



Students' Struggles with Engineering and Technical Vocabulary A Case Study of Translation Issues at the Higher Institute of Engineering Technologies, Benghazi

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صعوبات الطلاب في التعامل مع المفردات الهندسية والتقنية
دراسة حالة حول مشكلات الترجمة في المعهد العالي للتقنيات الهندسية – بنغازي

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Abstract:

This study investigated the persistent challenges faced by undergraduate engineering students attempting to translate technical terminology from English into Arabic at the Higher Institute of Engineering Techniques, Benghazi. The language of instruction in engineering and source materials is mostly English, and students' efforts to produce accurate and contextually appropriate translations interfere with their understanding and academic performance. Utilizing a mixed-method case study design, the study triangulated information from task analysis of translations, error typology, and student questionnaires to examine cognitive and linguistic barriers in engineering discourse. The findings validated problems in conceptualizing and contextualizing technical terms, which often resulted in literal, erroneous, or semantically incoherent translations. These issues were caused by limited exposure to domain texts, insufficient lexical training, and a disconnect between general English teaching and specialized translation needs. The results highlight the need for explicit vocabulary instruction and field-specific, translation-oriented modules in engineering education. The study contributes to the field of translation pedagogy by emphasizing the cognitive demands of technical translation and proposing data-driven instructional interventions for non-native English-speaking engineering students.

Keywords: Technical translation, ESP (English for Special Purposes), engineering vocabulary, Arabic-English translation, translation pedagogy, students' difficulties.

الملخص

تهدف هذه الدراسة إلى استكشاف التحديات المستمرة التي يواجهها طلاب الهندسة في مرحلة البكالوريوس عند ترجمة المصطلحات التقنية من الإنجليزية إلى العربية في المعهد العالي للتقنيات الهندسية، بنغازي. نظرًا لأن لغة التدريس والمواد المصدرية غالبًا ما تكون بالإنجليزية، فإن محاولات الطلاب لإنتاج ترجمات دقيقة وملائمة للسياق تؤثر على فهمهم وأدائهم الأكاديمي. اعتمدت الدراسة على تصميم دراسة حالة متعددة الأساليب، وجمعت البيانات من تحليل مهام الترجمات، وتصنيف الأخطاء، واستبيانات الطلاب لفحص الحواجز المعرفية واللغوية في الخطاب الهندسي. أظهرت النتائج أن الطلاب غالبًا ما ينتجون ترجمات حرفية أو خاطئة أو غير متماسكة دلاليًا، نتيجة محدودية التعرض للنصوص التخصصية، وضعف التدريب المعجمي، والفجوة بين تدريس اللغة الإنجليزية العامة واحتياجات الترجمة التقنية. وتشير النتائج إلى أهمية تعليم المفردات بشكل صريح وتقديم وحدات تعليمية مخصصة للمجال الهندسي وموجهة نحو الترجمة. حيث تسهم هذه الدراسة في تطوير تعليم الترجمة من خلال التركيز على المتطلبات المعرفية للترجمة التقنية واقتراح تدخلات تعليمية مستندة إلى البيانات لدعم الطلاب غير الناطقين بالإنجليزية.

الكلمات المفتاحية: الترجمة التقنية، الإنجليزية للأغراض الخاصة، المفردات الهندسية، الترجمة العربية-الإنجليزية، تدريس الترجمة، صعوبات الطلاب.

1. Introduction

English is the primary language of science and engineering all over the globe (Hutchinson & Waters, 1987; Dudley-Evans & St. John, 1998). At the Higher Institute of Engineering Technologies in Benghazi, classes in fields such as Oil and Gas Technology are conducted in English (Qaddafi, 2022). This means that students have not only to understand and translate technical terms but also to deal with general English in a more advanced way. Most students struggle with this problem, primarily because they lack technical knowledge and are unfamiliar with the context (Al-Zanati, 2019; Al-Taher, 2021). Examples such as “blowout preventer” or “drilling mud” require face-to-face and exact subject knowledge, which students may find difficult to acquire from their limited training (Al-Zawi, 2016).

In this paper, we aim to identify the challenges faced by students of Oil and Gas Technology in their third and fourth semesters, specifically in the translation area. Surveys, translation tasks, and error analysis help to pinpoint the main obstacles and provide input on ways to improve the technical English course for better academic success and career preparation

2. Theoretical Background

2.1 Technical Translation in Engineering Education

Technical translation is the process of accurately conveying the meaning of specialized terms from one language into another (Newmark, 1988; Byrne, 2006). The exercise involves the knowledge of two languages and also the understanding of the subject. If engineering students want to make use of textbooks, manuals, and documents from the industry, this is a must (Gile, 2009). Strong translation skills not only increase understanding but also boost career readiness (Al-Taher, 2021).

2.2 English for Specific Purposes (ESP)

ESP is a part of the teaching of the English language that concentrates on the personalized demands of learners from some particular fields, like engineering (Hutchinson & Waters, 1987). Students will learn the necessary vocabulary and communication skills for the industry. English for Specific Purposes (ESP) is vital in the technical sphere, as it enables people to get a clear idea of the main activities that are carried out in English (Dudley-Evans & St. John, 1998; Al-Zawi, 2016).

2.3 Common Translation Challenges

Engineering students are most likely to encounter issues such as the following:

- Lexical issues: everyday words that have a specialized meaning (for example, “mud” as drilling fluid) (Byrne, 2006).
- Contextual errors: not understanding the technical uses correctly (Al-Zanati, 2019).
- Knowledge gaps: a very limited understanding of the technical field (Abdullah, 2017).
- Cultural differences: these can make it difficult to find the right and accurate translations for unfamiliar concepts (Newmark, 1988).

2.4 Vocabulary and Academic Performance

A study shows that there is a strong correlation between academic performance and the level of vocabulary mastery (Al-Zanati, 2019). Being familiar with the terms can support the learning of courses such as Drilling Technologies and Fluid Mechanics (Qaddafi, 2022).

2.5 The Libyan Context

Students from Libya, in addition, have to deal with the fact that they do not have any structured ESP courses at all, their access to the specialized dictionaries is very limited, and they have to rely on rote learning or machine translation to accomplish their tasks (Qaddafi, 2022; Al-Zawi, 2016). Such gaps interfere with the growth of the students' translation skills and also indicate the necessity of improving the curriculum (Al-Taher, 2021).

Technical translation is an important element for engineering students in the development of their careers and academic success (Byrne, 2006). The difficulties faced by Oil and Gas Technology students in Libya stem from the fact that language teaching and technical content are not well integrated (Al-Zanati, 2019; Qaddafi, 2022). Changes must be targeted in education to meet academic and industry needs, thus addressing these problems (Hutchinson & Waters, 1987).

3. Methodology

3.1 Participants

This project involved 30 third- and fourth-semester students in the Department of Oil and Gas Technology.

3.2 Research Tools

- Translation Task: Converting the ten most frequent petroleum engineering terms from English into Arabic (Newmark, 1988; Byrne, 2006).
- Questionnaire: A 12-item instrument to ascertain perceived difficulties, confidence levels, and exposure to technical vocabulary (Al-Zanati, 2019; Al-Taher, 2021).
- Error Analysis: Figuring out errors in translations by categorizing them as correct, literal, partial, or wrong.

3.3 Data Analysis

The respondents' answers to the questionnaire were subjected to percentage analysis (Al-Zawi, 2016). The errors in the translation task were studied qualitatively to establish regularities (Byrne, 2006; Gile, 2009).

4. Results and Analysis

The survey questioned teachers regarding their students' degree of self-assurance in comprehending and translating technical vocabulary. The findings additionally illustrated that students have limited knowledge of technical terms.

4.1 Survey Results

The survey revealed a clear knowledge gap in understanding and translating technical terms.

Statement	Agree	Disagree
I understand most technical terms that are used in lectures.	30%	70%
I'm sure I can translate technical words into Arabic correctly.	25%	75%
I had trained in the use of technical vocabulary during my studies.	20%	80%
I use the translation tools online for unfamiliar terms.	85%	15%
I feel that technical English covers more than general English.	90%	10%

Analysis:

- Excessive dependence on machine translation without recognizing the context.
- Lack of systematic training in technical vocabulary.
- Lower performance in English studies because of low confidence when dealing with technical texts, leading to problems with academic performance and work preparedness.

4.2 Translation Task Results

Performance in the translation task:

- 7 students (23%) translated more than 7 terms correctly.
- 23 students (77%) mistranslated 5 or more terms.

Examples of errors:

- Blowout Preventer: Some people correctly translated it as “explosion preventer”; however, others gave the wrong answer, “air blaster” or “blower.”
- Reservoir Pressure: The concept was incorrectly represented by the term “general pressure.”
- Drilling Mud: The suggested literal translations did not indicate the function of the object.

Common Error Patterns:

- Literal translations without understanding.
- Misleading and vague general and technical meanings.
- Over-reliance on online tools without verification.

4.3 Qualitative Analysis of Difficulties

Main problems identified:

- Difficulty conceptualizing words in scientific contexts.
- Limited access to vocabulary relevant to the domains.
- A divide between ordinary English teaching and technical subject matter.
- No trustworthy bilingual materials to check the translations.

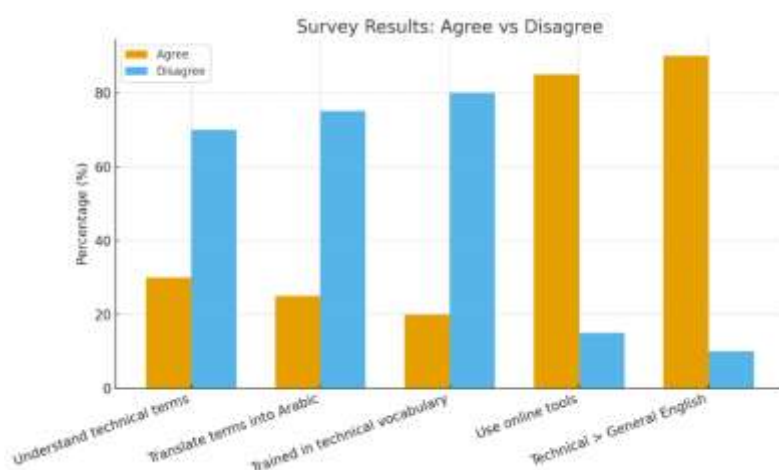


Figure 1: Survey Results on Understanding and Translating Technical Terms.

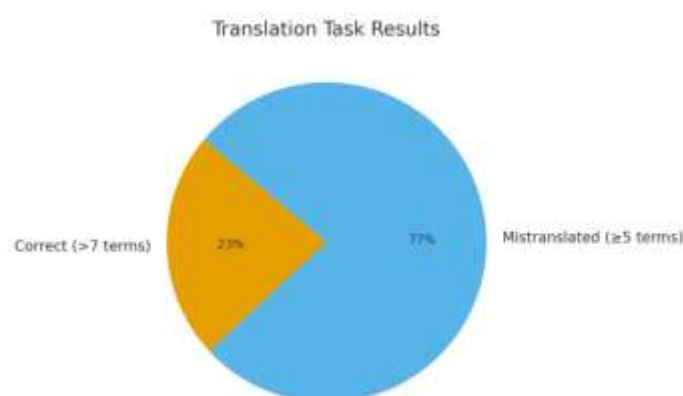


Figure 2: Translation Task Results.

5. Recommendations

Given the results, it is proposed to implement the following actions to enhance technical English and translation instruction (Al-Taher, 2021; Qaddafi, 2022).

5.1 Introduce a Technical Vocabulary Course

Conduct a course on technical terminology for the oil and gas sector in English, incorporating translation and practical exercises (Hutchinson & Waters, 1987; Al-Zawi, 2016).

5.2 Develop a Bilingual Guide

Produce a terminology booklet in English/Arabic with:

- Simple definitions.
- Correct translations.
- Contextual usage of terms (Newmark, 1988; Byrne, 2006).

5.3 Organize Translation Workshops

Conduct practical translation training sessions with language experts and technologists (Gile, 2009; Abdullah, 2017).

5.4 Use Authentic Texts in Teaching

Introduce authentic materials, such as instruction manuals and reports, for reading, translation, and analysis in class (Dudley-Evans & St. John, 1998; Byrne, 2006).

5.5 Build an Online Resource Base

Construct an online portal with:

- Video lessons on technical vocabulary.
- Interactive translation exercises.
- Links to reputable specialized dictionaries.

5.6 Encourage Collaborative Learning

Promote group translation activities to encourage discussion and shared understanding of technical terms.

Conclusion of Results and Recommendations

This research identifies the major problems that students of petroleum engineering at college encounter in the 3rd and 4th semesters while attempting to find correct translations of technical words. A mere 23% of them managed to come up with mostly correct translations, meaning the present language teaching is far from being adequate for them. Customized teaching methods are essential for students to not only train their technical translation skills but also to be fully equipped for the professional sector.

6. Additional Recommendations

1. Introduce specialized vocabulary units that focus on the terminology of petroleum and gas engineering.
2. Use authentic materials for reading and interpreting activities.
3. Arrange translation seminars, which are conducted by individuals who are proficient in both the language and the engineering sectors.
4. Support peer learning by collaborative translation tasks.

7. Conclusion

This research is a definite indication of the major difficulties encountered by third- and fourth-semester petroleum engineering students in rendering technical terms into another language. Language instruction that is going on now is only 23% of students, who have mostly correct translations. Students should be taught in a way suitable for them so that they can increase their technical translation skills and be ready for the requirements of the industry.

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Compliance with ethical standards

Disclosure of conflict of interest

The author(s) declare that they have no conflict of interest.

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Appendix 1: Survey on Technical Term Translation Challenges

Purpose

This questionnaire aims to identify the challenges students face when dealing with English technical terms and translating them into Arabic.

Section 1: Background Information

1. What is your current semester?

- ☐ Third ☐ Fourth

2. How many years have you studied English?

- ☐ Less than 5 years ☐ 5–8 years ☐ More than 8 years

3. How would you rate your overall English level?

- ☐ Excellent ☐ Very Good ☐ Good ☐ Weak

4. Have you ever taken a course in translation or technical vocabulary?

- ☐ Yes ☐ No

Section 2: Technical Translation and Terminology

5. How difficult is it for you to understand technical terms in your courses?

- ☐ Very difficult ☐ Difficult ☐ Moderate ☐ Easy

6. When you encounter a new technical term, what is your usual approach?

- ☐ Use online translation
☐ Check a dictionary
☐ Ask a teacher or classmate
☐ Guess or ignore it

7. Which area is hardest for you to translate?

- ☐ Drilling ☐ Production ☐ Reservoirs ☐ Geology ☐ General engineering terms

8. Do you rely on literal (word-for-word) translation?

- ☐ Yes ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

9. How often do you use machine translation (e.g., Google Translate) for technical terms?

- ☐ Always ☐ Often ☐ Sometimes ☐ Rarely ☐ Never

10. Do you think machine translation is accurate for technical terms?

- ☐ Yes ☐ No ☐ Sometimes

Section 3: Translation Challenges and Academic Impact

11. Do translation difficulties affect your understanding of course content?

- ☐ Yes, very much ☐ Somewhat ☐ No

12. What type of mistakes do you most often make when translating?

- ☐ Grammar
☐ Meaning/semantics
☐ Using incorrect terms/idioms
☐ Not sure

13. Do you understand technical terms better in English or Arabic?

- ☐ English ☐ Arabic ☐ I don't understand them well in either language

14. What confuses you most when translating?

- ☐ Too many new terms
☐ Similar words
☐ No good Arabic translation
☐ Grammar difficulties

Section 4: Education and Training

15. Do you think your courses explain technical terms well enough?

- ☐ Yes ☐ No ☐ Sometimes

16. Which language do you prefer for your courses?

- ☐ Arabic ☐ English ☐ A mix of both

17. Would a course on technical translation be helpful?

- ☐ Yes ☐ No ☐ Not sure

18. Have you tried translating technical texts yourself?

- ☐ Yes ☐ No

If yes, how was your experience?

- ☐ Successful ☐ Difficult ☐ Frustrating

Section 5: Suggestions and Opinions

19. What would help you improve your translation skills the most?

- ☐ A dedicated course
 - ☐ Practical workshops
 - ☐ A bilingual dictionary
 - ☐ Self-study

20. What is your suggestion for improving students' translation skills?

(Open Answer)

Appendix 2: Common Student Translation Errors

No.	English Term	Incorrect Arabic Translation	Correct Arabic Translation	Error Type
1	Well logging	تسجيل البئر	تحليل سجل البئر	Semantic
2	Reservoir	خزان مياه	خزان نفطي	Semantic
3	Drilling mud	طين الحفر	سائل الحفر	Literal/Inaccurate
4	Downhole	أسفل الحفرة	داخل البئر	Literal
5	Porosity	مسامية	قدرة الصخور على تخزين السوائل (المسامية)	Under translation
6	Permeability	نفاذية	قابلية مرور السوائل عبر الصخور (النفاذية)	Underexplained
7	Casing	التغليف	أنبوب التغليف / تبطين البئر	Ambiguous Term
8	Blowout	الانفجار	اندفاع غير مسيطر عليه للنفط أو الغاز	Oversimplification
9	Completion	الإكمال	تهيئة البئر للإنتاج	Literal
10	Workover	إعادة العمل	صيانة البئر أو إعادة تشغيله	Literal
11	Christmas tree	شجرة عيد الميلاد	تركيب الإنتاج أعلى رأس البئر	Literal (Severe)
12	Kick	الركلة	زيادة مفاجئة في ضغط البئر	Incomprehensible
13	Hydraulic fracturing	التكسير الهيدروليكي	التحفيز الهيدروليكي لتكسير الصخور	Technically Inaccurate
14	Wellhead	رأس البئر	معدات رأس البئر	Incomplete
15	Production rate	معدل الإنتاج	(Correct)	—
16	Gas lift	رفع الغاز	نظام الرفع بالغاز لتحفيز الإنتاج	Ambiguous
17	Tubing	أنبوب	أنابيب الإنتاج داخل البئر	Oversimplified
18	Drill string	خيط الحفر	عمود الحفر أو مجموعة مواسير الحفر	Literal/Ambiguous
19	Core sample	عينة النواة	عينة لبّية من الصخور تحت السطح	Partial/Under translated
20	Spudding	التنقيب	بدء حفر البئر	Semantic/Inaccurate
21	Annulus	الفجوة	المسافة الحلقية بين الأنابيب	Inaccurate
22	Bottom hole pressure	ضغط أسفل الحفرة	الضغط في قاع البئر	Needs Rephrasing
23	Artificial lift	الرفع الاصطناعي	وسائل تحفيز الإنتاج مثل المضخات	Partially Correct
24	Oil recovery	استرجاع النفط	استخلاص النفط من الخزانات	Awkward phrasing