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Investigating Linguistic Barriers Hindering Medical English Vocabulary Learning in an English Medium Instruction Context

Naima MERAIHI [•], Haron BOURAS [••], Abdelbasset DOU [•••]

Abstract

This study examines the linguistic barriers faced by second-year Algerian medical students in an English as a medium of instruction (EMI) context, specifically those from a French-medium educational background. It also explores students' attitudes towards using artificial intelligence (ai) tools for learning medical English vocabulary and probes the relationship between these attitudes and their perceived linguistic challenges. A quantitative research design was employed, with data collected via a structured questionnaire divided into two sections: one assessing linguistic barriers in medical English and the other evaluating attitudes towards ai-based vocabulary learning tools. Descriptive statistics, reliability analysis, and Pearson correlation tests were used for data analysis. The findings reveal that students experience moderate difficulties in learning medical English, particularly in productive skills such as pronunciation and writing, which may be influenced by their French-medium educational background within an EMI context. Although students expressed generally positive attitudes towards ai-based tools, correlation analysis indicated no statistically significant relationship between AI attitudes and linguistic barriers. These results suggest that while positive perceptions of AI exist, they are insufficient to address the linguistic challenges faced by students. The study underscores the need for coherent EMI implementation and structured pedagogical integration of AI tools to effectively support students transitioning from a French-medium background.

Keywords: Linguistic barriers, medical English, vocabulary, artificial intelligence, English as a medium of instruction.

• Ph.D. Candidate, Languages & Texts Research Laboratory (LanText- University of Annaba) University of Souk-Ahras, Algeria, n.mrayhy@univ-soukahras.dz
•• Ph.D. Lecturer, Languages & Texts Research Laboratory (LanText) University of Souk-Ahras, Algeria, haron.bouras@univ-soukahras.dz
••• Ph.D., DSPM Research Laboratory, University of Mostaganem, Algeria, abdelbasset.dou.etu@univ-mosta.dz

1. Introduction

As English has become the global lingua franca, it is no longer regarded as the exclusive property of any one nation. Instead, it serves as a shared resource available to anyone who chooses to use it within their specific context. In this regard, Crystal (2003) asserts that English is the global language, unifying people across nations and disciplines. Indeed, there is widespread consensus that English has solidified its role as the language of science, technology, and travel, transforming the world into a small village. Consequently, its role has expanded as the dominant medium of global communication in both professional and academic spheres. According to Swales (1990), English has become the principal channel of international communication in science. It lies at the heart of globalisation, influencing the ways people work, travel, and communicate. This far-reaching global influence is particularly evident in the medical field, where English has established itself as the primary language for scientific publications, international conferences, and professional training. This underscores the pressing need to adopt English as the medium of instruction within Algeria's medical education system.

Following this line of thought, medical vocabulary learning emerges as a critical aspect of EMI policy. Saville-Troike (1984) emphasizes the importance of vocabulary knowledge in second language learning. In other words, since medical students must use specialised language to communicate with both patients and peers (Ahmed, 2022, p. 50), mastering the meaning, usage, and pronunciation of specialised terms is essential (Zaidi & Al Jadaan, 2022, p. 92). Furthermore, proficiency in medical vocabulary enables students to read reports, complete admission forms, make diagnoses (Hsu et al., 2023), and "tailor admission notes and medication administration records" (Hsieh, 2016, p. 1).

Several scholars emphasise the paramount importance of vocabulary learning (Wilkins, 1976; Kaur, 2020). However, vocabulary learning involves not only acquiring an extensive range of words but also retaining them. Memory plays a pivotal role in language learning, and it is important to recognise that there are two types of memory. Short-term memory holds a limited amount of information for a brief period, while long-term memory stores an unlimited amount of information for an indefinite duration. In this regard, words are stored and remembered in a network of associations that can be of various types and linked in different ways. More importantly, medical students should be exposed to meaningful tasks, as the deeper they analyse and process language, the more easily information will be stored in long-term memory.

A substantial body of research has investigated medical vocabulary. On the one hand, numerous studies have explored the characteristics of English for Medical Purposes (EMP) vocabulary (Liu, 2013). On the other hand, many scholars have examined memory strategies, such as chunking, association, repetition, and word-structure techniques and their effects on vocabulary learning. Although these studies are primarily concerned with EMP contexts, their findings are relevant to EMI settings, where medical vocabulary

recognition aids students in decoding and encoding meaning. Despite the growing interest in vocabulary learning and teaching, there is a paucity of studies addressing the linguistic barriers faced by medical students (Zaidi & Al Jadaan, 2022; Askarova, 2023; Abdullah et al., 2013). Notably, no studies have examined the linguistic challenges related to medical vocabulary within the Algerian EMI context, highlighting a clear research gap.

Given its challenging nature, more than one-third of students fail their medical terminology courses (Ahmed, 2022). Consequently, many lose interest in pronouncing, spelling, remembering, and using medical jargon (Abdullah et al., 2013). To address these difficulties, instructors should integrate the latest technological methods for teaching vocabulary (Zafirovska & Xhaferi, 2022). In this respect, Elsanousi et al. (2021) suggest that instructors should be equipped with AI tools to design their courses and interact with students in the classroom.

As one of the driving forces of this era, AI assists teachers in simulating learning, preparing problem-solving activities, and enhancing students' decision-making skills by creating a motivational learning environment (Anggraini & Faisal, 2024). With the advancement of smart technology, AI helps students practice medical vocabulary in real-life scenarios, creating a personalised environment.

In particular, there has been growing interest in exploring the use of AI tools to improve students' vocabulary learning. Research has shown that AI interventions can enhance various aspects of vocabulary acquisition, including learning interest, memory retention (Moore & Calvert, 2000), engagement (Hwang & Wang, 2016), and cognitive load (Wei et al., 2018). For instance, Huang et al. (2021) found that Augmented Reality (AR) and Virtual Reality (VR) improve vocabulary learning by immersing students in an inclusive environment that boosts motivation and engagement. Moreover, while AR flashcards increase vocabulary retention through interactive learning, AR tools also offer contextualised learning situations. Similarly, Majid and Salam (2021) observed that AR flashcards with word identification and pronunciation games motivate learners and make the vocabulary acquisition process more enjoyable. Numerous studies highlight the linguistic and socio-cultural obstacles faced by language learners (Guo et al., 2024). AI tools can assist learners by analysing text, providing support for grammar, syntax, and vocabulary reinforcement, and enabling students to practice meaningful language use (Guo et al., 2024). These AI-powered tools effectively offer immediate linguistic support. Furthermore, AI applications help students structure their thoughts in the target language and engage with new linguistic content. AI's potential for individualised and immediate linguistic support is considered a cornerstone for vocabulary development and second language proficiency. However, research focusing on learners' attitudes towards the use of AI remains limited. More importantly, the attitudes of Algerian medical students towards using AI applications to enhance their vocabulary retention in an EMI context remain largely unexplored, revealing yet another research gap.

In post-pandemic Algerian higher education, significant transformations have emerged regarding e-learning integration, the implementation of EMI, and the transition

toward University 4.0 (Dou et al., 2026; Dou, 2025). Concurrently, researchers have initiated scholarly inquiries into EMP following the official policy shift transitioning the medium of instruction from French to English. This study primarily aims to explore the linguistic barriers faced by Algerian medical students in learning medical vocabulary and their attitudes towards the integration of AI in improving vocabulary retention. A secondary objective is to investigate the correlation between linguistic challenges and students' attitudes towards AI-assisted vocabulary learning.

Accordingly, this study seeks to address the following research questions:

RQ1- What are the major linguistic challenges faced by Algerian medical students in learning medical vocabulary?

RQ2- What are their attitudes towards the use of AI tools in learning medical vocabulary?

RQ3- To what extent are linguistic barriers in medical vocabulary associated with the students' attitudes towards AI-assisted vocabulary learning in an EMI context?

2. Theoretical background

Vocabulary Learning

Vocabulary acquisition plays a crucial role in language learning (Nation, 2013; Schmitt, 2010) and constitutes a central aspect of language teaching. Vocabulary is a sum or stock of words used by individuals or groups in relation to specific subjects. Vocabulary varies depending on the context, whether personal, academic, or professional. As Heibert and Kamil (2005) note, vocabulary also encompasses "the knowledge of the meaning of words" (p. 3), stressing the importance of understanding not only the shape and form of words but their meanings as well.

Moreover, vocabulary knowledge is interlinked with correct pronunciation. Effective communication requires accurate articulation, which connects vocabulary to the four language skills: listening, speaking, reading, and writing. Tankersley (2003) defines vocabulary as "the number of words that we understand or can actively use to listen, speak, read, or write" (p. 52). Vocabulary can thus be categorised into four types, based on the skill through which it is learned: receptive (listening and reading) and productive (speaking and writing). Carter (1998) further elaborates on vocabulary from an orthographic perspective, defining it as "any sequence of letters bounded on either side by a space or punctuation mark" (p. 4).

For effective language acquisition, mastery of vocabulary extends beyond the classroom, particularly in professional and academic contexts. Nation (2001) outlines that comprehensive vocabulary knowledge involves understanding the word's form, meaning, and use, each requiring distinct learning activities. Also, true word knowledge goes beyond its definition; it involves understanding how a word fits into the world. For example, a medical student must not only define "blood vessel" but also use the term appropriately with patients. Thornbury (2002) and McCarthy and O'Dell (1994) also emphasise the importance of understanding a word's form, meaning, and usage, which are essential for effective communication.

The cognitive process of acquiring such vocabulary is often supported by Dual Coding Theory (DCT). As proposed by Paivio (2007), DCT suggests that information is processed through two distinct but interrelated systems: a verbal system for linguistic information and a non-verbal (imagery) system for visual information. In the context of medical English, the simultaneous presentation of a technical term and its visual representation can create dual mental traces, thereby enhancing conceptual clarity and long-term retention compared to text-based learning alone.

Challenges of Learning Medical Vocabulary

Vocabulary learning in contexts such as English for Specific Purposes (ESP) and English as a Foreign Language (EFL) poses significant challenges, particularly in medical education. Students must master a large set of technical terms while simultaneously using English to engage with complex subject matter in EMI settings. Stahl and Nagy (2006) argue that "vocabulary is one of the primary challenges facing students who come from non-English-speaking homes" (p. 6), with limited exposure to medical English and the technical complexity of its terms inhibiting vocabulary acquisition.

McCarthy and O'Dell (1994) identified several common factors that significantly impact vocabulary acquisition, particularly in the context of learning medical terminology. Spelling difficulties can arise due to the complex orthographic patterns of medical terms, such as *'diarrhea*,' *'arrhythmia*,' and *'haemorrhage*,' which often constitute challenges for non-native speakers. Phonological difficulties also hinder students' ability to accurately pronounce medical vocabulary, particularly words with sound clusters like "*sphygmomanometer*" and "*thrombosis*," affecting their confidence in oral communication. Additionally, syntactic difficulties can interfere with students' ability to use medical terms correctly in grammatically appropriate contexts, as some words require flexible combinations while others demand more complex sentence structures. Semantic links, where terms appear similar but have distinct meanings, can further complicate matters, as evidenced by the confusion between "*make*" and "*do*" in medical contexts, such as "*make a check-up*" versus "*do a check-up*." Lastly, false friends (words that share similar forms but differ in meaning across languages) create another challenge, as seen in the confusion between "*actually*" (meaning "*really*" in English) and "*actuellement*" (meaning "*currently*" in French).

These overlapping difficulties collectively impact students' ability to master medical vocabulary and apply it accurately in both written and spoken communication. Beyond these categorical linguistic obstacles, the literature on EMP emphasizes that it is crucial for trainers to prepare students to use English effectively in both academic and professional contexts (Hyland, 2006). According to ESP theory (Dudley-Evans & St John, 1998), EMP course design should be based on an analysis of students' current language needs, academic requirements, and future professional demands. The authors posit that medical students need to acquire specialised vocabulary because it is vital for their professional and academic development. It enables them to write case histories, interact

with patients and colleagues in foreign hospitals, and participate in clinical discussions and international conferences. Drawing from the aforementioned challenges, this study suggests that medical students must not only learn medical vocabulary but also apply it accurately in different communicative contexts, overcoming potential linguistic barriers that may hinder comprehension and communication. As they must navigate distinct registers (e.g., between doctor-patient and doctor-doctor communications), mastering these nuances is essential.

For Algerian students transitioning from French-Medium Instruction (FMI), the linguistic transition to English presents a unique set of challenges characterized by both facilitation and interference. Phonologically, the interference is significant; French is a syllable-timed language with a relatively flat intonation, whereas English is stress-timed and relies heavily on vowel reduction and word-level stress (Walker, 2011). This often leads to difficulties in 'phonological decoding,' where students apply French pronunciation rules to English medical terms. Furthermore, while French and English share an extensive corpus of Greco-Latin cognates in medicine, this 'lexical overlap' can be a double-edged sword. Research into cognate processing suggests that while shared roots can facilitate comprehension, they often trigger orthographic and phonological interference (Gaskell & Marslen-Wilson, 2002). Students may struggle with 'deceptive transparency', assuming that because a word looks similar in French (e.g., *appendicite*) and English (*appendicitis*), the spelling conventions and suffixation are interchangeable, leading to persistent errors in academic writing.

3. Methods

Participants

The study was conducted at the Annex of Faculty of Medical Sciences University of Oum El Bouaghi in Algeria, where a sample of 70 medical students was purposively selected. This sample size represents approximately 60% of the second-year cohort at this specific annex, ensuring a representative profile of the local student population. To account for the study's null correlation findings, a post-hoc power analysis was conducted. For a sample of N=70, the study achieves a power of approximately 0.74 to detect a medium effect size (r=0.3) at a significance level of α=0.05. While the sample size is sufficient for descriptive and exploratory correlation analysis, the findings are interpreted with caution regarding the detection of subtle or weak relationships.

Instruments

Data collection involved two questionnaires, both utilising a five-point Likert scale, designed to address distinct aspects of the study within the EMI context. The first questionnaire targets the linguistic barriers in learning medical vocabulary. It aims to explore the linguistic barriers faced by medical students when learning medical vocabulary in an EMI context. It is adapted from Zaidi and Al Jadaan (2022), with a focus on language-related difficulties encountered while learning and using medical

terminology in English. The questionnaire addresses challenges in areas such as pronunciation, spelling, and syntactic structure, as well as other common difficulties related to medical vocabulary acquisition.

The second questionnaire targets the attitudes towards AI in learning medical vocabulary. It is self-administered and developed by the researchers, theoretically grounded in the Technology Acceptance Model (TAM) originally proposed by Davis (1989). While the original TAM includes multiple constructs such as Perceived Usefulness and Perceived Ease of Use, this study specifically retained the "Attitude towards Use" dimension. This selective approach was chosen because the study's primary objective was to assess students' affective dispositions and readiness, rather than the technical usability of a specific software, which serves as a key mediator for future technology adoption in EMI contexts. To ensure the instrument's validity despite its researcher-developed nature, the items were adapted from validated TAM-based scales used in similar educational technology studies (e.g., Venkatesh et al., 2003) and refined through the aforementioned expert review and pilot testing.

Validity and Reliability

To ensure the validity of the questionnaires, three experienced EMP practitioners were consulted to review the relevance and content validity of the questions. Afterwards, the questionnaires were piloted with a representative sample of the intended participants. The reliability and internal consistency of the questionnaires were assessed using Cronbach's alpha.

The Cronbach's alpha values obtained for the two instruments confirm the validity and reliability of the instruments used in this study. Table 1 shows that for the Linguistic Barriers Questionnaire, the alpha coefficient was greater than 0.80, indicating strong internal consistency. For the Attitudes towards AI Questionnaire, the Cronbach's alpha was also greater than 0.85, suggesting reliable measurement of the students' attitudes.

Table 1. Reliability Statistics

	N. of Items	**Cronbach's Alpha**
Linguistic Barriers Questionnaire	6	.816
Attitudes Toward AI Questionnaire	6	.858

Prior to conducting the correlation analysis, the data were subjected to the Shapiro-Wilk test to assess normality. The results indicated that the distributions for the composite scores of linguistic barriers and AI attitudes did not significantly deviate from normality (p>0.05). Consequently, Pearson's correlation coefficient (r) was utilized. Its use with 5-point Likert scale data is justified in this context, as the items were aggregated into composite scores, which are treated as interval data in educational and psychological research (Sullivan & Artino, 2013).

4. Results

Table 2 displays the means and standard deviations for items related to the linguistic barriers encountered by second-year medical students from a French-medium background when learning medical English vocabulary in an EMI context. The overall mean score of 3.14 suggests that while these students face moderate challenges in acquiring medical English vocabulary, these difficulties are not overwhelmingly severe. This indicates that students are partially ready to engage with English medical terminology, though persistent obstacles remain.

Linguistic Challenges in Medical Vocabulary Learning (RQ1)

Pronunciation emerges as the most significant challenge, with the highest mean score of 3.59. This finding is consistent with the phonological interference from French, where students often struggle with English stress patterns, vowel quality, and consonant articulation. Writing difficulties (M=3.23) also present significant challenges, likely due to the differences in English spelling conventions and the academic medical norms students are expected to master.

The challenges related to reading and remembering medical vocabulary yielded identical mean scores (M=3.13), suggesting that students face comparable difficulties in both decoding and retaining specialised terms. While many medical terms are derived from Greek and Latin roots common to both French and English, the English-specific orthographic and phonological realizations of these roots likely exacerbate these challenges. Rather than the roots being unfamiliar, the difficulty may lie in the 'morphological mismatch' between the two languages, where the English suffixes, silent letters, and stress patterns differ from the French-medium equivalents the students previously mastered. This creates a cognitive burden where students must 're-learn' the form of a word they already conceptually understand in French. Listening comprehension (M=2.93) and overall vocabulary learning (M=2.82) received lower mean scores, suggesting that students perceive these areas as less problematic. This may indicate a growing familiarity with English input through lectures, digital resources, or AI-based tools, which might be helping students adapt to spoken English more effectively. The data highlight that productive skills are more challenging for students than receptive skills, such as listening and reading. These findings propose a clear need for pedagogical interventions that focus on improving pronunciation, providing structured writing support, and offering explicit vocabulary instruction tailored to students transitioning from a French-medium educational background.

Table 2. Medical Students' Perceptions of Linguistic Barriers

Statement	Mean	Std. Dev.
Medical students from a French-medium background find it difficult to write correctly.	3.23	1.039
Medical students from a French-medium background find it difficult to speak with correct pronunciation.	3.59	0.955
Medical students from a French-medium background find it difficult to understand what they listen to.	2.93	1.138
Medical students from a French-medium background find it difficult to read medical English vocabulary.	3.13	1.162
Medical students from a French-medium background find it difficult to remember medical English.	3.13	1.072
Medical students from a French-medium background find it difficult to learn medical vocabulary.	2.82	1.148

Students' Attitudes Towards AI-Based Vocabulary Learning (RQ2)

Table 3 shows the means and standard deviations for second-year medical students' attitudes towards using AI to learn medical English vocabulary. The results reflect a generally positive attitude towards the use of AI, with mean scores ranging from 3.44 to 3.87 across all items, implying that students perceive AI tools as valuable resources that can alleviate some of the linguistic challenges identified in Table 2.

Table 3. Medical Students' Attitudes towards AI-Based Vocabulary Learning

Statement	Mean	Std. Dev.
I can improve my medical English vocabulary using AI-based applications.	3.44	1.041
AI-based game apps make me enjoy the process of medical vocabulary learning.	3.51	1.090
Using AI flashcards visualizes medical vocabulary for me, which accelerates my understanding.	3.87	0.957
Interacting with AI tools improves my ability to use medical vocabulary appropriately.	3.75	1.011
I recommended using AI-bilingual dictionaries.	3.48	0.887
AI-based applications enhance my writing through providing feedback about appropriate medical vocabulary use.	3.57	0.957

The highest mean score was recorded for the use of AI-based flashcards (M=3.87), reflecting a strong student preference for visual support in vocabulary learning. This is particularly relevant in an EMI context, where students transitioning

from French to English may benefit from multimodal input that they perceive to enhance conceptual clarity and retention. This preference for visualised vocabulary input is consistent with the principles of Dual Coding Theory, as discussed in the theoretical framework of this study, which suggests that combining verbal and visual representations can facilitate more effective learning."

Students also expressed a strong perception that AI interaction could improve their ability to use medical vocabulary appropriately (M=3.75) and might enhance writing through feedback (M=3.57). These results indicate that students perceive AI tools as a means to support productive skills by providing what they believe to be immediate, personalised feedback, an advantage they identify as often missing in traditional ESP classrooms. Their reports suggest that they view AI tools as not only supporting cognitive outcomes but also potentially addressing affective dimensions such as motivation and anxiety reduction. Enjoyment and engagement were also key factors, with students reporting positive perceptions of AI-based game applications (M=3.51). This means that AI tools not only support cognitive outcomes but also address affective dimensions such as motivation and anxiety reduction, which are particularly beneficial for learners dealing with cross-linguistic interference from French. The favourable perception of AI-bilingual dictionaries (M=3.48) suggests that these tools can effectively mediate language learning. Rather than being viewed as a crutch, AI-supported bilingual tools are seen as facilitating smoother lexical transfer and comprehension in the transition from French-Medium Instruction (FMI) to EMI.

Correlation Between Linguistic Barriers and AI Attitudes (RQ3)

Table 4 presents the correlation coefficients between students' attitudes towards AI tools and their reported linguistic difficulties in learning medical English vocabulary. The data disclose no statistically significant correlations between students' use of AI-based tools and their self-reported difficulties across all examined language skills, including writing, speaking, listening, reading, remembering, and learning medical vocabulary. The correlation coefficients remain weak and statistically non-significant ($p > 0.05$), suggesting that students' positive attitudes toward AI tools or the perceived usefulness of these tools do not directly reduce their linguistic barriers. For instance, the correlation between the "ability to improve vocabulary using AI" and "difficulty to write correctly" ($r = -0.065$) or "difficulty to speak fluently" ($r = 0.018$) are both weak and statistically non-significant, indicating that the perceived potential of AI tools to improve vocabulary does not translate into an observable reduction in writing and speaking challenges. Similarly, other correlations between AI use and difficulties with listening comprehension, reading medical vocabulary, or remembering terms (all with r-values close to 0) further support the lack of significant impact.

One possible explanation for the absence of significant correlations is the participants' current academic level. As second-year students, they are still adjusting to medical discourse in English while transitioning from a French-medium educational background. This dual challenge may hinder the immediate effectiveness of AI tools, as

students may still be exploring or inconsistently using these technologies, rather than employing them systematically to address their linguistic difficulties. Moreover, linguistic barriers in medical English are multifactorial, influenced by several variables, including prior proficiency in English, exposure to academic medical language, cognitive load, and teaching practices. These factors may have a stronger effect on students' language learning outcomes than attitudinal variables alone, especially during the early stages of medical education.

However, despite the lack of statistical significance, a few weak negative correlations were observed, suggesting that increased interaction with AI tools may be slightly associated with reduced linguistic difficulties. For example, the correlation between "interacting with AI tools" and "difficulty in understanding what they listen to" (r = -0.087) or "difficulty in remembering medical English" (r = -0.015) reveal a trend of decreasing difficulties as AI interaction increases. While these trends are not conclusive, they point to the potential of AI tools to mitigate linguistic barriers over time, particularly if these tools are integrated more effectively within a structured pedagogical framework.

Table 4. Correlational Statistics

		Ability to improve vocabulary using AI	AI-based game apps	Using flashcards	Interacting with AI tools	AI-bilingual dictionaries.	AI-based feedback
Difficulty to write correctly	*r*	-0.065	-0.016	0.064	0.055	0.133	-0.034
	Sig.	0.621	0.900	0.623	0.676	0.308	0.794
Difficulty to speak fluently	*r*	0.018	-0.133	-0.023	-0.020	0.076	0.097
	Sig.	0.891	0.308	0.858	0.880	0.558	0.455
Difficulty to understand what they listen to	*r*	-0.059	-0.026	-0.069	-0.087	-0.051	0.005
	Sig.	0.649	0.840	0.596	0.507	0.695	0.972
Difficulty to read medical English vocabulary	*r*	-0.076	-0.014	-0.074	0.000	0.036	0.006
	Sig.	0.559	0.915	0.570	0.997	0.786	0.963
Difficulty to remember medical English	*r*	0.082	0.070	-0.015	0.015	0.126	0.169
	Sig.	0.532	0.590	0.906	0.909	0.333	0.192
Difficulty to learn medical English	*r*	0.026	0.035	0.024	0.062	0.069	0.111
	Sig.	0.842	0.792	0.857	0.637	0.596	0.394

To address the increased risk of errors resulting from the 36 correlation tests performed in Table 4, a Bonferroni correction was applied. The alpha level for significance was adjusted to $p<0.0014$ (0.05/36). Additionally, effect sizes were interpreted using the coefficient of determination (r^2) to assess the practical significance of the relationships.

The data disclose no statistically significant correlations between students' perceptions of AI-based tools and their self-reported linguistic difficulties. After applying the Bonferroni adjustment ($p<0.0014$), all correlation coefficients remained non-significant. The observed effect sizes were negligible, with r^2 values ranging from 0.0001 to 0.028, suggesting that less than 3% of the variance in linguistic barriers could be explained by attitudes toward AI. While the absence of significant findings suggests a lack of a strong relationship, these results should be interpreted in the context of the study's statistical power; it is possible that the current sample size (N=70) was insufficient to detect very weak or subtle associations that might exist in a larger population.

5. Discussion

The findings of this study unveiled that while second-year medical students have a generally positive attitude towards using AI tools for learning medical English vocabulary, these tools do not significantly alleviate the linguistic barriers students face in acquiring and using medical English. This finding is consistent with Tayem et al. (2020), who found that while students appreciated the potential benefits of language support tools, their actual improvement in overcoming barriers, such as writing and speaking difficulties, remained modest. This suggests that the positive attitude towards AI tools observed in our study aligns with their findings, where students' perceptions do not necessarily correlate with improved linguistic competence.

The lack of significant correlations between the use of AI and the reduction of linguistic barriers in this study can be contrasted with Carlson et al. (2022), who examined how AI-based tools influenced students' language learning. While their study found that AI tools helped students improve specific language skills, it also stressed the need for structured integration within the curriculum for these tools to be effective. In a similar vein, the current study's findings indicate that AI tools may have some impact on students' language proficiency, but their effectiveness is contingent on how well these tools are incorporated into a well-rounded, consistent pedagogical approach. In the absence of such integration, AI's role in alleviating linguistic difficulties remains limited.

Moreover, Almushwat and Elkout (2024) pointed out that language barriers in EMI contexts, especially for students transitioning from a non-English-speaking background, remain a significant challenge despite students' positive attitudes towards English as the medium of instruction. This finding mirrors the current study's results, where medical students expressed a willingness to embrace AI tools but continued to struggle with core linguistic issues such as pronunciation, spelling, and vocabulary retention. While

students may recognise the utility of AI in language learning, as found by Hamad et al. (2025), the reality of overcoming language barriers in medical education requires more than positive attitudes; it necessitates systemic changes in how language support tools are integrated into medical curricula.

Interestingly, Hamad et al. (2025) highlighted the complex nature of language barriers in medical education, including the interplay between language proficiency, cognitive load, and the effectiveness of foreign language instruction. They found that language proficiency significantly influenced academic performance and patient communication skills. Similarly, in the present study, students' difficulties with medical English vocabulary, especially productive skills were more apparent. This suggests that while AI tools might help students passively engage with language input, they may not be sufficient to address the active language production demands that medical students face, which require greater linguistic proficiency.

In terms of AI tools' specific benefits, Almushwat & Elkout (2024) pointed out that students preferred bilingual dictionaries and other language support resources to aid their transition to English-medium instruction. This is mirrored by the current study's finding that AI-bilingual dictionaries were viewed positively by students, who regarded them as crucial aids in overcoming language barriers. The reliance on bilingual tools, however, should not be considered as a limitation, but rather as a potential bridge that facilitates lexical transfer and comprehension, especially in contexts like the transition from FMI to EMI.

While the lack of significant correlations between AI tool usage and linguistic improvement may suggest that the current interventions are not yet fully effective, several studies, including Tayem et al. (2020) and Carlson et al. (2022), recommend long-term and structured use of AI tools to foster deeper language learning. The findings of this study suggest that a more deliberate integration of AI tools into the medical curriculum, supported by ongoing training and guided use, could provide more substantial linguistic benefits over time.

In brief, this study contributes to the growing body of research on AI-assisted language learning in medical education, but it also underscores the importance of context and integration when using such tools. While students perceive the potential benefits of AI-based language support, their reported attitudes do not necessarily translate into a perceived reduction in core linguistic obstacles like writing and speaking. While students are open to AI tools, the impact on their linguistic barriers, particularly in productive skills, remains limited. Future research should explore the longitudinal effects of AI-based language interventions and consider integrating these tools into a more cohesive and structured curriculum that addresses the complex nature of language acquisition in medical contexts.

6. Implications

The undertaken study provides valuable theoretical and pedagogical insights into the use of AI tools for learning medical English vocabulary. Theoretically, it contributes to the fields of ESP and EMI/FMI research by unearthing that attitudinal variables alone may have limited explanatory power, especially among novice learners. The absence of significant correlations between students' attitudes towards AI and their reported linguistic difficulties brings to light the need for a more nuanced approach. Factors such as instructional design, learner training, and language proficiency should be considered as mediators of AI's effectiveness. Moreover, the study underscores the importance of contextualising AI integration within local educational realities, particularly in multilingual environments like Algeria, where the use of AI may need to be adapted to the linguistic and cultural context.

Pedagogically, the findings highlight that positive attitudes towards AI alone are not sufficient to overcome the linguistic barriers students tackle, particularly in EMI contexts where cross-linguistic interference from the native language remains significant. While students exhibit enthusiasm for AI tools, especially those offering visual support, interaction, and feedback, these tools should be viewed as supplementary rather than standalone solutions. The integration of AI tools needs to be strategically planned within the curriculum to ensure that they are used effectively and align with specific learning goals.

7. Recommendations

Based on the findings, several recommendations can be made for improving the effectiveness of AI tools in medical English instruction:

1. Integration within Task-Based Frameworks: Medical English instructors should incorporate AI tools into guided, task-based instructional frameworks. Students should be trained to use these tools strategically for vocabulary development, rather than using them in an unstructured or ad-hoc manner.

2. Alignment with Linguistic Objectives: Curriculum developers and syllabus designers should align AI-supported activities with specific linguistic objectives, particularly those targeting pronunciation, academic writing, and medical terminology retention. This ensures that AI tools are used to address the most pertinent linguistic barriers faced by students.

3. Longitudinal and Intervention-Based Research: Future research agenda should adopt longitudinal and intervention-based designs to examine the sustained impact of AI use on linguistic outcomes over time. This would help determine whether structured and consistent use of AI tools can lead to significant improvements in language proficiency.

4. Incorporating Objective Language Measures: In addition to self-reported data, future studies should incorporate objective language proficiency measures. This would provide a more comprehensive understanding of the true pedagogical impact of AI in

medical English learning, offering insights into both the cognitive and behavioural changes brought about by AI tools.

By addressing these recommendations, AI tools can be more effectively integrated into medical English courses, contributing to better language acquisition and helping students overcome linguistic barriers in the EMI context.

8. Conclusion

In conclusion, this study explored the linguistic barriers faced by second-year Algerian medical students in an EMI context and examined their attitudes towards the use of AI in learning medical English vocabulary. While students reported moderate difficulties with medical English, especially in productive skills like pronunciation and writing, they expressed positive attitudes towards AI tools, particularly those offering visual support and feedback. However, the lack of statistically significant correlations between students' attitudes towards AI and their linguistic difficulties suggests that while AI is viewed favourably, its impact on reducing language barriers is not immediate. The findings indicate that AI tools, though beneficial, require structured pedagogical integration and consistent use to effectively address the linguistic challenges in medical education, particularly in the early stages.

The results have significant implications for both teaching practices and theoretical frameworks. They highlight the need for a comprehensive approach that integrates AI tools within well-designed syllabus and developed curricula, ensuring that their use is purposeful and aligned with specific learning outcomes, such as improving pronunciation and writing skills. Furthermore, the study suggests that future research should explore the long-term effects of AI on language acquisition by adopting longitudinal and intervention-based designs, incorporating objective language proficiency measures alongside self-reported data to offer a more holistic view of AI's pedagogical impact.

Declaration of Generative AI Use

The authors, who possess advanced expertise in the English language, utilized Gemini's Model solely for the final-stage refinement of the manuscript. The application of this tool was strictly limited to identifying linguistic redundancies and enhancing stylistic cohesion. All intellectual content, data interpretation, and original drafting were performed exclusively by the authors, who maintain full accountability for the integrity of the final text.

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