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Introduction

The increasing adoption of English-Medium Instruction (EMI) in Science, Technology, Engineering, and Mathematics (STEM) has reshaped higher education in non-English-speaking countries, offering access to global knowledge but also generating new learning challenges. In Algeria, where EMI is progressively introduced, STEM students face dual pressures : they must master both complex disciplinary content and academic English simultaneously.

One of the key difficulties observed in EMI contexts is the recurrence of linguistic and cognitive errors, particularly in the areas of technical vocabulary, grammar, critical reasoning, and academic communication. These issues often hinder students' ability to express scientific ideas clearly and accurately, which negatively affects both their learning outcomes and academic confidence.

In response to these challenges, Task-Based Learning (TBL) has gained attention as a promising pedagogical framework. By focusing on real-world tasks, problem-solving, and collaborative learning, TBL fosters active engagement and contextualized language use, aligning well with the demands of STEM education. Despite its potential, there is a lack of empirical research on how TBL can be applied to address the specific error patterns of EMI learners in the Algerian context.

This study aims to fill that gap by investigating the most frequent linguistic and cognitive errors among EMI STEM students in Algeria, and by evaluating how TBL-based corrective feedback can be used to reduce these errors and enhance language proficiency. The research specifically seeks to :

- Identify and categorize errors in language mechanics, technical vocabulary, reasoning, and presentation.
- Analyze their impact on students' academic performance and scientific communication.
- Assess the effectiveness of TBL interventions in improving language accuracy and reducing recurrence.

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By analyzing authentic student data and implementing a task-based corrective approach, this study offers practical insights for instructors, EMI program designers, and language support services, contributing to the enhancement of English-medium STEM education in Algeria and similar multilingual contexts.

1. Literature Review

Over the past two decades, the expansion of English-Medium Instruction (EMI) in non-English-speaking countries has reshaped higher education. While EMI facilitates global academic integration and access to scientific literature, it also imposes significant linguistic demands, especially in Science, Technology, Engineering, and Mathematics (STEM). In these disciplines, students are required to process complex disciplinary content in a non-native language, which can slow comprehension and undermine academic performance (Macaro, 2018 ; Wilkinson, 2020).

In the Algerian context, EMI has been introduced unevenly across institutions, with limited institutional support or clear frameworks. Research by Benrabah (2014) and Boukadi (2019) has shown that students in EMI STEM programs often face challenges in :

- mastering specialized vocabulary,
- producing academic writing,
- and delivering oral presentations.

These obstacles hinder students' ability to communicate scientific content clearly, affecting their outcomes in exams, research reports, and classroom discussions. Despite this, few pedagogical responses have been tailored to address the specific language needs of EMI students in STEM contexts.

One promising solution is Task-Based Learning (TBL), a pedagogical approach that focuses on meaningful tasks as the central unit of teaching and learning. According to Ellis (2003) and Willis & Willis (2007), TBL creates opportunities for authentic language use in academic settings and encourages deeper cognitive engagement. TBL is especially relevant in EMI environments for several reasons :

- It promotes contextualized acquisition of domain-specific terminology through problem-solving tasks.
- It stimulates communication via collaborative work, discussions, and peer feedback.
- It enhances language accuracy by embedding corrective feedback within the learning process.

Evidence from Carless (2015) and Ferris (2018) supports the effectiveness of TBL in improving both language retentionand learner motivation, particularly in content-based learning settings.

However, to fully benefit from TBL, instructors must first understand the types of errors EMI learners are prone to. Research in error analysis (Dulay, Burt & Krashen, 1982 ; Ferris, 2011) distinguishes four major categories :

- Mechanical errors : issues with grammar, spelling, or punctuation.
- Lexical errors : misuse or overgeneralization of technical vocabulary and collocations.
- Cognitive errors : conceptual misunderstandings and flawed logical reasoning.
- Presentation errors : lack of structure or coherence in written and spoken output.

In STEM education, these errors go beyond linguistic surface issues—they can significantly distort the interpretation of scientific arguments and compromise the clarity of communication (Hyland, 2004). While TBL holds promise as a corrective strategy, very few studies have examined its application for systematic error reduction in EMI STEM contexts, particularly in multilingual environments like Algeria.

2. Methodology

This study adopts a mixed-methods approach, combining quantitative analysis of linguistic error patterns with qualitative insights from student reflections and instructor feedback. This design allows for a comprehensive understanding of the linguistic and cognitive challenges faced by EMI STEM students, and provides an empirical basis to evaluate the impact of Task-Based Learning (TBL) as a corrective pedagogical tool.

The participants were 80 undergraduate students from various STEM disciplines (Engineering, Computer Science, and Applied Sciences) enrolled in EMI programs at two Algerian universities. They were selected based on three criteria :

- They were enrolled in courses delivered entirely in English.
- They had at least one year of experience with EMI.
- They had participated in at least one corrective session using TBL strategies.

Data were collected over three months from written assignments, oral presentations, and research reports. The identified errors were classified into four categories :

- Mechanical errors : grammar, spelling, punctuation.
- Lexical errors : incorrect use of technical vocabulary and collocations.
- Cognitive errors : misinterpretation of concepts and logical inconsistencies.
- Presentation errors : lack of coherence and clarity in oral and written communication.

To support the students, corrective feedback was provided by both language instructors and STEM subject experts, guided by TBL principles. Peer-review sessions were also integrated to promote collaborative learning and self-correction.

Finally, a comparative analysis was conducted between pre-intervention and post-intervention performance, evaluating the frequency and recurrence of errors. In parallel, a qualitative analysis of student feedback provided insight into their perceptions of the TBL approach and their self-reported language development.

3. Results and Discussion

3.1 Error Types and Frequency

The analysis of student work revealed consistent patterns in the types of errors encountered across EMI STEM courses. Among the four categories identified, lexical (40 %) and mechanical errors (35 %) were the most frequent, suggesting significant difficulties with both technical terminology and basic language structure. Cognitive errors (15 %) and presentation issues (10 %) were less common but still noteworthy in affecting students' ability to communicate scientific ideas effectively.

Table 1. Distribution of Errors in STEM EMI Students

Error Type	Frequency (%)	Example of Common Mistakes
Mechanical errors	35 %	"The data is accurate" → "The data are accurate."
Lexical errors	40 %	"The chemical reaction evaporates energy" → "releases energy."
Cognitive errors	15 %	Inconsistent reasoning without scientific basis.
Presentation issues	10 %	Lack of structure and clarity in writing and speech.

These results indicate that students struggle particularly with the precision of scientific vocabulary and grammatical correctness, both of which are essential for articulating complex STEM content.

3.2 Effect of TBL on Error Reduction

The impact of these difficulties was further assessed through a three-month intervention using task-based corrective feedback.

A pre/post comparative analysis showed that error rates dropped across all categories, especially lexical and mechanical ones, demonstrating the tangible benefits of a TBL-based approach.

Table 2. Error Reduction Rates After TBL Interventions

Error Type	Pre-TBL (%)	Post-TBL (%)	Reduction (%)
Mechanical errors	35 %	22 %	↓ 13 %
Lexical errors	40 %	24 %	↓ 16 %
Cognitive errors	15 %	10 %	↓ 5 %
Presentation issues	10 %	6 %	↓ 4 %

These improvements align with prior research (Ferris, 2018 ; Ellis, 2003), affirming the value of active, feedback-rich learning environments in EMI settings.

3.3. Student Perspectives and Pedagogical Implications

In addition to these quantitative outcomes, qualitative feedback from students highlighted three recurring themes: a greater awareness of habitual errors, a more confident use of English in STEM-related tasks, and improved retention of technical vocabulary through contextual learning. One student noted, "I now recognize my usual errors and try to correct them before submitting assignments." Another explained, "Feedback sessions helped me feel more confident when using English during presentations." Despite this, some students mentioned difficulties applying feedback in more specialized or abstract scientific contexts, pointing to a need for discipline-specific scaffolding.

Students also frequently exhibited challenges during oral presentations, including weak argumentation structures, such as jumping between ideas without logical progression; inadequate visual aids, such as overly text-heavy slides or poorly labeled diagrams; and limited audience engagement, including reading directly from slides with minimal interaction. These trends further underscore the necessity of targeted training in communication strategies.

The following table summarizes the specific impacts of each error type on student performance, along with pedagogical strategies to address them:

Table 3. Error Type, Impact, and Suggested Solutions

Error Type	Impact on Students	Suggested Solutions
Language Mechanics	Reduced clarity, lower comprehensibility, negative impression in communication	Proofreading workshops, grammar exercises, peer correction, language platforms
Technical Vocabulary	Misinterpretation of key concepts, reduced precision in scientific explanations	Tailored STEM glossaries, concept-mapping exercises, authentic readings
Critical Thinking	Weak arguments, superficial reasoning, limited analytical depth	Explicit logic instruction, case studies, puzzles, evidence-based reasoning
Presentation Skills	Poor audience engagement, unclear presentations, ineffective communication	Structured presentation training, mock presentations, use of visual aids

Taken together, these findings emphasize several key implications for EMI in STEM education: the importance of providing structured linguistic support within content-based curricula; the proven effectiveness of task-based corrective feedback; and the necessity of collaboration between language instructors and STEM faculty to develop integrated, pedagogically coherent programs.

Conclusion

This study investigated the most frequent linguistic and cognitive errors encountered by STEM students in an English-Medium Instruction (EMI) context in Algeria and examined the effectiveness of Task-Based Learning (TBL) as a pedagogical response. The findings indicate that lexical and mechanical errors are particularly prevalent and significantly affect students' academic performance. The use of task-based corrective feedback not only reduced the frequency of these errors but also improved students' awareness of their linguistic challenges and their confidence in using English in STEM settings.

These results underscore the importance of integrating structured language support within EMI programs. Universities should consider implementing discipline-specific language modules focused on technical vocabulary, academic writing, and oral communication. Likewise, EMI instructors would benefit from targeted training on how to embed linguistic scaffolding into content delivery. The study also reinforces the pedagogical value of TBL, particularly its capacity to foster active engagement, collaborative learning, and targeted error correction. Encouraging interdisciplinary collaboration between language instructors and STEM faculty could lead to the development of more coherent EMI curricula that address both scientific and linguistic demands.

Future research should now examine the long-term impact of task-based corrective strategies, compare their effectiveness with other feedback models—such as explicit grammar instruction—and explore how EMI-related challenges vary across cultural and institutional contexts. Such investigations would contribute to building more inclusive and adaptable pedagogical frameworks, ultimately enhancing the academic and professional outcomes of EMI learners in STEM fields.

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Abstract

The increasing adoption of English-Medium Instruction (EMI) in non-English-speaking countries has posed significant linguistic challenges for STEM students, particularly in technical vocabulary, academic writing, and critical thinking skills. This study examines the most frequent linguistic and cognitive errors made by EMI STEM students in Algeria and evaluates the effectiveness of Task-Based Learning (TBL) as a corrective strategy. A mixed-methods approach was employed, combining quantitative analysis of students' written and oral productions with qualitative feedback from instructors and students. Errors were categorized into four types : mechanical (grammar, spelling, punctuation), lexical (misuse of technical vocabulary), cognitive (misinterpretation of concepts), and presentation (coherence and organization issues). A pre-test/post-test framework assessed the impact of TBL-based corrective feedback over a three-month period. The results revealed that lexical and mechanical errors were the most frequent, significantly affecting students' academic performance. Task-based corrective interventions led to a 16 % reduction in lexical errors and a 13 % reduction in mechanical errors, highlighting the effectiveness of TBL in EMI STEM education. Additionally, students reported greater confidence in using English for scientific communication. These findings suggest that integrating structured language support and TBL strategies in EMI curricula can enhance STEM students' language proficiency and academic success. Further research should explore longitudinal effects of TBL on language retention and its applicability in different EMI contexts worldwide.

Keywords

English-Medium Instruction (EMI), Task-Based Learning (TBL), STEM Education, Linguistic Errors, Corrective Feedback, Cognitive Development, Language Proficiency

الملخص

أدى الاعتماد المتزايد لأسلوب التدريس باللغة الإنجليزية (EMI) في الدول غير الناطقة بالإنجليزية إلى تحديات لغوية كبيرة لطلاب العلوم التكنولوجيا، الهندسة، والرياضيات (STEM)، خاصة فيما يتعلق بالمفردات التقنية، الكتابة الأكاديمية، والتفكير النقدي. تهدف هذه الدراسة إلى تحليل الأخطاء اللغوية والمعرفية الأكثر شيوعًا بين طلاب EMI في الجزائر وتقييم فعالية التعلم القائم على المهام (TBL) كإستراتيجية تصحيحية.

استخدمت الدراسة منهجية مختلطة تجمع بين التحليل الكمي للأداء الكتابي والشفهي للطلاب والتقييم النوعي من قبل الأساتذة والطلاب. تم تصنيف الأخطاء إلى أربع فئات : الأخطاء الميكانيكية (النحو، الإملاء، الترقيم)، الأخطاء المعجمية (الاستخدام غير الصحيح للمصطلحات التقنية)، الأخطاء المعرفية (سوء تفسير المفاهيم)، وأخطاء العرض والتقديم (مشاكل التنظيم والتماسك النصي). تم تطبيق نموذج اختبار قبلي/بعدي لتقييم تأثير التغذية الراجعة التصحيحية القائمة على TBL خلال فترة ثلاثة أشهر.

أظهرت النتائج أن الأخطاء المعجمية والميكانيكية كانت الأكثر شيوعًا، مما أثر بشكل كبير على الأداء الأكاديمي للطلاب. وقد ساهمت التدخلات التصحيحية عبر TBL في تقليل الأخطاء المعجمية بنسبة 16 % والأخطاء الميكانيكية بنسبة 13 %، مما يدل على فعالية TBL في التعليم EMI في مجالات STEM. كما أشار الطلاب إلى تحسن في الثقة باستخدام اللغة الإنجليزية في التواصل العلمي.

تشير هذه النتائج إلى أن دمج الدعم اللغوي المنظم واستراتيجيات TBL في مناهج EMI يمكن أن يعزز الكفاءة اللغوية والنجاح الأكاديمي لطلاب STEM. وتقترح الدراسة المستقبلية فحص التأثيرات طويلة المدى لـ TBL على اكتساب اللغة وتكييفه في سياقات EMI المختلفة عالميًا.

الكلمات المفتاحية

التدريس باللغة الإنجليزية (EMI)، التعلم القائم على المهام (TBL)، الأخطاء اللغوية، الكتابة الأكاديمية، التغذية الراجعة التصحيحية، الكفاءة اللغوية

Résumé

L'adoption croissante de l'enseignement en anglais (EMI) dans les pays non anglophones pose des défis linguistiques majeurs aux étudiants en sciences, technologie, ingénierie et mathématiques (STEM), notamment en matière de vocabulaire technique, d'écriture académique et de pensée critique. Cette étude examine les erreurs linguistiques et cognitives les plus fréquentes chez les étudiants EMI en Algérie et évalue l'efficacité de l'apprentissage basé sur les tâches (TBL) comme stratégie corrective. Une approche mixte a été utilisée, combinant l'analyse quantitative des productions écrites et orales des étudiants avec des retours qualitatifs des enseignants et des étudiants. Les erreurs ont été classifiées en quatre catégories : mécaniques (grammaire, orthographe, ponctuation), lexicales (mauvaise utilisation du vocabulaire technique), cognitives (mauvaise interprétation des concepts) et de présentation (problèmes de cohérence et d'organisation). Un dispositif de pré-test/post-test a permis d'évaluer l'impact du feedback correctif basé sur le TBL sur une période de trois mois. Les résultats montrent que les erreurs lexicales et mécaniques sont les plus fréquentes, ayant un impact significatif sur la performance académique des étudiants. Les

interventions correctives basées sur le TBL ont permis de réduire de 16 % les erreurs lexicales et de 13 % les erreurs mécaniques, démontrant l'efficacité du TBL dans l'apprentissage des EMI en STEM. De plus, les étudiants ont signalé une meilleure confiance dans l'utilisation de l'anglais pour la communication scientifique. Ces résultats suggèrent que l'intégration d'un accompagnement linguistique structuré et des stratégies TBL dans les programmes EMI peut améliorer la maîtrise linguistique et la réussite académique des étudiants en STEM. Des recherches futures devraient examiner les effets à long terme du TBL sur la rétention linguistique et son applicabilité dans différents contextes EMI à l'échelle internationale.

Mots-clés

Enseignement en anglais (EMI, Apprentissage basé sur les tâches (TBL), Éducation STEM, Erreurs linguistiques, Feedback correctif, Compétences linguistiques