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Advancing English Medium Instruction in Algerian Higher Education: The Effect of Adaptive Pedagogical Strategies on Teacher Academic Performance and Student Engagement

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Abstract

Some teachers may face difficulties in engaging with English Medium Instruction (EMI) courses including the shift from using their native language to run disciplinary courses in English. These issues prompt many scholars to adapt strategies for training and assisting EMI teachers' performance in EMI courses. The current literature on the training and support of teachers in executing EMI pedagogy has received inadequate attention. The deficiency of research on preparing educators for EMI pedagogy has resulted in a notable gap in the literature. This study aims at examining teachers and students' common challenges in pursuing EMI courses and their impact on their academic performance and engagement. The study employed a quantitative design with a sample of 14 EMI teachers and 60 undergraduate students enrolled in engineering courses. The design involved conducting pre- and post-test experiments and a self-report questionnaire after engaging in the courses. The participants were divided into a CG =30 and an EG=30 receiving the treatment. Findings indicated that EG students and teachers increased their engagement and academic performance prior to implementing adaptive strategies in EMI courses. Indeed, challenges associated with the EMI courses such as inadequate teaching materials and insufficient classroom interactions decreased only after employing adaptive solutions, including alternative textbooks, self-reflection skills, technological devices, and the first language. Therefore, implementing EMI programs is challenging, necessitating teacher development, institutional support, and effective student self-directed and peer learning strategies. In addition, the adaptive strategies utilized by students and teachers provide insights into how other EMI courses could enhance their adaptation.

Keywords EMI courses, Algerian Higher Education, adaptive strategies, teachers, students, academic performance, achievement.

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1. Introduction

The prevalence of English as a lingua franca has led to an increase in the number of universities providing English Medium Instruction globally (Dearden, 2015). The alteration in the medium of instruction signifies that English has transitioned from being taught as a foreign language in conjunction with other discipline-specific courses to serving as a crucial educational language for the instruction of non-language academic subjects (McKinley et al., 2021), such as studying Engineering content in English or pursuing Business degrees in English (Curle et al., 2024). According to Macaro et al. (2018), EMI involves using English language for the instruction of academic disciplines, not considering contexts where the primary language (L1) of the majority is not English. This concept, while contested, is pertinent to numerous expanding settings of EMI in higher education (Huang, 2015), as current trends suggest a swift expansion of EMI offerings at certain universities for partial courses, complete courses, and entire programs conducted in English (Galloway et al., 2020; Humphrey, 2017).

While it is acknowledged that EMI is an unavoidable phenomenon in the globalizing landscape, research in this domain remains constrained regarding the perceptions of EMI among lecturers and students (Kırkgöz et al., 2023). The internationalization and global student mobility have resulted in significant growth in the populations of Anglophone colleges, where many students utilize English as their second language in a multilingual academic environment with limited interaction with local students (Humphreys, 2017).

The adoption of EMI has posed numerous challenges for EMI educators, as they are occasionally required by politicians to implement EMI without adequate involvement (Evans & Morrison, 2011). Consequently, EMI engenders worry, anxiety, or discomfort among educators (Hung et al., 2017). Teaching in a foreign language has numerous problems, including issues of proficiency, self-confidence, and pedagogy (Martinez & Fernandes, 2020). Other issues are equally significant, such as the ramifications of instructing professionals and researchers in a globally pertinent language, so supporting its hegemonic status (Kim & Kim, 2021).

Due to the significance of language in these issues, apprehensions over proficiency, specifically insufficient English skills among both educators and learners, are prevalent (Macaro et al., 2019). There is prevalent concern that reduced learning outcomes would ensue from educators and students attempting to interact with knowledge acquisition through a medium in which they lack confidence (Tien, 2023). It is essential to consider the justifications for this practice, typically linked to internationalization initiatives (Gimenez et al., 2021).

Recently, substantial research has emerged regarding the implementation of EMI in Algeria, focusing on the efficacy of EMI courses and the perspectives of stakeholders (Ouarniki, 2025, Bougabès, 2025). Nevertheless, there is limited understanding of Algerian engineering students' perceptions of their EMI learning and the issues they encounter as problematic in their EMI courses, necessitating further inquiry (Malki, 2025). Few studies have empirically examined adaptive EMI strategies in North African contexts. Most Algerian EMI research is

descriptive (Harroug, 2025; Naimi, 2025; Sahki, 2024) focusing on attitudes rather than intervention outcomes. This study fills that gap by empirically evaluating the protentional challenge of adaptive strategies in improving teacher performance and students' engagement in Algerian EMI courses. The research was conducted in the Algerian context with EMI engineering courses. It addressed the following research questions :

1. Do adaptive strategies affect students' academic engagement in EMI courses ?
2. How do adaptive strategies affect teachers' academic performance ?
3. What challenges do EMI teachers and students face in using adaptive strategies?

To properly evaluate the students' engagement in their EMI courses and teachers struggling challenges with adaptive strategies, a quantitative research design with 60 EFL students and 14 EMI teachers in engineering at university of Laghouat was conducted after they completed their EMI courses.

2. Review of Literature

2.1 Adaptive Strategies

Due to internationalization and globalization, English Medium Instruction (EMI) has proliferated across all continents and educational contexts (Dearden, 2015; Galloway & Rose, 2021; Macaro et al., 2018). EMI instruction and learning have been extensively implemented in education across Europe, Asia, and Africa because of the acknowledgment of its undeniable advantages. Aizawa and Rose (2019) found that students across all proficiency levels had challenges, with more proficient students struggling with academic literacy tasks like essay writing, while less proficient students had difficulties comprehending instructors and grammatical structures, among other issues. Li (2018) identified links between English proficiency and academic success, indicating that although other factors influence academic performance, language proficiency is crucial. In this context, a crucial inquiry for EMI programs is how various assessments may guarantee that students enter these programs with enough English proficiency.

Numerous research has investigated teaching strategies in EMI contexts from the viewpoints of educators, coinciding with the substantial growth of EMI programs (Thompson & McKinley, 2018; Yuan, 2021). The majority of EMI instructors indicated that they encountered difficulties in delivering lectures in EMI owing to their L2 language proficiency, particularly in articulating concepts and identifying equivalent terminology for content knowledge (McKinley et al., 2021; McKinley & Rose, 2022). Moreover, Mahawattha & Rassool (2023) observed that numerous EMI educators tend to focus exclusively on a subject while offering less linguistic assistance in their teaching.

Lasagabaster et al. (2018) believes that is mostly due to the inadequacy of the current EMI teacher preparation program, which appears to furnish subject teachers with insufficient language and literacy instruction in interdisciplinary courses. Nonetheless, similar concerns regarding EMI professors exhibited a diminished regard for students' perspectives. Their EMI instructors consistently endeavored to deliver lectures with comprehensible content explanations and clear L2 expressions throughout their classes (Hung & Lan, 2017).

Mendoza and Ou (2022) assert that tertiary level educators must adopt a more strategic approach to teaching, as not all motivational strategies are effective in this context. Teaching in the English language within the classroom may encounter both linguistic and pedagogical challenges (Nieto Moreno & Fernández, 2021). The lecturers who are not fluent in English may encounter difficulties in delivering courses in it. These difficulties are quite prevalent in the domain of EMI (Macarao et al., 2018). Simultaneously, English instruction necessitates additional effort from non-English speakers, such as resources, lesson plans, and evaluation systems. In addition to reading texts and watching videos in English for increasing teachers' competence in EMI courses (Diezmas & Barrera, 2021).

EMI has gained popularity in research, and recent studies indicate that its success is contingent upon meeting specific requirements (Mahawattha & Rassool, 2023). Initially, students' English proficiency must reach a specific standard to comprehend the material presented in English. Teachers must possess fluent English for effective communication with students, along with extensive understanding in pedagogical and disciplinary domains (Pun & Jin, 2021). Students also may encounter problems in comprehending the learning materials and situations while confronting challenges in learning through EMI (Sahki, 2025). Yang et al. 2019 indicated that during the selection of courses, teachers need to appropriately select the teaching strategy. Furthermore, academic institutions must provide precise resources that assist both educators and learners in accomplishing EMI courses (Pun & Jin, 2021).

Ball and Lindsay (2013) contend that EMI instructors frequently plan lectures, select content, and utilize more interactive strategies such as group discussions and diagnostic assessments to facilitate learning. Evans and Morrison (2011) assert that EMI students often participate in self-regulated learning tasks, such as scaffolding, adaptive learning platforms, project work, and advanced writing and reading materials. Wu (2023) observes that students depend on peer collaboration, including study groups, shared arguments, peer questioning, and peer feedback, to facilitate subject understanding in EMI environments. Galloway et al. (2020) advocate that integrating English for Academic Purposes support in EMI courses alleviates the conflict between language acquisition and content comprehension. Mahawattha & Rassool, (2023) highlights the increasing significance of technology-driven strategies by emphasizing the progressive use of recorded lectures, learning management systems, and translation tools. These technologies provide adaptable learning possibilities and assist in surmounting both linguistic and content-related obstacles (Macaro et al., 2018).

Empirically, the study of Yang et al. (2019) explores EMI teachers' challenges of implementing adaptive strategies in a medical Chinese program to discern the obstacles and effective local approaches. Findings indicate that although many issues resemble those faced by other EMI projects, the adaptive solutions employed in this particular program may provide valuable insights for other EMI initiatives. In the Algerian EMI context, few empirical studies examined the challenges faced by teachers in interdisciplinary EMI courses (Sahki, 2025, Amara, 2025), EMI teachers' attitude (Touahmia & Bakar, 2024), teachers' perspectives towards EMI (Ouarniki, 2025). However, a set of studies explored the challenge of using pedagogical strategies and their effect on teachers and students' performance and engagement in engineering and scientific EMI courses.

The study of Malki (2025) examined the difficulties encountered by scientific field teachers in learning the English language at Ecole Nationale Polytechnique de Constantine. Using a diagnostic assessment, and focus group conversations to collect the data. The results indicate that numerous obstacles were identified that impede the success of the procedure, including the selection of relevant content and the adoption of proper approaches for diverse groups regarding English proficiency, discipline, and professional background.

Likewise, the study of Bougabes (2025) investigates the challenges faced by teachers' language proficiency and the preservation of academic standards during the early stages of EMI adoption. The study used interviews with twenty faculty members and institutional document analysis to collect the data. The study findings reveal institutional shortcomings in English for Specific Purposes education, including inconsistent professional growth, lack of standardized frameworks, and insufficient coordination between academics and specialists. Another study by Ouarniki (2025) explores the strategic integration of English for Specific Purposes within EMI to improve students' academic performance across various disciplines. It highlights challenges like inadequate resources and linguistic support and suggests professional development programs for instructors. Findings show that students augment both their academic competency and their employability in EMI learning settings.

3. Method

A quantitative design was employed to gather data regarding teachers' academic performance in their EMI courses and engineering students' academic achievement. In order to meet the study's objectives. The researcher has selected an experiment with a questionnaire to collect the data. Teachers' academic performance and students' academic achievement were assessed before and after using adaptive strategies. The sample consisted of 60 students and 14 teachers from university of Laghouat enrolling in a 4-week EMI course. The questionnaire assessed teachers' teaching strategies in EMI and their challenges with these practices. The research participants consisted of students getting EMI teaching from 2021 to 2025 (N=60) who were divided into CG (N=30) and EG (N=30), in addition to EMI teachers from various engineering disciplines.

3.1 Instruments and Procedure

The research participants consisted of students getting EMI teaching from 2021 to 2025 (N=60) who were divided into CG (N=30) and EG (N=30), in addition to EMI teachers from various engineering disciplines. Data were gathered from students' test scores and teachers' responses to the self-report questionnaire adapted from Wang (2021). In addition to inquiries on grades, years of teaching and learning experience, and general feedback on EMI, there were 21 items in the teacher's questionnaire, evaluated on a 4-point Likert scale from Strongly Disagree=1 to Strongly Agree= 4. The questionnaire was available in both English and Arabic versions. The Arabic version was disseminated to the participants to enhance comprehension. It was completed by 14 EMI teachers (response rate = 74%).

On the other hand, the experiment test on academic achievement was adapted from Zevallo Valdivia (2024) using score rubric ranging between 20 and 100 points. In addition, adaptive strategies including bilingual vocabulary, PowerPoint, peer assessment, project work, AI-based tools, and emotional scaffolding. In the first week, a pre-test was conducted on

academic achievement and teachers were exposed to adaptive strategies. In the second week, the instructor presented the course content using adaptive strategies. The CG group was instructed based on feedback and traditional lecturing, while the EG group was exposed to technology-based tasks, peer assessment, and project work. In the sixth week, a post-test was administered, and test scores were assessed using a specific scoring criterion.

3.2. Results

Quantitative data collected from the questionnaires were analyzed using the Statistical Package for Social Science, version 23. First, descriptive analysis provided frequencies and percentages, then independent and paired sample tests were performed to compare the scores of teachers and students during and after the treatment.

3.2.1 Students' Academic Achievement

First Research Question : Do adaptive strategies affect students' academic engagement in EMI courses ?

An independent t-test was performed on a written task comparing the CG with the EG. Table 1 demonstrates that there were no significant differences in academic achievement ($t = -0.547$; $p = 0.256$) between the groups, confirming that both groups had equal writing performance levels prior to the treatment.

Table N°01: Results of independent t-test on academic achievement for CG and EG

Pretest	Levene's test for equality of variances		t-test for equality of Means				
	F	Sig	T	df	Sig (2 tailed)	Mean difference	Std.error difference
Equal variance assumed	0.053	.256	-.547	59	.256	-2.05000	2.23200
			-.547	58.5	.256	-2.05000	2.23200
Equal variances not assumed							

After employing adaptive strategies, a paired sample t-test was used to evaluate the scores within the group post-treatment. Table 2 demonstrates that the CG (academic achievement: $t(29) = 6.502$; $p < .005$; $r = 0.834$) and EG (academic achievement: $t(29) = -17.523$; $p < .005$; $r = 0.023$) displayed a substantial alteration in academic achievement from the pre-test to the post-test for the EG, along with differing effect sizes. This result indicates that adaptive strategies substantially impacted students' academic achievement.

Table N°02: Results of Paired Sample t-test for CG and EG students

	M	Std	Correlation	T	df	Sig
CG pretest-posttest	-35.7	10.43	0.834	6.502	29	0.001

EG pretest- posttest	-9.46	5.22	0.023	-17.523	29	0.000
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ANCOVA was utilized to compare overall academic achievement, specifically the total test scores between the CG and EG, using the pre-test total scores as a covariate. The researcher initially assessed the assumptions of ANCOVA, including homogeneity of variance, linearity, and normality. A linear relationship between the covariate and the dependent variable indicates a violation of the assumption. The customized ANCOVA indicates no statistically significant relationship between the groups and the covariate, with $F = 0.153$ and $P = 0.506$, where $p > 0.05$.

The descriptive statistics for the pre-test and post-test of both groups include the mean and standard deviation. The mean and standard deviation for CG were 4.81 and 0.80, respectively, while for the EG, the mean and standard deviation were 8.07 and 0.83, respectively, for the pre-test. The post-test results revealed a mean (M) of 40.51 and a standard deviation (Std) of 11.23 for CG, while the EG exhibited a mean (M) of 17.53 and a standard deviation (SD) of 6.05. We employed the ANCOVA test to analyze the covariance between the dependent variables in the two groups. Results are presented in Table 3. The analysis revealed a significant effect for Group, $F = 653.50$, $p = 0.00$, $P < 0.05$, indicating statistical differences in total academic achievement on the post-test between the CG and EG, with pre-test scores accounted for as a covariate.

Table N°03: Results of Univariate tests

Univariate								
	Mean difference	Mean square	SE	F	Sig	Partial Eta Squared	Df	Sum of Squares
Group	-14.234	355.14	1.216	56.64	0.00	0.215		
Error							57	1266.92

3.2.2 Teachers Academic Performance

Second Research Question : How do adaptive strategies affect teachers' academic performance ?

Before we analyze the data, we need to test the reliability and normality of the data. Prior to the use of the survey which consists of likert scales questions (21 items). Cronbach's Alpha $\alpha = 0.75$ for teachers' scale signifies that there is a high level of internal consistency between the items of the scale, and proves that the tool of the study is extremely accurate. Pearson correlation was used to evaluate the linear relationship between the research variables, establishing the validity of the questionnaire. The results demonstrate a significant correlation among the questionnaire items, $r(14) = .604$, $P < .001$.

In addition, to see if the data are normally dispensed, we go for the normality test as table 4 shows. The normality Kolmogorov test of the effectiveness of using adaptation strategies in EMI courses was 0.068. The sig value is above 0.05, ($0.200 \geq 0.05$), for academic performance statistics, the assumption is 0,305 with sig= 0.001 which is below 0.05, this signifies that the data analyzed prior to the scales was normally dispensed since the sample is less than fifty. In addition, the Shapiro-Wilk tests of variance were below the level of 0.05. The normality score of effectiveness of adoptive strategies was 0.747, and academic performance towards score was 0.024.

Table N°04: Results of Tests of Normality

Sample group	Kolmogorov-Smirnov ^b			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	df	Sig.
Adaptative strategies	,068	14	,200*	,977	14	,525
Academic Performance	,305	14	,001	,919	14	,024

The questionnaire was administered to the teachers before and after the 4-week treatment in which teachers received adaptive strategies training. For that, the academic performance was evaluated using descriptive statistics. Table 5 shows that teachers reported improved performance in executing EMI courses after engaging with adaptive strategies. The mean score improved from $M = 4.34$ ($SD = 0.82$) to $M = 8.2$ ($SD = 0.76$), $t(14) = 5.67$, $p < .001$.

Table N°05: Results of teachers Academic Achievement during pre- and post-test

		N	Mean	Std.	t (14)
Pre-test	Adoptive strategies effectiveness	14	4.34	0.82	5.67
Post-test		14	8.20	0.76	
	Academic performance	14	2.72	0.25	
	Valid N (listwise)	14			

$p < .001$

3.2.3 Challenges in Using Adaptive Strategies

Third research question : What challenges do EMI teachers and students face in using adaptive strategies?

Figure 1 indicates that, in response to the inadequate quality of instruction, students engaged in substantial self-directed learning, encompassing both previews and reviews through online educational resources.



Figure N°01: Adaptation to Common Challenges

Students additionally depended on peer assistance following class $S=1.5$. Certain educators exert greater effort in lesson preparation $S=13.17$, refining PowerPoints to enhance focus and coherence compared to their counterparts $S=21.25$. Some students, uncomfortable with in-class engagement in English $S=5.9$, preferred to pose questions in Arabic after class when lecturers responded in Arabic. Moreover, problem-based learning conversations enhanced engagement $S=17.21$ as both educators and students could prepare in terms of language and subject matter expertise $S=9.13$.

4. Discussion

Findings in this study show that students had high scores of academic achievements, despite some challenges, including insufficient teaching tools and restricted classroom interactions. To address these challenges, teachers used adaptive solutions, such as alternative textbooks, self-reflective activities, and the utilization of their native language. Thus, the execution of EMI programs is intricate, necessitating teacher reflective practice, institutional support, and effective methods for student self-directed and self-regulation. A comprehensive interpretation may involve the social and cultural influence on EMI course delivery, along with the inadequate English competence of both teachers and students. This finding is consistent with those of Sahki (2025), Amara (2025), Touahmia & Bakar (2024), indicating that the execution of EMI programs is intricate, necessitating teacher development and effective adaptive strategies in enhancing content knowledge using alternative resources, English proficiency, and authentic materials.

The favorable reactions to the implementation of adoptive strategies are seen in the respondents' scores that such adaptations can enhance their academic achievement and adequate understanding during the course. In addition, the implementation of technology-driven initiatives can augment students' self-reflection and motivational awareness. This finding aligns with the research of Malki (2025) and Bougabes (2025), which demonstrate the efficacy of adaptive tools in enhancing the English language learning process and indicate that the implementation of EMI requires appropriate content selection and professional background.

Students are typically driven by external factors such as grades and rewards, rather than by the intrinsic desire to learn for the ultimate objective of learning. This may hinder students from improving their language abilities and proficiency, as they focus solely on achieving high academic marks (Galloway & Rose, 2021). Also, the students who received adaptive strategies showed increased performance in the post-test scores $t(29) = -17.523$; $p < .005$; $r = 0.023$). This may be due to structured language assistance that can function as a significant practice that offers teachers and students an assessment tool to attain learning outcomes. This finding aligns with Macaro et al. (2018), which underscores the importance of vocabulary understanding, and utilizing online dictionaries to provide flexible learning opportunities and address both linguistic and content-related obstacles.

The use of technological devices such as automatic platforms that prioritizes text, graphics, or videos, is essential for fostering an interactive and collaborative digital environment. A significant majority of respondents, totaling 77%, concur or strongly concur that technology-based tools facilitate students in becoming more engaged and autonomous learners. This finding aligns with the conclusions of Huang (2015) and Mahawattha & Rassool (2023), which emphasize that students must be driven to study autonomously, make independent decisions, and assume full responsibility for their learning in a digital environment. Students can also engage in reflection and self-direction by developing strategies like peer cooperation, including group work and peer work, and engaging in debates, to enhance content comprehension in EMI environments.

However, data from the questionnaire indicate that a majority of respondents (60%) agree with the notion that technological devices as adaptive strategy are unnecessary for students to understand the course. This demonstrates that the majority possess favorable attitudes towards the utilization of educational technology overall, such as automatic feedback and portfolios. This finding aligns with the assertions of Wu (2023) and Mckingley et al. (2021), who argue that while institutions may not provide multimedia platforms, individuals are motivated to utilize technological tools by developing their own portfolios. Nonetheless, the absence of technological skills and competencies, time limitations for portfolio building, along with internet disruptions during task downloads, hinder many educators, who contend that it is more beneficial to allocate time for instruction or preparing student assignments (Li, 2018).

In addition, EMI students engaged in project works with English textbooks. They retained the Arabic texts to develop a multilingual lexicon and enhance awareness of scientific methods. Textbook utilization in native language is also observed in other English Medium Instruction scenarios. The specific challenge of EMI engineering education lies in the necessity of utilizing imported textbooks to address local learning and scientific practice requirements. This finding is congruent with those of Bougabes (2025) indicating that this process emphasizes utilizing pedagogical methods suited for specific social contexts and subsequently internalizing the corresponding cognitive and metacognitive strategies.

Finally, findings show that project work discussions are an alternative approach to enhancing classroom participation. This outcome aligns with the conclusions of Wu (2023) and Galloway et al. (2020), which demonstrate that EMI innovation is not merely an English adaptation of the indigenous program, but rather a mechanism for catalyzing transformation in

higher education pedagogy. Adaptation strategies in EMI are complex and contingent upon context, encompassing pedagogical adjustments by educators, proactive coping mechanisms by students, institutional linguistic assistance, and technology aid. Future research should investigate the long-term effects of these strategies and their efficacy across various disciplines and educational systems.

5. Limitations

This research recognized a limitation in its reliance on studies employing self-reported questionnaire and interviews data, which may be intrinsically erroneous. Also, the study could better be conducted using a mixed methods approach to get more confirmatory findings about engineering students' engagement in EMI courses. Participants frequently have difficulties in delivering entirely authentic responses. This is one reason survey research on language concerns in Applied Linguistics is often regarded as insufficient, leading to a preference for more extensive and reliable assessments. Students whose first language is English may encounter similar difficulties in academic writing. The categorization of language problems in this study by skill areas does not align with modern integrated frameworks of academic competencies.

6. Conclusion

To improve English language teaching in English Medium Instruction, it is essential to analyze the impact of language-based systems on the academic outcomes of EMI courses. Essential constructs identified as critical for educational success including fluency in academic and technical vocabulary, self-efficacy, and writing skills; hence, these areas necessitate focused future research. Although many issues resemble those faced in prior EMI projects, the adaptive solutions employed in this study may provide valuable insights for future EMI initiatives. The worldwide policy of implementing EMI necessitates cognitive and conceptual transformations, leading to the establishment of local norms for adaptation and appropriation. Indeed, implementing EMI programs is challenging, necessitating teacher development, institutional support, and effective procedures for student self-directed and peer work to attain success. The adaptive strategies utilized by engineering students and educators at the university of Laghouat provide valuable insights on enhancing the execution of English programs in other EMI initiatives. A range of implications has been identified previous to our investigation, as follows. Language-learning objectives must be incorporated into the educational aims and explicitly communicated to the students. Consequently, educators should utilize instructional strategies to improve students' English proficiency. This poses issues regarding the integration of English language acquisition as a learning objective in English Medium Instruction and its significance in language education pertaining to English for Specific Purposes. This subject exceeds the parameters of this research; yet, it merits additional consideration.

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