabic involved a systematic examination of error frequencies in the three main categories; lexical, syntactic, and orthographic across all the translations provided by all 40 translator trainees who have participated in this study with regard to the first ten sentences in the pilot test.

Table 2: English to Arabic Translation Errors by Category and Subcategory

Category	Subcategory	Frequency	Percentage
Lexical Errors	Wrong Word Choice	36	38.7%
	Wrong Collocations	34	36.6%

	Incorrect Terminology	23	24.7%
Total Lexical Errors	93	40.8%	
Syntactic Errors	Sentence Structure	28	33.5%
	Word Order	22	26.2%
	Subject-Verb Agreement	14	16.7%
	Tense Errors	12	14.3%
	Preposition Errors	10	11.9%
Total Syntactic Errors	84	36.8%	
Orthographic Errors	Spelling Errors	33	64.7%
	Punctuation Errors	18	35.3%
	Capitalization Errors	00	0 %
Total Orthographic Errors	51	22.4%	
Total Errors	228		

As shown in Table 2, lexical errors accounted for the largest proportion of errors, with 93 instances (40.8%) attributed to wrong word choice (38.7%), wrong collocations (36.6%), and incorrect terminology (24.7%), which together make up 100% of the lexical errors. This suggests that translator trainees struggled with selecting the appropriate vocabulary and terms for accurate translation.

Syntactic errors comprised the second largest category, with 84 instances (36.8%) attributed to sentence structure (33.5%), word order (26.2%), subject-verb agreement (16.7%), tense errors (14.3%), and preposition errors (11.9%). This highlights the need for attention to sentence construction and organization in English to Arabic translations.

Orthographic errors, including spelling and punctuation errors, accounted for 51 instances (22.4%) of the total errors, with spelling errors being the most prevalent (64.7%) while no capitalization errors found in this translation direction. This could be attributed to the variation in the scripts of the two language pair as the capitalization exists in English script but not in Arabic script system. This suggests that translator trainees may require additional training in proofreading and spelling rules in the two languages.

Examples of Errors in English to Arabic Translation

The English-to-Arabic translation direction revealed several lexical errors. For instance, the incorrect use of the Arabic term "نظرية" instead of "فرضية" to translate the English term 'hypothesis' indicates a lack of understanding of specific scientific terminology. Additionally, the incorrect choice of vocabulary when translating the English word 'effectiveness' as "فعالية" instead of "فاعلية" in the sentence " توضح الدراسة فاعلية الدواء في تثبيط نمو الورم" affects the precision and accuracy of the scientific content.

In terms of syntactic errors, verb tense errors were identified, such as the omission of the preposition "عن" following the verb "أسفرت" in a sentence, which alters the sentence structure and affects the overall coherence of the translation.

Furthermore, orthographic errors were observed, including misspellings like "درجت" instead of "درجة" and incorrect word choices like substituting "حرق" for "خرق" to translate the technical term 'breach'.

Distribution of Errors in Arabic to English Translations

Table 3 : Arabic to English Translation Errors by Main Category and Subcategory

Error Category	Subcategory	Frequency	Percentage
Lexical Errors	Wrong Word Choice	98	41.43%
	Incorrect Terminology	84	35.44%
	Wrong Collocations	55	23.21%
Total Lexical Errors	237	47.98%	
Syntactic Errors	Sentence Structure	48	28.40%
	Word Order	37	21.89%
	Subject-Verb Agreement	25	14.78%
	Tense Errors	26	15.38%
	Preposition Errors	33	19.53%
Total Syntactic Errors	169	34.03%	
Orthographic Errors	Spelling Errors	40	44.44%
	Punctuation Errors	30	33.33%
	Capitalization Errors	20	22.22%
Total Orthographic Errors	90	18.19%	
Total Errors	496		

The investigation into translation errors from Arabic to English reveals that lexical errors accounted for the largest proportion of errors, with 237 instances (47.98%) attributed to wrong word choice (41.43%), incorrect terminology (35.44%), and wrong collocations (23.21%). These findings suggest that translator trainees struggled with selecting the appropriate equivalent vocabulary and terms when translating scientific and technical texts from Arabic to English.

Syntactic Errors comprised the second largest category, with 169 instances (34.03%) attributed to sentence structure (28.40%), word order (21.89%), subject-verb agreement (14.78%), tense errors (15.38%), and preposition errors (19.53%). This highlights the importance of attention to sentence construction and organization while translating to English.

Orthographic Errors, including spelling, punctuation, and capitalization errors, accounted for 90 instances (18.19%) of the total errors, with spelling errors being the most prevalent at 44.44%. Punctuation errors occurred at a rate of 33.33%, while capitalization errors accounted for 22.22%. These findings suggest that translator trainees may require additional training in proofreading and editing skills to ensure accuracy in all aspects of written language.

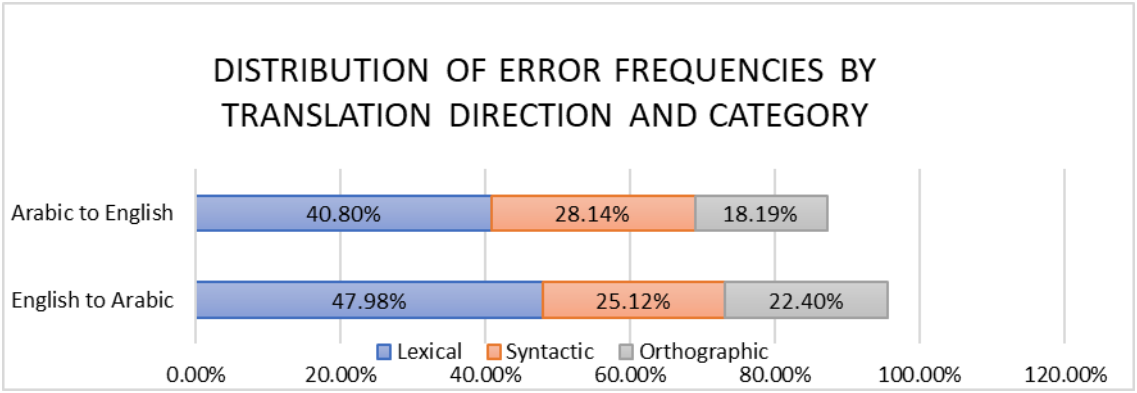
Examples of Errors detected in Arabic to English

In the Arabic-to-English translation direction, lexical errors were observed in the translations of technical terms. For instance, the incorrect translation of the Arabic sentence " ان السبب الأبرز للمشكلة هو الانتباه الضعيف" resulted from the wrong collocation of the adjective "ضعيف" with an incorrect equivalent. Another example is the incorrect translation of the sentence " تم تصميم الدراسة لاستكشاف العلاقة بين الإجهاد والأمراض المزمنة", which resulted from substituting "discover" for "explore" and "fatigue" for "stress".

Syntactic errors were also observed, including incorrect use of verb tenses. For example, trainees frequently translated the Arabic sentence " تم تصميم هذه المعدّات لتوفير آلية أمنة فعّالة وموثوق بها" as "This equipment is designed to provide a safe and effective and reliable method" instead of the correct translation "This equipment was designed to provide a safe and effective and reliable method".

Orthographic errors were observed in this translation direction, including incorrect spellings like substituting "safly" for "safely". These errors highlight the importance of meticulous attention to linguistic accuracy in research contexts.

Figure 2: Error Frequencies in English-Arabic and Arabic-English Translations



The Stacked Bar in Figure 2 presents the error frequencies in English to Arabic and Arabic to English translations, revealing significant differences the rates of error frequencies between the two translation directions. The results indicate that lexical errors were the most prevalent type of mistake in both directions, with a higher frequency in Arabic to English translations (47.98%, 237 errors) compared to English to Arabic translations (40.8%, 93 errors).

Syntactic errors were also common in both directions, with a slightly higher frequency in Arabic to English translations (34.03%, 169 errors) compared to English to Arabic translations (36.8%, 84 errors). Orthographic errors, which include spelling, punctuation, and capitalization mistakes, were less frequent than lexical and syntactic errors, but still accounted for a significant proportion of total errors in both directions.

Furthermore, a closer examination of the error patterns reveals interesting contrasts between English to Arabic and Arabic to English translation directions.

While lexical errors are common in both directions, syntactic errors are more prevalent in translations from Arabic to English. Orthographic errors, on the other hand, are more frequent in English to Arabic translations. This could possibly be due to the complexity of the Arabic script.

Domain-specific Analysis

While designing the pilot test which was used to collect the corpus of translation from the trainees, the researcher intended to arrange the 10 sentences in each translation direction on the basis of the texts genres from which they were extracted where the first five sentences (S1-S5) selected to represent the scientific domains and the other five sentences (S6-S10) to represent technical domains. This arrangement was preferred to make the process of analysis smooth and easier with regard to their frequencies and percentages of error categories and subcategories in each of the specified domains.

Errors in Scientific and Technical Texts Translation

The present study examined the errors made by translation trainees in translating texts from Arabic to English, focusing on scientific and technical domains. The arrangement of sentences in the pilot test comprised five scientific sentences (S1-S5) and five technical sentences (S6-S10). Table 1 presents the frequencies and percentages of errors in each category for both domains.

Table 4: Frequencies and Percentages of Errors in Scientific and Technical domains (Eng.-Arb.)

Error Category	scientific sentences (S1-S5)	technical sentences (S6-S10)	Total
Lexical Errors	45 (37.5%)	48 (44.4%)	93
Syntactic Errors	48 (40.0%)	36 (33.3%)	84
Orthographic Errors	27 (22.5%)	24 (22.2%)	51
Total Errors	120	108	228

The results show that the total number of errors in scientific texts was 120, with lexical errors accounting for 37.5%, syntactic errors for 40.0%, and orthographic errors for 22.5%. In contrast, technical texts had a total of 108 errors, with lexical errors accounting for 44.4%, syntactic errors for 33.3%, and orthographic errors for 22.2%. A comparison of the two domains reveals that lexical errors were the most common type of error in both domains.

Table 5: Frequencies and Percentages of Errors in Scientific and Technical domains (Arb.-Eng.)

Error Category	scientific sentences (1-5)	technical sentences (6-10)	Total
Lexical Errors	116 (48.57%)	121 (48.21%)	237
Syntactic Errors	82 (33.47%)	87 (34.66%)	169
Orthographic Errors	47 (18.96%)	43 (17.13%)	90
Total Errors	245	251	496

The analysis reveals that trainees made a total of 496 errors, with lexical errors accounting for 48.57% in scientific texts and 48.21% in technical texts. Syntactic errors accounted for 33.47% in scientific texts and 34.66% in technical texts, with a difference of only -1.19%. Orthographic errors accounted for 18.96% in scientific texts and 17.13% in technical texts, with a difference of -1.83%.

Comparing this analysis to the previous section, where errors were examined in translation from English to Arabic, it is evident that the distribution of errors differs slightly when translating from Arabic to English. The variations in error types and frequencies highlight the complex nature of translation and the importance of targeted interventions to address specific linguistic challenges in scientific and technical translation.

Both sections underscore the significance of error analysis in identifying areas for improvement and enhancing language proficiency among translation trainees in specialized domains. Targeted language support and training can mitigate errors and enhance communication and clarity in scientific and technical discourse across different language pairs.

In conclusion, a contrastive analysis of errors in Arabic to English and English to Arabic translations sheds light on the specific challenges encountered by translator trainees. Addressing these error patterns through targeted training and interventions is essential to enhance translation accuracy in scientific and technical texts. Continued research in this area will contribute to the improvement of translator skills and the quality of translated materials in Arabic and English.

The findings of this study reveal the complexities and challenges that translator trainees face when translating scientific and technical texts between Arabic and English. The results highlight the importance of understanding the commonalities and differences between scientific and technical translation, as well as the need for translators to possess a deep understanding of both languages and cultures.

The study's error analysis methodology also provided valuable insights into the patterns, causes, and factors contributing to errors in translator trainees' translations. The results show that lexical, grammatical, and orthographic errors were prevalent, with linguistic, cultural, and cognitive factors playing a significant role in their occurrence. These findings are consistent with some of the previous studies that have identified similar challenges in translation trainees' performance (Al-Smady, 2022; Elkateb, 2017).

The study's findings also underscore the importance of understanding the unique features of scientific and technical texts, including their formal tone, specialized vocabulary, and precision requirements. The results suggest that translators must be aware of the differences in language pairs, including lexical, syntactic, and cultural differences between Arabic and English.

The major limitation that should be acknowledged is that the sample size was limited to a small number of translator trainees, which may not be representative of all translation trainees at all translation training programs. This could be taken any consideration when other relevant studies could be implemented in the field.

CONCLUSION

In conclusion, this study has demonstrated the complex nature of scientific and technical translation between Arabic and English, highlighting the various challenges that translator trainees face in the translation process. The analysis of error samples from translator trainees' translations revealed a range of linguistic, cultural, and cognitive factors that contribute to errors, including lexical, grammatical, and orthographic errors.

Recommendations and Suggestions

Based on the findings of this study, the following recommendations and suggestions are made:

For Translator Trainees

1. Develop and refine vocabulary and terminology skills: The preponderance of lexical errors in both translation directions underscores the importance of enhancing vocabulary and terminology skills, particularly in scientific and technical domains. Trainees should engage in targeted exercises and activities designed to improve their familiarity with specialized terminology and nomenclature.
2. Attain syntactic proficiency: The frequency of syntactic errors in both directions highlights the significance of attention to sentence structure, word order, and subject-verb agreement. Trainees should prioritize developing their skills in writing clear, concise, and grammatically correct sentences.
3. Refine orthographic skills: Orthographic errors, particularly in English-to-Arabic translations, underscore the importance of attention to spelling, punctuation, and capitalization rules in both languages. Trainees should cultivate a keen sense of linguistic detail to minimize such errors.
4. Practiced-based training: The study's findings suggest that trainees require hands-on experience with scientific and technical texts to develop confidence and proficiency. Practiced-based training can facilitate this process.

For Training Institutions

1. Incorporate specialized training in scientific and technical translation: Institutions should provide dedicated training programs in scientific and technical translation to equip trainees with the specialized knowledge and skills required for effective communication in these domains.
2. Emphasize vocabulary and terminology development: Institutions should prioritize building vocabulary and terminology skills through targeted exercises, workshops, and discussions to support trainees' linguistic development.
3. Feedback mechanisms for syntactic and orthographic errors: Institutions should establish feedback mechanisms to identify and address syntactic and orthographic errors, providing trainees with constructive guidance for improvement.

For Researchers

1. Investigate translation challenges: Further research is needed to investigate the specific challenges faced by translator trainees when translating scientific and technical texts from Arabic to English.

2. Examine linguistic factors influencing translation errors: Researchers should investigate the impact of linguistic factors, such as script differences, on translation errors to inform targeted interventions.
3. Develop tailored interventions: Researchers should design evidence-based interventions to address specific linguistic challenges in scientific and technical translation, thereby enhancing the effectiveness of translation training programs.

ACKNOWLEDGEMENTS

This research received grant number (99/2023) from the Arab Observatory for Translation (an affiliate of ALESCO, which is supported by the Literature, Publishing & Translation Commission in Saudi Arabic. This support was gratefully acknowledged by the researcher.

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