# Translation Techniques of Mechanical Engineering Terms in *English for Engineering* Book by Mechanical Engineering Students

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**Abstract.** Translators often face challenges when dealing with unfamiliar terms, particularly in specialized fields like mechanical engineering. This study investigates the translation techniques employed by students in the Mechanical Engineering Study Program at Universitas Muhammadiyah Yogyakarta, Indonesia, when translating texts from *English for Engineering* textbook. The research involved six classes, each with 35-40 students, and applied 18 translation techniques based on Molina & Albir's (2002) theory. The study revealed that literal translation (57.89%) and natural borrowing (29.82%) are the most frequently used techniques, ensuring precision and clarity in technical documentation. However, common translation errors include inconsistent terminology, lack of context, and failure to localize technical terms. The results suggest that students' translation choices are influenced by their limited English vocabulary and reliance on English reference materials. Recommendations include enhancing students' vocabulary and translation skills to improve accuracy and consistency in technical translations, thereby supporting better global collaboration in mechanical engineering.

## 1 Introduction

Translators encounter difficulties with unfamiliar or specialized terms, especially in fields like engineering or technology. Finding equivalent words between source and target languages can sometimes be particularly challenging for translators [1]. In the realm of academic studies, particularly within specialized fields like mechanical engineering, proficient translation techniques are crucial due to the diverse demographic makeup of students. Mechanical engineering literature, from foundational textbooks to research papers, predominantly employs English for terminology and concepts. In translating mechanical engineering terms, mistakes can be really serious [2] because they can change the meaning

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of the terms. Given the diverse backgrounds of mechanical engineering students, effective translation methods are essential to ensure comprehensive understanding and accessibility to this technical content.

The linguistic barrier poses a significant challenge for students whose first language is not English when comprehending and engaging with technical literature effectively. Technical papers must have translations that are clear and exact, keeping the original meaning of words. Translation is necessary in engineering for various tasks like technical drawings, manuals, plans, patents, reports, specifications, safety guides, responses to requests, and academic writing. It's crucial for translators to fully understand engineering terms and have deep knowledge of the subject [3]. Moreover, the nuances and intricacies of specialized terminology in mechanical engineering demand precise understanding to ensure accurate interpretation and application.

Translation techniques play a crucial role in overcoming this challenge. According to a study, four types of translation techniques are used to translate mechanical engineering terms: adaptation techniques, common matching techniques, literal translation techniques, calque technique techniques, and pure borrowing techniques [1]. These techniques are essential for ensuring the accuracy, acceptability, and readability of the translated terms [1].

In the context of mechanical engineering, translating specific terms is one of the difficulties translators encounters [4]. The translation is an effort to emphasize equal meanings when transferring written messages from the source language to the target language (Farahsani et al., 2024). Fluency in both the source and target languages is required of translators [4].

Experience and expertise in the field of engineering are vital for translators, as even a small mistake could have serious consequences [3]. Translators must clarify ambiguities in the text and consult other experts to ensure accuracy [3]

In today's interconnected world, engineering education transcends geographical boundaries, drawing students from diverse cultural and linguistic backgrounds. This globalization of engineering education underscores the importance of facilitating effective communication and knowledge transfer across linguistic divides. While English serves as the lingua franca of the engineering community, acknowledging and addressing the linguistic diversity within this community is essential for fostering inclusivity and promoting equitable access to education. Students who don't speak English as their first language face big problems understanding and using technical books well. When they come across difficult technical words and ideas in a language, they're not good at, it makes learning harder for them. Also, the detailed and tricky words used in mechanical engineering need to be understood exactly to make sure they're used and understood correctly [5].

To translate technical terms in mechanical engineering properly, we need special methods because these words are different from everyday language [6]. Proficient translation techniques are essential for students whose first language is not English to effectively comprehend and engage with technical literature in the field of mechanical engineering. These techniques ensure the accuracy, acceptability, and readability of the translated terms. Translators must be fluent in both the source and target languages and have expertise in the field of engineering to ensure accurate translations.

## 2 Literature Review

Interpreting meaning from one language to another is called translation [7]. Al-Nakhalah [8] asserts that translation serves as an insight into the perspectives of others and their society. According to Newmark [9], translation is a tool for education and truth, as it must reach readers who have different educational and cultural backgrounds to the readers of the original text, who are often inferior or prior. Translation, according to Bassnett [10], is the process of translating a text from the source language into the target language with the aim of retaining the structure of the source language as much as possible without significantly changing the structure of the target language and ensuring that the surface meaning of the two languages is approximately the same. Steiner [11] argues that translation can be understood as the creation of a text subject to certain constraints involving linguistic and cultural changes. Translation, according to Owens [12], is the process of transferring the meaning of a text—which can be a word or a book—from one language to another for a new audience.

In the field of translation, translation techniques are classified as a new theory. Translation techniques include processes for evaluating and categorizing translation equivalence operations [13]. Translation techniques are categorized into 18 techniques based on five fundamental features: translation techniques are functional, translation techniques are discursive and contextual, translation techniques are influenced by the micro-unit of the text, translation techniques are influenced by the translation outcome, and translation techniques are categorized based on their comparison with the source language [13] [14]. The 18 translation techniques are adaptation, amplification (addition), borrowing, calque, compensation, description, discursive creation, equivalence, generalization, linguistic amplification, linguistic compression, literal translation, modulation, particularization, reduction, substitution, transposition, and variation [13].

Research on the application of this translation technique has been conducted in various fields of translation. An example is translation in the field of information technology. In their research, Mustafa, Aziz, & Khabri [15] examined translation techniques in smartphone user manuals. Technology has become an important aspect of life, facilitating long-distance relationships and improving communication. Smartphones have become popular for social media and video calls, with expanded functions. As technology advances, companies need to provide user manuals, often in English, to inform customers about new features and functions. As smartphones are manufactured overseas, translations are provided to ensure accessibility and understanding. Dashela [14], who looked at translation strategies in the Samsung Manual Book, also carried out similar research. The researcher analyzed the source language (SL) and target language (TL) from English to Indonesian by using various translation techniques. Literal translation is the most dominant, accounting for 76.4% of the data, as it directly transfers SL into TL in accordance with TL grammar.

In literary research, many studies on translation techniques have also been conducted with different research objects. Nasution, Syahputra & Mulyono [16] are two of the researchers who examined translation techniques in mantras. In Malay society, mantra is a well-liked genre of oral literature with magical properties that its followers use to overcome obstacles and meet their needs. Translating cultural texts can be challenging due to cultural

implications, including lexical and syntactic content, ideology, and translator assumptions. Translators must consider the ideological needs of the target culture when translating texts. The Malay text of Mantra Jamuan Laut contains 82 clauses, and Molina & Albir's [13] translation techniques were used to translate the text. The literal technique, which concentrates on form and structure without additions or subtractions in the target language, is the one that all five translators use the most. The use of the literal technique in translation shows that words, phrases, and clauses are translated literally, focusing on form and structure without addition or subtraction.

Besides mantras, there are also studies on prose texts conducted by Muchtar & Kembaren [17]; Armyla, Kuncara, & Asanti [18]; Amos, Oentari, Setiajid, & Adji [19]; Qin, Widodo, & Triyono [20]; and Hidayati & Wagiran [21]. Literary translation involves translating various forms of literature, including poetry, drama, books, and verse. Literary translation involves considering the communicator's intent and context. Translating cultural texts is challenging because it involves not only dealing with linguistic differences but also cultural gaps between the two languages. Therefore, the translation of cultural texts receives special attention from translators because they participate in preserving local wisdom from the source text into the target text.

In addition to mantras and prose, another area of literature that is widely researched is movies. Nowadays, translation is not only done for books, novels, or newspapers but also for movies. Movies are considered a good source of information, as they contain various sources of information about different cultures and are also a source of entertainment. There are several terms used in movie translation. The terms used in movie translation are subtitling and dubbing. These two terms are methods of language transfer in the process of translating films and television programs that belong to the genre of mass audio-visual communication. Hunadah & Lidinillah [22], Afandi & Authar [23], and Pahamzah & Syariifah [24] were responsible for conducting this study. In addition, research in this literary field has extended to works of poetry [25]; songs [26]; and even comics [27] [28].

In medical translation research, researchers usually conduct research on translation techniques in medical books. The study by Restiana and Nugroho [29] serves as an illustration. They stated that translators must use appropriate strategies to improve translation quality, especially in the context of COVID-19, which contains a lot of rare medical news and terms. Translation errors can lead to misdiagnosis, treatment errors, and errors in disease prevention, potentially leading to death. Translation is crucial in the medical field, as it can help discover discoveries and disseminate them through science. Good-quality translation is a benchmark for conveying a message and can be an interesting example for linguistic learning at the university level.

This study extends the examination of translation techniques to the field of mechanical engineering, specifically focusing on how students in the Mechanical Engineering Study Program translate technical terms from the *English for Engineering* textbook. By applying Molina and Albir's [13] framework of 18 translation techniques, this research investigates the strategies employed by these students as they navigate the complex task of translating specialized engineering terminology. This study not only builds upon previous research in diverse fields, such as information technology, literature, and medicine, but also contributes to a deeper understanding of how translation techniques are utilized in the context of

engineering education, offering insights into the effectiveness and challenges of translating technical content for academic purposes.

# 3 Research Method

This study aims to determine the translation techniques used by students of Mechanical Engineering Study Program of Universitas Muhammadiyah Yogyakarta Batch 2023 who took English for Engineering I course in translating reading comprehension texts in English for Engineering textbook [30]. The translated texts are those in units 1-5 with the titles "What is Engineering"; "Jobs in Engineering"; "Engineering Materials"; "Plastics - Man's Most Useful Materials"; and "Mechanism". The translation techniques used were 18 translation techniques based on the theory of Molina & Albir [13]. There were six classes with about 35-40 students in each class. The research team used a blank sheet containing a list of terms in the form of words and phrases to be translated from English into Indonesian. This activity took place in the English for Engineering I class. From the translations done by the students, the research team examined the translation techniques used by the students to translate phrases and words which are terms related to the field of mechanical engineering.

# 4 Results and Discussion

## 4.1 Results

### *4.1.1 Overview of translation techniques employed*

When delving into the realm of translation techniques employed by mechanical engineering students, it's essential to start with an overarching perspective on the various strategies they utilize to bridge the gap between languages. These techniques are not only fundamental for effective communication but also play a pivotal role in ensuring the accurate transmission of technical knowledge across linguistic boundaries.

Translation technique is an integral part of the translation process. In the initial stage of translation, the translator performs several translation procedures, one of which is the reconstruction stage or the translating stage. At this stage, translators use translation techniques to produce quality translations. Translators must also have good linguistic skills, which include understanding the grammar of the source and target languages [31].

Some scholars have described different types of translation techniques based on their research. The following are 18 translation techniques proposed by Molina & Albir [13]:

1. Adaptation is the technique of replacing a cultural element in the source language with something that has the same meaning in the target language culture [13]. Newmark [9] calls it a "cultural equivalent", Baker [32] calls it a "cultural substitution", and Hoed [33] calls it a cultural equivalent. Newmark [9] adds that adaptation techniques do not necessarily change the text as a whole into an adaptation, but only translate elements of the text, unless all elements in the text are adapted as a whole.

2. Amplification is a translation technique that clarifies or restates information implied in the source language [13]. Newmark [9] calls it paraphrasing, which is an additional explanation of the meaning of a text segment because the segment contains implied or missing meaning, so it needs to be explained or restated for clarity. Molina and Albir [13] also state that the addition technique is done to clarify ellipsis expressions, avoid vagueness or ambiguity, and add conjunctions.
3. Borrowing is a translation technique in which the translator uses a word or series of words from the source language. Borrowing can be pure borrowing or borrowing adapted to the rules of the target language (naturalized borrowing). Newmark [9] refers to pure borrowing as transference, while Baker [32] calls it loanwords. Hoed [33] gives a definition of this technique as translation without providing an exact equivalent. The natural borrowing technique is similar to the phonological translation technique mentioned by Hoed [33] and its naturalization procedure described by Newmark [9], which is to take the sound of the word in the source language and adapt it to the sound system or pronunciation in the target language.
4. Calque is a translation technique in which words or phrases from the source language are literally transferred to the target language both lexically and structurally [13].
5. Compensation is a translation technique in which the translator inserts other information elements or stylistic effects into the target text because they cannot be placed in the same position as the source text [13] [9].
6. Description is a translation technique that replaces a term with a description of its form or function [13]. This technique is different from amplification which aims to explain the implied information. Newmark [9] explains that this translation technique includes descriptive equivalent and functional equivalent.
7. Discursive creation is a translation technique that uses temporary equivalents that are unexpected or out of context. That is, it tries to determine or create an equivalent that is completely out of context and unexpected in translation. This technique is usually used in title translation [13].
8. Established equivalent is the use of a term that is commonly used in the dictionary or target language as the equivalent of the original language [13]. Newmark [9] calls it recognized translational/accepted standard translation or official translation [34]. This technique is similar to literal translation.
9. Generalization is a translation technique that uses more general or neutral terms in the target language [13].
10. Linguistic amplification is the technique of adding linguistic elements to make the translation longer [13].
11. Linguistic compression is a technique that combines linguistic elements to make them simpler and easier to understand [13].
12. Literal translation is the technique of translating words or expressions on a word-for-word basis [13].
13. Modulation is a translation technique in which the translator changes the point of view, focus or cognitive category in relation to the source language. Hoed [33] and Newmark [9] also agree with this.
14. Particularization, is the technique of using terms that are more specific and concrete than generalized forms [13]. This technique is the opposite of the generalization technique.
15. Reduction, a technique that implies information as it is already implied in the target language, is part of the translation technique. Baker [32] defines reduction as the omission of words or expressions.

16. Substitution, in both linguistic and paralinguistic forms, is the technique of replacing elements in the source language with elements in the target language such as intonation, gesture, or sign language. The use of this technique usually occurs in spoken language translation [13].
17. Transposition, as a translation technique, involves switching grammatical categories. Authors Hoed [33] and Newmark [9] also refer to the same technique with the terms "shifts" or "transposition".
18. Variation is the technique of replacing or modifying linguistic or paralinguistic elements that affect language diversity. This technique is often used in the translation of drama scripts.

### *4.1.2 Analysis of Mechanical Engineering Term Translation Results*

The first step in analyzing the translation of mechanical engineering terms is to compare the English term with its Indonesian translation. This is important to ensure accuracy and congruence of meaning between the two languages to avoid distortion or loss of important information. Linguistic aspects should also be considered to ensure the translation sounds natural and is easily understood by readers who are proficient in both languages. Using inconsistent terminology, translating without context, not localizing machine user interfaces, not using professional services, and not reviewing content before publication are common mistakes to avoid in mechanical engineering translation [2].

a. Comparison of English Terms and their Indonesian Translations

In mechanical engineering, there are many technical terms used in English. When these terms are translated into Indonesian, there are several techniques commonly used to maintain meaning and accuracy. One commonly used technique is literal translation, where English terms are translated directly into Indonesian without much change. This technique is the most dominant, covering most of the data found in the data collection. The following is a description of each translation technique:

1. Literal Translation

Literal translation is the process of directly transferring text from the source language into grammatically and idiomatically appropriate target language text. The translator only needs to ensure that the text follows the linguistic rules of the target language [35]. In simple terms, this means word-for-word translation with attention to the grammar of the target language. In this study, we found 33 examples that were translated using the literal translation technique from English to Indonesian. This literal translation technique was used to translate words and phrases. The data are:

**Table 1. Examples of word-form data translated with the literal translation technique**

| No. | SL | TL |
|---|---|---|
| 1 | engineering | *teknik/rekayasa* |

| | | |
|---|---|---|
| 2 | Mechanical engineers | *Insinyur mesin* |
| 3 | design | *rancangan* |
| 4 | test | *pengujian* |
| 5 | tool | *alat* |
| 6 | material | *bahan* |
| 7 | installation | *pemasangan* |
| 8 | equipment | *perlengkapan* |
| 9 | craftman | *tukang* |
| 10 | toolmaker | *Pembuat alat* |
| 11 | mold | *cetakan* |
| 12 | welder | *Tukang las* |
| 13 | gauge | *Alat ukur* |
| 14 | metal | *logam* |
| 15 | non-metal | *Bukan logam* |
| 16 | Ferrous metals | *Logam besi* |
| 17 | Non-ferrous metal | *Logam bukan besi* |
| 18 | iron | *besi* |
| 19 | steel | *baja* |
| 20 | alloy | *paduan* |

The literal translation technique is an approach that emphasizes a literal match of word meanings between the two languages without regard to context or special nuances that may exist in everyday use. In the process of translating the data into words, the translation is done based on its literal meaning. This means that the words in the original language are translated directly, according to the meanings listed in the dictionary, into the target language without significant additions or changes in meaning.

Literal translation of phrases from English to Bahasa Indonesia requires adjusting to the different phrase structures between the two. Most translations tend to produce noun phrases in Indonesian due to the different word organization between the two languages. In Indonesian, the common sentence pattern is explain-describe, where the adjective is placed

after the noun. Whereas in English, the common phrase structure is *diterangkan-menerangkan*, where the adjective is usually placed before the noun.

2. Natural Borrowing

The naturalized borrowing technique is a way of translating from the source language into the target language, which involves adjusting the spelling from the original language to the target language. In this study, there are 17 data points translated using this naturalized borrowing technique. The purpose of applying this borrowing technique is to adjust the pronunciation of technical terms in the field of mechanical engineering to the Indonesian pronunciation contained in the English for Engineering book. The data are:

**Table 2. Examples of word-form data translated with the natural borrowing technique**

| No. | SL | TL |
|---|---|---|
| 1 | manufacture | *manufaktur* |
| 2 | machinary | *permesinan* |
| 3 | component | *komponen* |
| 4 | technician | *teknisi* |
| 5 | fabricate | *fabrikasi* |
| 6 | machine | *mesin* |
| 7 | micrometer | *mikrometer* |
| 8 | property | *properti* |
| 9 | carbon | *karbon* |
| 10 | element | *elemen* |
| 11 | chromium | *kromium* |
| 12 | corrosion | *korosi* |
| 13 | aluminum | *aluminium* |
| 14 | plastic | *plastik* |
| 15 | ceramic | *keramik* |
| 16 | product | *produk* |

| | | |
|---|---|---|
| 17 | Machine oil | *Oli mesin* |

The scientific borrowing translation technique is used to translate terms in the form of words and phrases in a language. All the data mentioned above adopt spelling adjustments from the source language, English, into the target language, Indonesian. Some of these examples can be categorized into several sound adjustments, among others:

a. [k] phoneme adjustment. In some English words, the phoneme [k] is spelled as "/c/", but in Indonesian it is spelled as "/k/". This occurs in terms such as "manufacture, component, fabricate, micrometer, carbon, corrosion, plastic, ceramic, and product." These terms are translated into "*manufaktur, komponen, fabrikasi, mikrometer, karbon, korosi, plastik, keramik,* and *produk*" by changing the spelling of "/c/" to "/k/".
b. [i] phoneme adjustment. Some English words use the spelling "/y/" which is pronounced as [i]. In Indonesian, the spelling is changed to [i] according to the pronunciation. Examples can be found in terms such as "property". These terms are translated as "*properti*".
c. Adjustment of the [ʃən] sound. Some English words use this sound, and in Indonesian, it is changed to the [si] sound. Examples can be found in the term "technician" which translates to "*teknisi*".

The concept of translating phrases using the natural borrowing technique is similar to that of translating words. The purpose is to adjust the sound from English to Indonesian. As explained earlier in the literal translation technique, there are structural changes from English to Indonesian when translating noun phrases. This concept also applies when translating noun phrases using the natural translation technique. For example, the term "machine oil" can be translated into "*oli mesin*".

3. Amplification

Amplification and reduction are two approaches in translation technique. Amplification means adding detailed information that is not present in the source text to the target text, as there are vocabulary differences between the two languages. Meanwhile, reduction means reducing certain information from the source text when translated to the target text [36].

In this study, there are three sets of data translated using the amplification technique. This technique is used to provide additional information in the translation so that it is more easily understood by target language readers.

**Table 3. Examples of word-form data translated with the amplification technique**

| **No.** | **SL** | **TL** |
|---|---|---|
| 1 | automobile | *Transportasi mobil* |
| 2 | tungsten | *Baja tangsten* |
| 3 | Electrical articles | *Komponen kelistrikan* |

In some of the data above, it is found that the Indonesian translation provides additional explanations to make it easier to understand. For example, automobile is translated into *transportasi mobil*, tungsten is translated into *baja tangsten*, and electrical articles are translated into *komponen kelistrikan*. Amplification techniques are used in translating technical terms for several reasons related to clarity, accuracy, and deep understanding.

First, technical terms often have very specific and detailed meanings. In many cases, word-for-word translation is insufficient for a thorough understanding of the concept. By using amplification techniques, translators can add additional information to clarify the concept. Secondly, there are some technical terms that have no direct equivalent in the target language due to vocabulary differences or different concepts. With amplification, the translator can explain the concept in more detail so that the reader can understand it better. Third, accurate translation of technical terms requires accuracy and detail. Amplification gives the translator the opportunity to elaborate on the term in more detail so that there is no confusion or misunderstanding in understanding the concept being explained. Fourth, in technical terms, it is sometimes important to understand the broader context in which the term is used. Amplification allows the translator to include additional context that may be necessary for better understanding. The main purpose of this technique is to explain better, not to change the meaning of the source text.

4. Pure Borrowing

In the previous point, the researcher discussed borrowing techniques, which are divided into two, namely natural borrowing techniques and pure borrowing techniques. The natural borrowing technique has been discussed in the previous sub-chapter; therefore, in this sub-chapter, the author will discuss the pure borrowing technique, where the translator does not make any changes, especially in the spelling of the word, for example, the word “debug” which is translated into “debug”. This is because the term in the source language is borrowed without any changes in the target language. In using this technique, the author found 2 data points in the English of Engineering book chapters 1–5, namely the words “debug” and “material”.

Pure borrowing is a technique used in translating terms. In using this technique, the term in the form of a word is borrowed directly from the source language without changing the form or meaning when translated into the target language. The use of this technique is generally done when the term has the same designation between the source language and the target language. The use of this pure borrowing technique is done because the terms in the source language are common and widely accepted in the scientific community in various countries. Thus, these terms are still used in Indonesian without any change in form or meaning.

5. Descriptive Technique

Descriptive translation is a translation technique used to describe the meaning of a word. When a translator realizes that the meaning of the word cannot be found in the source language, this technique is applied [37]. In addition, Rachmawati [38] explains that description is a translation technique that involves replacing a phrase or statement with an explanation of its form and purpose. There is one data set that uses this technique, namely “vernier” which is translated into “*alat pembantu penglihatan untuk mengukur agar lebih*

*tepat*". Descriptive translation is used to explain the meaning and characteristics of the term so that it can be more easily understood by those who are not familiar with the original technical term.

b. Frequency and effectiveness of techniques

The most dominant techniques used are literal translation (57.89%) and natural borrowing (29.82%). Both techniques are particularly effective in translating mechanical engineering terms to fit the reading context for several reasons.

Literal translation involves translating words directly from the source language to the target language while preserving their exact meaning. This technique is highly effective in mechanical engineering because the terminology in this field often comprises standardized terms with precise definitions. By applying literal translation, the integrity and specificity of technical terms are maintained, ensuring that the translated text accurately conveys the original meaning without ambiguity. This is crucial in mechanical engineering, where precision and clarity are paramount to avoid misunderstandings that could lead to design flaws or safety issues.

Natural borrowing, on the other hand, involves incorporating terms from the source language into the target language with little or no modification. This technique is effective because it allows the retention of specific technical terms that may not have direct equivalents in the target language. In mechanical engineering, many terms are internationally recognized and used across different languages. By borrowing these terms, translators can ensure that the text remains familiar and understandable to professionals in the field, who are often already acquainted with these terms in their original form. Natural borrowing helps maintain consistency and continuity in technical documentation and communication.

Moreover, both literal translation and natural borrowing facilitate the dissemination of new technologies and innovations. As mechanical engineering continuously evolves with new concepts and inventions, having a consistent and accurate translation approach ensures that these advancements are effectively communicated across different linguistic and cultural contexts. This promotes global collaboration and knowledge sharing, which are essential for the progression of the engineering field. These techniques ensure that translated texts are accurate, contextually appropriate, and easily understood by professionals worldwide, thereby supporting effective communication and the global exchange of technical knowledge.

c. Factors influencing the choice of techniques

The selection of translation techniques used by Mechanical Engineering students when dealing with mechanical engineering terms in the English of Engineering book is influenced by two primary factors. The first factor is the students' limited knowledge of mechanical engineering vocabulary in English. Due to this lack of familiarity, students frequently rely on online dictionaries to translate these specialized terms. This dependence on online resources stems from their need to quickly find accurate translations, which they might not be able to recall or understand from their existing knowledge base. Online dictionaries offer

a convenient and accessible solution, allowing students to bridge the gap in their vocabulary knowledge efficiently.

The second factor influencing their translation techniques is the nature of the reference materials used in their coursework. In the mechanical engineering department, most of the reference sources are in English. Additionally, the lecturers who teach these courses often base their instruction on the same English-language materials. As a result, students are frequently exposed to the original English terms used in these references. This consistent exposure to English terminology encourages students to adopt loan words—terms borrowed directly from the English language—rather than attempting to find or create equivalent terms in their native language. The use of loan words can simplify the translation process and maintain consistency with the terminology used in their academic and professional environments.

Overall, the combination of limited vocabulary knowledge and the prevalence of English reference materials and instruction leads Mechanical Engineering students to adopt specific translation techniques. They tend to rely on online dictionaries for immediate translation needs and prefer using loan words to ensure clarity and consistency in their academic work. These factors highlight the practical considerations that shape their approach to translating mechanical engineering terms.

## 4.2 Discussion

The translation of mechanical engineering terms from English to Indonesian involves various techniques, each chosen to maintain the integrity and clarity of the original meaning. The analysis reveals that these techniques, including literal translation, natural borrowing, amplification, pure borrowing, and descriptive translation, each have specific applications and implications for the translation process.

### *4.2.1 Literal Translation: Preserving Precision and Clarity*

Literal translation, the most frequently used technique in the analysis, is particularly effective in the field of mechanical engineering. This approach involves a direct, word-for-word translation that preserves the exact meaning of the original terms, ensuring that the technical vocabulary remains consistent and unambiguous. For example, terms like "engineering" translated to "teknik/rekayasa" and "mechanical engineers" to "insinyur mesin" demonstrate how literal translation can maintain the integrity of technical language. The effectiveness of this technique lies in its ability to convey the precise definitions inherent in mechanical engineering terminology, which is crucial in a field where clarity and accuracy are paramount. This approach minimizes the risk of misinterpretation, which could otherwise lead to errors in application, such as design flaws or operational failures.

### *4.2.2 Natural Borrowing: Retaining International Standardization*

Natural borrowing, where English terms are adopted into Indonesian with minimal modification, is another widely used technique, accounting for nearly 30% of the translations analyzed. This method is particularly valuable in contexts where the original English terms are already widely recognized and used within the global engineering community. For example, "manufacture" becomes "manufaktur," and "machine" becomes "mesin," demonstrating the adaptability of English terms to the Indonesian linguistic structure. The use of natural borrowing helps maintain consistency in technical documentation, allowing professionals across different linguistic backgrounds to communicate effectively. Moreover, this technique supports the global standardization of engineering terms, facilitating international collaboration and the dissemination of technological advancements.

#### *4.2.3 Amplification: Enhancing Understanding through Detailed Explanation*

The amplification technique, though less commonly used, plays a critical role in enhancing the clarity of translated terms that might otherwise be difficult to understand. By adding additional explanatory information, amplification ensures that the target audience fully comprehends the technical concepts being conveyed. For instance, translating "automobile" as "transportasi mobil" or "tungsten" as "baja tangsten" provides readers with more context, making the terms more accessible. This approach is particularly useful in cases where the target language lacks a direct equivalent for the source term, necessitating a more detailed explanation to preserve the original meaning and ensure accurate communication.

#### *4.2.4 Pure Borrowing: Maintaining Original Terminology*

Pure borrowing, where terms are directly transferred from the source language without any changes, is employed when the English term is universally recognized and does not require translation. The examples "debug" and "material" illustrate this technique, where the terms are borrowed wholesale into Indonesian. Pure borrowing is particularly effective when the terms in question have become part of the international lexicon of mechanical engineering, ensuring that the translated text is immediately recognizable and understandable by professionals who may be familiar with the English terminology.

#### *4.2.5 Descriptive Translation: Providing Clarity through Explanation*

Descriptive translation, which involves explaining the meaning of a term rather than providing a direct translation, is used in cases where the original term does not have a direct equivalent in the target language. The translation of "vernier" as "alat pembantu penglihatan untuk mengukur agar lebih tepat" exemplifies this approach. This technique is valuable for ensuring that complex or unfamiliar technical terms are accessible to a broader audience, particularly those who may not be familiar with the original English terminology. By providing a detailed description, the translator ensures that the term's function and significance are clearly communicated, thereby enhancing the reader's understanding.

The analysis of translation techniques used in mechanical engineering term translation highlights the importance of selecting the appropriate method to ensure accuracy, clarity, and comprehension. Literal translation and natural borrowing are the most effective and frequently used techniques, preserving the original meaning and maintaining consistency with global engineering standards. Amplification and descriptive translation play supporting roles, providing additional context and explanation where necessary, while pure borrowing ensures that universally recognized terms remain intact. Together, these techniques facilitate the effective translation of technical terms, supporting clear communication and knowledge dissemination in the field of mechanical engineering.

## 5 Conclusion

Translators face challenges in translating unfamiliar terms, especially in fields like engineering and technology. In mechanical engineering, the diverse demographic makeup of students necessitates proficient translation techniques. Techniques include adaptation, common matching, literal translation, calque technique, and pure borrowing. Fluency in both source and target languages and expertise in engineering are essential for accurate translations. Addressing linguistic diversity is crucial for inclusivity and equitable access to education.

Mechanical engineering translations involve comparing English terms with Indonesian translations to ensure accuracy and congruence. Common mistakes in translation include using inconsistent terminology, translating without context, not localizing machine user interfaces, not using professional services, and not reviewing content before publication. Literal translation maintains meaning and accuracy by transferring text from the source language into a grammatically appropriate target language. Natural borrowing adjusts the pronunciation of technical terms to Indonesian pronunciation, such as phoneme adjustment and structural changes. Amplification and reduction techniques are used to add detailed information and provide context for better understanding. Pure borrowing involves borrowing a term directly from the source language without changing its meaning. Descriptive translation replaces phrases or statements with explanations.

Mechanical engineering terms are translated using literal translation (57.89%) and natural borrowing (29.82%), ensuring precision and clarity. These methods facilitate global collaboration and knowledge sharing. Mechanical Engineering students' translation techniques are influenced by their limited English vocabulary knowledge and the prevalence of English reference materials in their coursework. They rely on online dictionaries for quick translations and prefer loan words for academic consistency.

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