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Translation-Based Instruction in Teaching Technical English: A Comparative Case Study of the Grammar–Translation Method in Mechanical Engineering Education

Research Article

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Abstract

The pedagogical role of translation in English for Specific Purposes (ESP), particularly in technical disciplines, remains debated in applied linguistics. While translation is often associated with the Grammar–Translation Method (GTM), its instructional effectiveness depends largely on how it is methodologically employed. This study investigates translation-based instruction in teaching Technical English to Mechanical Engineering students, focusing on differences between technical subject specialists and translation specialists as instructors. Using a comparative mixed-methods case study design, the research draws on syllabus analysis, semi-structured instructor interviews, and quantitative analysis of students' final course grades across three academic terms. The findings show that technical specialists tend to rely implicitly on a GTM-dominant approach, characterized by extensive use of the learners' first language, sentence-level translation, and form-focused practices. While this approach supports accuracy and comprehension of technical content, it

provides limited opportunities for developing communicative competence. In contrast, translation specialists adopt a principled eclectic approach that integrates translation with communicative, strategic, and skill-based activities. Quantitative results indicate that although no significant difference was observed in the first term, translator-led classes demonstrated statistically significant and increasingly strong advantages in student performance in the second and third terms. This study concludes that translation is not inherently pedagogically restrictive; rather, its effectiveness depends on its integration within an eclectic and theoretically informed instructional framework. These findings highlight the importance of pedagogical training and methodological awareness in ESP contexts and contribute to ongoing discussions on effective approaches to Technical English instruction in engineering education.

Keywords: Translation-based instruction, Technical English, Grammar–Translation Method, Communicative competence, English for Specific Purposes

1. Introduction

English functions as the dominant language of science, technology, and higher education worldwide, particularly in engineering disciplines where access to academic knowledge, technical documentation, and professional communication is largely mediated through English. As a result, Technical English has become a compulsory component of engineering curricula in many higher education institutions. Despite its central role, however, the effectiveness of English instruction in technical and engineering programs remains a persistent concern, particularly within ESP contexts. In many cases, students complete Technical English courses without attaining the expected level of communicative competence, especially in spoken interaction.

Speaking proficiency is widely regarded as a core component of overall language competence, as oral communication often precedes and outweighs written production in both academic and professional settings (Cahyani et al., 2017). Nevertheless, research consistently shows that foreign language learners, including engineering students, frequently demonstrate limited ability to communicate effectively in English after years of formal instruction. This discrepancy suggests a misalignment between instructional practices and communicative learning outcomes in Technical English classrooms, pointing to pedagogical rather than purely learner-related challenges.

Applied linguistics research highlights teaching methodology, instructor background, and theoretical awareness as critical factors influencing language learning outcomes (Brown, 2007; Larsen-Freeman, 2000; Richards & Rodgers, 2014). In technical institutions, English courses are often taught by subject specialists whose academic training is primarily in engineering rather than language pedagogy. Although such instructors possess strong disciplinary expertise, their classroom practices frequently rely, often implicitly, on traditional form-focused approaches, most notably GTM. GTM can be effective in promoting grammatical accuracy, comprehension of technical texts, and acquisition of specialized terminology; however, its limited emphasis on interaction, fluency, and communicative use of language restricts opportunities for developing spoken competence.

In contrast, translation specialists and trained language educators are more likely to adopt eclectic and communicatively oriented instructional approaches that integrate translation with contemporary language teaching principles. Eclectic methodology allows instructors to draw selectively on multiple pedagogical traditions, balancing accuracy, fluency, learner engagement, and communicative practice. Within ESP contexts, such flexibility is particularly important, as engineering students must develop both technical precision and functional communicative ability. Recent scholarship therefore argues that translation should not be viewed as inherently restrictive but rather as a pedagogical resource whose effectiveness depends on its integration within a broader instructional framework.

Despite these insights, empirical research comparing the instructional practices of technical subject specialists and translation specialists in ESP classrooms remains limited. Existing studies often focus on learner outcomes or theoretical debates without systematically examining how instructors' academic background and methodological awareness shape classroom practices. In particular, there is a lack of empirical evidence investigating whether technical specialists rely on GTM unintentionally and how this contrasts with the instructional approaches adopted by translation specialists trained in language pedagogy.

Against this backdrop, the present study examines instructional practices in teaching Technical English to Mechanical Engineering students by comparing courses taught by a technical specialist and a translation specialist within the same institutional context. Adopting a comparative mixed-methods case study design, the research draws on syllabus analysis, semi-structured instructor interviews, classroom practices, and quantitative analysis of students' academic performance across multiple academic terms. The study aims to explore how differing methodological orientations influence linguistic performance and communicative development.

By focusing on instructional methodology rather than learner deficits alone, this research contributes to ongoing discussions in ESP pedagogy and provides empirically grounded insights into improving the quality of Technical English instruction in engineering education. The findings are expected to inform ESP teacher preparation, curriculum design, and professional development by highlighting the role of pedagogical training and theoretical awareness in achieving balanced linguistic and communicative outcomes.

1.1 Research Questions

1. To what extent does instructors' theoretical knowledge influence the quality of teaching methods in Technical English classrooms?
2. Do technical specialists tend to employ the Grammar–Translation Method unintentionally in teaching Technical English?
3. Do translation specialists predominantly apply an eclectic methodological approach in Technical English instruction?

1.2 Research Hypotheses

1. Instructors' theoretical knowledge significantly influences the quality and effectiveness of teaching methods in Technical English classrooms.
2. Technical specialists tend to rely on the Grammar–Translation Method unintentionally in Technical English instruction.
3. Translation specialists are more likely to employ an eclectic teaching approach in Technical English instruction.

2. Literature Review

The field of language teaching, as a professional and academic discipline, gained prominence in the twentieth century with the development of systematic theories and methodologies grounded in linguistics, psychology, and education (Salmani-Nodoushan, 2006). Before this period, language teaching largely lacked a coherent theoretical foundation and relied on inherited instructional traditions. The professionalization of the field coincided with frequent methodological shifts, pedagogical innovations, and the emergence of competing instructional paradigms, reflecting evolving perceptions of how languages are learned and taught (Richards & Rogers, 2014).

As traditional approaches gradually proved insufficient for addressing learners' communicative needs, particularly in academic and professional contexts, scholars began to reassess instructional practices and propose alternative models (Schick & Nelson, 2001). Reviewing the historical development of language teaching methods provides critical context for understanding contemporary pedagogical debates and the rationale behind newer instructional approaches (Richards & Rogers, 2014). This historical perspective is particularly significant for English for Specific Purposes (ESP), where methodological choices must respond to both disciplinary content and functional language use, such as in engineering and technical education.

Research on language teaching practices in European higher education demonstrates that a wide range of instructional methods coexist, with varying emphases on theory, practice, and learner engagement (Cano et al., 2014). While traditional approaches persist, learner-centered and innovative methods have gained prominence, driven by educational reforms and the internationalization of higher education (Wulk, 2016). These methodological transformations have been influenced by major shifts in educational philosophy and policy, leading to increased attention to communicative effectiveness, learner autonomy, and contextually relevant language use (Baroncelli & Stevancevic, 2014). Consequently, contemporary language teaching increasingly prioritizes learner needs, communicative goals, and flexible instructional designs over rigid, form-focused instruction, a trend especially pertinent to ESP contexts.

2.1 Theoretical Concepts

Contemporary language learning theories emphasize learner-centered instruction, meaningful communicative interaction, and the integration of linguistic form with functional use. Brown (2014) highlights three interrelated dimensions, awareness, autonomy, and action, as central to effective foreign language learning. These dimensions underpin student-oriented approaches that

encourage active engagement in communication rather than passive absorption of grammatical rules. Communicative ability, according to Brown, is not solely a product of linguistic knowledge but emerges through purposeful interaction, social engagement, and motivational factors.

Communicative competence encompasses grammatical, functional, and strategic abilities that enable learners to negotiate meaning and compensate for linguistic limitations. Functional competence, as defined by Rababah (2002), refers to the capacity to employ linguistic and non-linguistic strategies to overcome communication breakdowns, while Smith (2003) asserts that such strategies enhance communicative efficiency in real-world contexts. Similarly, Yule and Tarone (as cited in Brown, 2014) note that functional competence involves selecting appropriate linguistic resources to achieve communicative goals and ensure comprehensibility.

Motivation and goal orientation are also integral to successful language learning. Brown (2014) emphasizes that learners must be aware of communicative objectives and understand how instructional methods facilitate the achievement of these goals. Effective language instruction, therefore, should equip learners with strategies for sustained and meaningful language use beyond the classroom, rather than focusing solely on course completion.

The social and cultural dimensions of communication further shape communicative competence. Halliday's functional theory underscores the relationship between language form, use, and social context, conceptualizing language meaning across domains such as instrumental, regulatory, interactional, personal, heuristic, and informative functions (Richards & Rogers, 2014). The interactional or phatic function, in particular, plays a key role in sustaining social relationships and facilitating interpersonal communication.

Cultural and discourse awareness is likewise crucial. Effective language use requires familiarity with sociocultural norms, discourse conventions, and contextual expectations, including colloquial expressions, professional jargon, and culturally appropriate interactional practices (Brown, 2014). This aligns with Hymes's concept of communicative competence, which integrates linguistic knowledge with sociocultural and pragmatic awareness.

The model proposed by Canale and Swain (1980) elaborates communicative competence into four interrelated components: grammatical competence, sociolinguistic competence, discourse competence, and strategic competence (Richards & Rogers, 2014). This model has significantly influenced communicative language teaching and remains particularly relevant for ESP, where learners must navigate discipline-specific discourse while maintaining communicative effectiveness.

Wilkins's notional–functional framework further emphasizes language as purposeful communication rather than rule memorization. His model differentiates notional categories (e.g., time, quantity, sequence) from communicative functions (e.g., requesting, rejecting, expressing attitudes), highlighting the importance of meaning and use over structural accuracy (Richards & Rogers, 2014). Collectively, these theoretical perspectives underscore the integration of linguistic accuracy, communicative function, discourse competence, and cultural awareness, forming the foundation for both communicative and eclectic approaches to language teaching.

2.2 Grammar–Translation Method (GTM)

The Grammar–Translation Method (GTM) originated from classical instruction in Latin and Greek and later extended to modern foreign languages during the nineteenth century. GTM emphasizes explicit grammar teaching, deductive learning, and translation between the learners' first language and the target language (Abrar & Thamrin, 2020). Historically, it aimed to develop intellectual discipline and facilitate access to literary texts rather than promote spoken communication.

In GTM-based instruction, the medium of instruction is typically the learners' mother tongue, and learning involves memorizing grammatical paradigms and vocabulary lists, followed by translation exercises (Siregar, 2018). Accuracy at the sentence level is prioritized, often at the expense of fluency, meaning negotiation, and communicative interaction. Speaking and listening receive minimal attention, and reading is primarily developed through translation rather than interpretive engagement with texts.

Despite sustained criticism for its limited communicative value, GTM persists in ESP and technical disciplines, where instructors emphasize content comprehension and terminological precision. While translation tasks can aid advanced learners in text analysis and conceptual understanding, exclusive reliance on GTM may constrain the development of oral communicative competence. Recent scholarship suggests that translation is most effective when integrated within an eclectic or communicative framework, allowing instructors to balance form-focused accuracy with functional, interactive practice, particularly in Technical English instruction.

3. Methodology

3.1 Research Design

This study adopts a comparative, descriptive, and mixed-methods case study design to examine instructional practices in teaching Technical English to Mechanical Engineering students. The research combines qualitative data (document analysis and semi-structured interviews) with quantitative data (students' final course grades) to ensure methodological triangulation and enhance the reliability of findings. Such a design is appropriate for investigating pedagogical practices within a bounded institutional context and for comparing instructional approaches across instructors with different academic backgrounds.

3.2 Research Context and Participants

The study was conducted at the Higher Education Complex of Bam, where Technical English is a compulsory course for Mechanical Engineering students. Two instructors who taught the same course over multiple academic terms participated in the study. For clarity and anonymity, they are referred to as:

- **The Engineer Instructor**: Holds an MSc in Mechanical Engineering and a junior-level certificate from the Iran Language Institute (ILI).

- **The Translator Instructor**: Holds an MA in English Translation Studies and has familiarity with mechanical engineering discourse.

Both instructors taught the same course syllabus approved by the Educational Council of the Mechanical Engineering Department and used the same core textbook. This controlled instructional context allows for a meaningful comparison of teaching practices and outcomes.

3.3 Data Collection Procedures

Data were collected in three sequential stages:

Stage 1: Document Analysis

The officially approved syllabus and lesson plan for the Technical English course were examined to identify intended learning outcomes, skill emphasis, assessment structure, and pedagogical expectations. This analysis provided a benchmark against which instructors' classroom practices were later evaluated.

Stage 2: Instructor Interviews

Semi-structured interviews were conducted with both instructors to explore their teaching methods, instructional language choices, use of translation, treatment of language skills, familiarity with language teaching methodologies, and assessment practices. The interview questions were identical for both participants to ensure comparability. The interviews served to document instructors' self-reported pedagogical orientations and classroom procedures.

Stage 3: Student Achievement Data

Students' final course grades were collected across six academic terms, three terms taught by the Engineer Instructor and three terms taught by the Translator Instructor. To control for variations in class size, the number of students in the Engineer Instructor's classes was used as a reference point, and an equal number of students was randomly selected from the Translator Instructor's classes. This procedure resulted in three matched datasets, each representing one academic term. The grades were analyzed using descriptive statistics and independent-sample t-tests to examine differences in overall performance.

3.4 Materials

3.4.1 Course Syllabus and Instructional Materials

The Technical English course is designed in accordance with the Ministry of Science requirements. By the end of the course, students are expected to acquire approximately 1,000 technical vocabulary items related to mechanical engineering and demonstrate the ability to comprehend and translate technical texts such as academic articles, manuals, and reports.

The primary textbook used by both instructors was *Professional English in Use (Engineering)* by Mark Ibbotson. Supplementary materials included:

- *English for Mechanical Engineering* (Marian Dunn)
- *Mechanical Engineering* (Virginia Evans)
- *GATE Practice Book: Mechanical Engineering*
- *English in Mechanical Engineering* (Eric H. Glendinning)

The core textbook consists of 45 units, each organized around a technical topic. Units typically include reading passages, vocabulary-focused exercises (e.g., gap filling, matching definitions), and a communicative activity section ("Over to You"). While the textbook emphasizes vocabulary development and reading comprehension, it provides limited guidance on writing instruction, placing greater responsibility on instructors to design supplementary tasks.

3.4.2 Assessment Structure

Final grades were calculated as follows:

- Final Exam: 10 points
- Project: 5 points
- Class Participation: 3 points
- Homework: 2 points

Both instructors followed this assessment framework, ensuring consistency in evaluation criteria.

3.5 Instructor Performance and Teaching Practices

Instructor performance was examined through interview responses structured around seven core questions addressing instructional procedures, language use, skill integration, assessment practices, and methodological awareness.

3.5.1 Engineer Instructor

The Engineer Instructor primarily employed a translation-based and form-focused approach, with classroom activities centered on sentence-by-sentence translation of reading texts into Persian. Persian was the dominant language of instruction, chosen based on student preference. Instruction followed the textbook sequence closely, with limited use of communicative or interactive techniques. Writing tasks were assigned periodically, and feedback focused on error correction. No explicit grammar instruction was provided, based on the assumption that students had already acquired sufficient grammatical knowledge in prerequisite general English courses.

3.5.2 Translator Instructor

The Translator Instructor adopted a more eclectic and interactive approach, combining translation with group work, guided reading, writing practice, and limited listening activities. Both English

and Persian were used strategically in instruction, with an emphasis on familiarizing students with spoken English patterns. Reading instruction included strategies such as skimming, scanning, and identifying main ideas. Writing instruction focused on paragraph development and rhetorical organization. Occasional grammar explanations were provided when necessary but were not explicitly assessed in examinations.

3.6 Data Analysis

Qualitative data from syllabus analysis and interviews were analyzed thematically to identify instructional patterns, similarities, and differences between the two instructors. Quantitative grade data were analyzed using independent-sample t-tests to compare student performance across matched terms. This combination of qualitative and quantitative analysis strengthens the validity of the findings and allows for a more comprehensive interpretation of instructional impact.

3.7 Ethical Considerations

All data were collected with institutional permission. Instructor identities were anonymized, and student grade data were used solely for research purposes. No identifying information was disclosed.

Table 1: Summary of Instructional Similarities and Differences between Instructors

Aspect	Similarities	Differences
Teaching orientation	Use of translation	GTM-dominant vs. eclectic
Language of instruction	Persian	Partial use of English
Reading instruction	Translation-based	Strategy-based reading
Other skills	Error correction	Audio input, writing guidance
Methodological awareness	—	ELT-focused self-study
Grammar instruction	Implicit	Contextual explanation
Assessment	Based on syllabus	Instructor-selected writing topics

4. Final Exam Results and Data Analysis

This section presents the results of three final exams conducted for each instructor across three consecutive terms. For each term, student performance was analyzed using independent-samples t-tests to compare the scores between the classes taught by the Engineer and the Translator. Due to differences in class sizes, a random selection was made to equalize the number of students for comparison. The analysis was conducted separately for each term, followed by overall group statistics and significance testing.

Table 2: First Term Results

Engineer's Grades	Translator's Grades
15	15
11	7

16.5	14
12	18
16	18.5
17	17
16	18
18	19
15.5	14.5
12.5	18
5	12
14	16

Table 3: Second Term Results

Engineer's Grades	Translator's Grades
15	20
13.5	14
18.75	17
6.5	16.75
10	9
15.5	12
11.75	13
10	20
10	8.75
5.5	18
5.5	20
18.25	9.75
15.5	9.75
5	14
18.5	14
11	19
10	20
6	16
15.25	18
15.25	15
10.5	9
19	20
18.25	17

Table 4: Third Term Results

Engineer's Grades	Translator's Grades
16	15
16.25	19
18.75	17
16.25	18.5

16.5	18.75
15.25	20
17.25	18
12	19
11	15

4.1 Group Statistics and Independent-Samples t-Tests

4.1.1 First Term

Table 5: Group Statistics (First Term)

Group	N	Mean	Std. Deviation	Std. Error Mean
Engineer	12	14.00	3.536	1.021
Translator	12	15.58	3.443	0.994

Table 6: Independent Samples Test (First Term)

Test	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Equal variances assumed	-1.111	22	0.278	-1.583	1.425	-4.538	1.371
Equal variances not assumed	-1.111	21.985	0.278	-1.583	1.425	-4.538	1.371

An independent-samples t-test revealed no significant difference between the Engineer (M = 14.00, SD = 3.54) and Translator (M = 15.58, SD = 3.44) scores for the first term, $t(22) = 1.11$, $p = 0.28$ (two-tailed). The effect size was small ($\eta^2 = 0.06$), indicating minimal practical difference.

4.1.2 Second Term

Table 7: Group Statistics (Second Term)

Group	N	Mean	Std. Deviation	Std. Error Mean
Engineer	23	12.37	4.706	0.981
Translator	23	15.22	4.001	0.834

Table 8: Independent Samples Test (Second Term)

Test	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Equal variances assumed	-2.210	44	0.032	-2.846	1.288	-5.442	-0.250

Equal variances not assumed	-2.210	42.89	0.033	-2.846	1.288	-5.444	-0.249

For the second term, the t-test indicated a significant difference between Engineer (M = 12.37, SD = 4.71) and Translator (M = 15.22, SD = 4.00) scores, t(44) = 2.21, p = 0.03, with a moderate effect size ($\eta^2 = 0.10$).

4.1.3 Third Term

Table 9: Group Statistics (Third Term)

Group	N	Mean	Std. Deviation	Std. Error Mean
Engineer	9	15.47	2.464	0.821
Translator	9	17.81	1.784	0.595

Table 10: Independent Samples Test (Third Term)

Test	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% CI Lower	95% CI Upper
Equal variances assumed	-2.301	16	0.035	-2.333	1.014	-4.483	-0.184
Equal variances not assumed	-2.301	14.582	0.037	-2.333	1.014	-4.500	-0.167

The analysis for the third term revealed a significant difference between the Engineer (M = 15.47, SD = 2.46) and Translator (M = 17.81, SD = 1.78) scores, t(16) = 2.30, p = 0.04. The effect size was substantial ($\eta^2 = 0.25$), indicating a notable practical impact.

In summary, the statistical analysis across three terms indicates varying patterns. While no significant difference was observed in the first term, the second and third terms showed significant differences in student performance between instructors. Effect sizes suggest the practical significance increased from a minimal effect in the first term to a moderate and substantial effect in the subsequent terms. These findings highlight instructor-related variability in student outcomes in the Technical English course.

5. Discussion

The present study aimed to explore how instructors' academic background and theoretical knowledge shape methodological practices in Technical English instruction and how these practices, in turn, influence learners' linguistic and communicative outcomes. By combining classroom observations, instructor interviews, and statistical analysis of student performance across three academic terms, the study offers a multifaceted interpretation of instructional effectiveness in an ESP context.

The findings demonstrate that instructional methodology is not a neutral or incidental factor but a central determinant of learning outcomes. In relation to the first research question, the data clearly indicate that instructors' theoretical awareness of language teaching principles significantly influences the quality and orientation of classroom practices. The translator instructor, who possessed formal training in translation studies and familiarity with ELT methodologies, adopted an eclectic and learner-centered approach that integrated translation with communicative, strategic, and skill-based activities. In contrast, the engineer instructor's teaching was largely form-focused and translation-dominant, reflecting limited engagement with contemporary language pedagogy. This contrast empirically supports Brown's (2014) assertion that effective language instruction depends not only on content knowledge but also on pedagogical competence and theoretical grounding.

Regarding the second research question, the findings confirm that technical specialists tend to employ the Grammar–Translation Method implicitly rather than by deliberate methodological choice. Interview data revealed that the engineer instructor did not explicitly identify GTM as a guiding framework, yet classroom practices, such as exclusive reliance on the learners' first language, sentence-level translation, memorization, and error correction, closely aligned with core characteristics of GTM as described by Richards and Rodgers (2014) and Siregar (2018). This unintentional reliance on GTM suggests that, in the absence of formal pedagogical training, instructors often default to traditional and cognitively economical methods that prioritize content transmission over communicative engagement. While such practices may facilitate comprehension of technical texts and terminology, they offer limited opportunities for developing spoken interaction and strategic competence.

In response to the third research question, the evidence strongly indicates that translation specialists are more inclined to employ an eclectic methodological approach in Technical English instruction. The translator instructor's integration of translation with guided reading strategies, controlled writing tasks, selective grammar explanation, and limited oral exposure reflects a principled eclecticism rather than methodological inconsistency. This approach aligns with contemporary views in applied linguistics that advocate flexible pedagogy responsive to learner needs, instructional goals, and contextual constraints (Richards & Rodgers, 2014). Importantly, translation was not abandoned but repositioned as one pedagogical resource among several, supporting both accuracy and meaning-making.

The quantitative findings further illuminate these methodological differences. While the first term did not show a statistically significant difference between the two groups, the second and third terms revealed significant differences in favor of the translator-led classes, with effect sizes increasing over time. This pattern suggests that the benefits of eclectic and communicatively informed instruction may not be immediately observable but accumulate as learners become more engaged, confident, and strategically competent. Such delayed effects are consistent with second language acquisition research, which emphasizes that communicative competence develops gradually through sustained exposure and meaningful interaction rather than short-term form-focused instruction (Brown, 2014; Larsen-Freeman, 2000).

It is also important to interpret these results cautiously. Although statistical differences emerged in later terms, student performance was measured primarily through course grades, which may not fully capture communicative competence, particularly oral proficiency. Moreover, factors such as learners' prior English exposure, motivation, and classroom dynamics may have contributed to performance variation. Nevertheless, given that both instructors followed the same syllabus, materials, and assessment framework, the observed differences can be reasonably associated with instructional methodology rather than curricular or institutional variables.

From a broader pedagogical perspective, the findings challenge the assumption that technical expertise alone is sufficient for effective ESP instruction. While disciplinary knowledge is undeniably important, it does not automatically translate into effective language teaching. As demonstrated in this study, methodological awareness enables instructors to balance technical accuracy with communicative functionality, an essential requirement in contemporary engineering education. This aligns with Widdowson's view that language instruction should prioritize performance and use rather than isolated knowledge of linguistic forms.

Finally, the study highlights a systemic issue within Technical English syllabi, which often emphasize vocabulary acquisition and text translation while marginalizing communicative skill development. The findings suggest that even modest methodological adjustments, such as incorporating interactional tasks, strategy-based reading, and guided writing, can yield measurable improvements in learner outcomes. Importantly, these changes do not require radical curricular reform or extensive resources but depend primarily on instructor training and pedagogical orientation.

In sum, the discussion underscores that the effectiveness of translation-based instruction depends not on the presence of translation itself but on its pedagogical framing. When employed rigidly within a GTM-dominant model, translation constrains communicative development; when embedded within an eclectic and theoretically informed framework, it becomes a powerful tool that supports both linguistic accuracy and communicative competence. This insight carries significant implications for ESP teacher preparation, curriculum design, and professional development in technical and engineering education.

6. Conclusion

This study set out to examine the role of instructors' theoretical knowledge and professional background in shaping methodological practices in Technical English instruction, with particular reference to the use of GTM and eclectic pedagogical approaches. The findings of the study provide clear and convergent evidence that the research questions and hypotheses have been adequately addressed.

First, with regard to research question 1, which examined the extent to which instructors' theoretical knowledge influences the quality of teaching methods in Technical English classrooms, the results strongly indicate that theoretical awareness plays a decisive role in shaping instructional practices. The comparative analysis of classroom procedures, interview data, and student performance demonstrates that the instructor with formal training in translation and language

pedagogy employed a wider range of instructional strategies, integrated communicative elements, and adopted a more learner-centered orientation. In contrast, the instructor without formal ELT training relied predominantly on translation and form-focused practices. These findings support hypothesis 1, confirming that instructors' theoretical knowledge significantly influences the effectiveness and quality of teaching methods.

Second, research question 2 investigated whether technical specialists tend to employ the Grammar–Translation Method unintentionally in Technical English instruction. Classroom observations and interview data reveal that the engineer instructor relied extensively on sentence-by-sentence translation, exclusive use of the learners' first language, and accuracy-oriented tasks, despite not explicitly identifying these practices as GTM. This pattern indicates an implicit and largely unreflective use of GTM, driven more by disciplinary background and instructional convenience than by methodological choice. The consistency of these practices across multiple terms confirms hypothesis 2, demonstrating that technical specialists are indeed more likely to employ GTM unintentionally in ESP contexts.

Third, research question 3 explored whether translation specialists predominantly apply an eclectic methodological approach in Technical English instruction. The evidence clearly shows that the translator instructor combined translation with communicative activities, strategic reading instruction, guided writing practice, selective grammar explanation, and limited oral input. This integrated approach reflects an eclectic methodology grounded in contemporary language teaching theories rather than exclusive reliance on any single method. The observed instructional flexibility and methodological awareness directly confirm hypothesis 3, establishing that translation specialists are more inclined to adopt eclectic and communicatively informed approaches in Technical English classrooms.

Quantitative findings further reinforce these conclusions. Although the first term did not yield statistically significant differences in student performance, the second and third terms revealed significant and increasingly strong advantages for the translator-led classes. The progression from a negligible effect to moderate and substantial effect sizes suggests that the impact of eclectic and theoretically informed instruction becomes more pronounced over time. Given that both instructors followed identical syllabi, materials, and assessment structures, these performance differences can be reasonably attributed to methodological variation rather than curricular or evaluative factors.

Taken together, the findings demonstrate that translation itself is not pedagogically problematic; rather, its effectiveness depends on how it is situated within the broader instructional framework. When translation is used as the sole instructional method, as observed in GTM-dominant classrooms, it supports accuracy and content comprehension but constrains the development of communicative competence. Conversely, when translation is embedded within an eclectic, communicatively oriented approach, it contributes positively to both linguistic accuracy and functional language use.

In conclusion, this study confirms that instructors' theoretical grounding, rather than disciplinary expertise alone, is a key determinant of instructional quality in Technical English education. The

research questions have been systematically answered, and all proposed hypotheses have been empirically supported. The findings underscore the need for pedagogical training in ESP contexts and advocate for flexible, theory-informed teaching practices that balance technical accuracy with communicative competence, an essential requirement for engineering students operating in increasingly globalized academic and professional environments.

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Bio-note:

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