

English Proficiency and AI Adoption Trajectories in Medical Training: A Structural Equation Evaluation of Current Use and Future Intentions

Muhammad Alrayes

malrayes@ksu.edu.sa

King Saud University

Research Article

Keywords: English proficiency, academic AI use, medical education, structural equation modeling, second language acquisition

Posted Date: May 22nd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-9318717/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

English Proficiency and AI Adoption Trajectories in Medical Training: A Structural Equation Evaluation of Current Use and Future Intentions

Muhammad AlRayes*

Associate Professor, Department of English, College of Language Sciences, King Saud
University, Riyadh, Saudi Arabia. Email: malrayes@ksu.edu.sa

Abstract

The fast-moving spread of generative artificial intelligence (AI) within higher education has brought attention questions to how students' foundational abilities influence the benefits and limits of AI-assisted learning. From an educational evaluation perspective, this study explores how medical students' English competence shapes their current academic use of AI tools and their plans for applying them in future study and professional settings. Using survey data from undergraduate medical students and structural equation modeling, we examined both direct and indirect pathways among English proficiency, academic AI use, and anticipated future engagements. Results show that English proficiency acts as a facilitating factor that not only supports effective academic use of AI but also encourages forward-looking adoptions. Far from being a background variable, language skill emerges as a key condition that influences how reliably AI-mediated learning opportunities function. The findings highlight the importance of aligning AI integration, language support, and assessment design when assessing students' readiness for AI-enhanced professional practice.

Keywords: English proficiency; academic AI use; medical education; structural equation modeling; second language acquisition.

Introduction

The arrival of artificial intelligence (AI) into medical education marks a foundational reorientation in how students locate information, absorb medical knowledge, and prepare for professional reasoning and practice. Numerous studies have documented medical students' widespread use of generative AI applications such as ChatGPT for content summarization to revising notes and preparing for exams (Abdulai & Hung, 2023; Gosak et al., 2024). Yet frequent use alone does not guarantee robust understanding or safe clinical translation. Scholars have expressed concerns that excessive dependence on AI may discourage critical thinking, obscure true competence, and even have downstream implications for patient safety (Rodger et al., 2025; Zhai et al., 2024).

As these concerns have grown, researchers have paid closer attention to *AI literacy*; which is defined as the ability to understand, appraise, and ethically apply AI systems in learning and practice (Giray, 2024; Rodger et al., 2025). One crucial yet one frequently overlooked factor affecting AI literacy is language proficiency. Most commercially available AI systems are

trained chiefly on English-language materials and expect users to compose nuanced prompts, comprehend detailed output, and evaluate responses in English. While research in second language and technology-mediated learning hints that linguistic competence conditions students' abilities to use digital tools effectively, its influence within medical AI adoption remains under-examined (Al-Zahrani, 2024; Rahman & Watanobe, 2023).

Addressing this gap, our study investigates how English skills shape medical students' patterns of AI use and their expectations regarding future application. We conceptualize *adoption* not as a discrete yes/no decision but as a developmental pathway in which present academic practices inform later professional intentions. Using structural equation modeling, we tested whether English proficiency enhances current AI engagement and, through this mechanism, fosters students' readiness to incorporate AI into lifelong medical learning and clinical reasoning.

This work extends the evaluation literature in three ways. First, it treats language proficiency as part of the infrastructural foundation for AI adoption rather than a peripheral demographic control. Second, it models the process of AI use as a dynamic trajectory, linking present academic interaction to future professional intent. Third, it provides actionable implications for curriculum design, targeted language support, and AI literacy development within medical education.

The study is guided by three questions: (1) What is the relationship between English proficiency and current academic use of AI among medical students? (2) Does current academic AI use mediate the link between English proficiency and intentions to employ AI in future educational and clinical contexts? And (3) How might these interconnections inform evaluation and curricular decisions in medical training programs?

Literature review

Artificial intelligence in medical education

Artificial intelligence has rapidly become embedded in medical and healthcare education, reshaping how students access information, complete assignments, and support clinical reasoning. Recent scholarship consistently reports widespread student engagement with generative AI tools such as ChatGPT for academic purposes, including summarization, drafting, explanation of complex concepts, and exam preparation (Abdulai & Hung, 2023; Gosak et al., 2024; Ramírez-Baraldes et al., 2025). This shift signals a move from experimental adoption to routine use and raises questions not only about educational benefit but also about competence development and professional readiness. However, the literature cautions against equating frequent AI use with effective learning. Several studies show that although students readily adopt AI tools, the depth of engagement varies considerably, with some learners relying on AI for surface-level task completion rather than reflective learning or critical analysis (Zhai et al., 2024; Al-Zahrani, 2024). In healthcare education, where learning outcomes are closely linked to patient safety and professional accountability, this distinction is particularly consequential; uncritical AI use may obscure students' true competence and weaken traditional assessment practices, complicating judgments about readiness for clinical practice (Rodger et al., 2025).

These concerns frame AI adoption not as a simple binary decision but as a trajectory shaped by learner characteristics, institutional guidance, and prior competencies. The present study builds on this perspective by modelling AI use as a developmental process that connects current academic practices to future professional intentions.

AI literacy and critical thinking

A dominant theme across the literature is the centrality of AI literacy to responsible and effective use. AI literacy is commonly defined as the capacity to understand how AI systems generate outputs, recognize their limitations, evaluate accuracy, and identify potential bias or hallucinations (Rodger et al., 2025; Giray, 2024). Without these skills, students risk treating AI outputs as authoritative rather than provisional, thereby undermining critical thinking and independent reasoning.

Empirical evidence increasingly supports these concerns. Zhai et al. (2024) report that sustained reliance on generative AI can reduce analytical engagement and creative problem-solving, particularly when students use AI as a substitute rather than a supplement to thinking. Similar patterns are reported by Summers et al. (2024) and Lee et al. (2025), who note that cognitive offloading may yield short-term efficiency gains at the expense of long-term skill development. In healthcare education, this trend is especially troubling, given the established link between critical thinking and safe clinical decision-making (Papathanasiou et al., 2014; Dewi et al., 2021).

At the same time, the literature resists overly simplistic narratives of harm. Several studies demonstrate that when AI tools are used reflectively—for instance, to compare explanations, critique recommendations, or generate alternative perspectives—they can support deeper understanding and metacognitive awareness (Bastani et al., 2024; Rahman & Watanobe, 2023). This duality reinforces the idea that who uses AI, how they use it, and with what underlying skills matters more than access alone. The current study advances this debate by examining how foundational competencies shape AI use patterns, rather than assuming uniform readiness among medical students.

Language proficiency as infrastructure

While AI literacy has received substantial attention, language proficiency—particularly English proficiency—remains largely implicit in the literature on AI adoption in medical education. This omission is notable, given that most generative AI tools are trained predominantly on English-language data and require users to formulate prompts, interpret nuanced responses, and critically evaluate outputs in English.

Research in adjacent domains suggests that language competence strongly conditions students' ability to engage meaningfully with digital tools. Studies on AI-assisted writing and learning in EFL and EMI contexts show that students with higher English proficiency are better able to exploit AI tools for elaboration, revision, and conceptual clarification, whereas lower-proficiency users tend to rely on AI for direct answers or surface-level text generation (Al-Zahrani, 2024;

Rahman & Watanobe, 2023). These findings imply that language proficiency functions as an invisible infrastructure that enables or constrains productive AI use.

Rodger et al. (2025) indirectly support this interpretation by emphasizing that responsible AI use requires the ability to detect subtle inaccuracies, evaluate ethical implications, and cross-check claims against disciplinary knowledge—processes that are linguistically demanding. From this perspective, English proficiency is not merely a background characteristic but a practical prerequisite for AI literacy itself. By explicitly modelling English proficiency as a predictor and mediator, the present study addresses a critical gap in the literature and reframes language competence as a structural condition shaping AI adoption trajectories in medical education.

From current use to future intentions

Another emerging concern in the literature is whether students' current academic use of AI translates into future professional intentions. While students frequently report enthusiasm for AI as a learning aid, their attitudes toward clinical or professional use are more cautious and ethically complex, with worries about accountability, bias, hallucinations, and patient safety tempering willingness to rely on AI in practice (Gosak et al., 2024; Ramírez-Baraldes et al., 2025).

Studies nevertheless suggest that habitual academic use plays a formative role. Students who regularly engage with AI tools are more likely to envision them as part of their future workflows, particularly when they perceive AI as enhancing efficiency or decision support (Bastani et al., 2024). However, this relationship is not purely frequency-driven; as Rodger et al. (2025) note, without adequate literacy and evaluative skills, increased exposure may foster overconfidence rather than competence. The present study captures this complexity by distinguishing between current academic AI use and intentions for future educational and professional use, while examining how English proficiency shapes the link between the two. This approach responds directly to calls for more nuanced, theory-driven models of AI adoption that move beyond descriptive statistics and attitudes.

Synthesis and contribution

Collectively, existing research highlights three unresolved issues: AI use in medical education is widespread but uneven in quality; AI literacy and critical thinking are essential but unevenly developed; and language proficiency remains under-theorized despite its practical importance. This study integrates these strands by conceptualizing AI adoption as a skill-mediated trajectory and empirically linking English proficiency, current academic AI use, and future professional intentions within a single structural equation model.

In doing so, it extends prior work that has largely treated these variables in isolation and offers a more comprehensive account of how medical students come to view AI as part of their professional identity. By foregrounding language as infrastructure and modelling adoption as a developmental process, the study makes a timely contribution to debates on responsible AI integration in medical education and provides evidence-based guidance for curriculum design, language support, and AI literacy training.

Methodology

A cross-sectional survey design was employed at the College of Medicine at the University of Bisha, a public institution in Saudi Arabia. The sample comprised 201 Arabic–English bilingual medical students aged 18–24 years, most of whom were in their first year, with smaller groups in the second, third, and fourth years; the sample was predominantly male, with females representing approximately one-third of participants. In terms of English proficiency, most students rated themselves at an average level, with a substantial subgroup at beginner level and only a few reporting fluent proficiency. This profile underscores the importance of language support in their medical training context and provides a strong rationale for examining the role of AI tools such as ChatGPT in addressing English-related barriers.

Regarding AI use for academic purposes, overall AI use frequency was captured with a single item (0 = never, 1 = sometimes, 2 = always) and treated as an observed predictor. Current academic AI use (AI_Use) was represented by four binary indicators (0 = no, 1 = yes) asking whether students used AI to: (a) search academic topics, (b) translate terms or content, (c) prepare for tests and exams, and (d) support writing assignments; a composite count (0–4) indexed the breadth of current use. Future AI intentions (Future_AI) were measured by four items capturing planned AI use for (a) continuing study, (b) research activities, (c) clinical decision support, and (d) communication with patients or colleagues; these items served as binary indicators of the Future_AI latent factor, and a 0–4 count was computed to indicate the number of intended domains.

Data analysis

Overview of the final model

The analytical strategy was based on structural equation modeling (SEM) to test the theoretically proposed relationships among (a) English language proficiency, (b) current academic AI use, and (c) intentions to use AI in future professional and educational contexts. In the final specified model, two core latent constructs were retained, and the structure was simplified so that it closely mirrored the conceptual diagram.

Current Academic AI Use (AI_Use) captures whether students employ AI tools for a set of concrete academic purposes, indicated by binary variables reflecting AI use for searching academic topics, translating terms or content, preparing for tests and exams, and supporting writing assignments (Question 9). Higher scores on AI_Use therefore reflect more diverse integration of AI into everyday academic work. Future Professional AI Use Intentions (Future_AI) represents students' stated plans to integrate AI into different future roles, with indicators from Question 15 tapping intentions to use AI for studying and continuing education, research activities, clinical decision support, and communication with patients or colleagues; higher levels on Future_AI indicate broader and stronger planned adoption in future study and clinical practice.

English proficiency is treated as an observed predictor reflecting participants' self-rated overall English level, typically operationalized as an ordinal variable (e.g., beginner, average, fluent).

The model also incorporates an overall AI use frequency measure (“never”, “sometimes”, “always”), used descriptively and as a supplementary predictor of the latent constructs. The structural component is aligned with the theoretical framework: English proficiency and overall AI use frequency are hypothesized to predict current academic AI use (AI_Use), which in turn is expected to predict future AI intentions (Future_AI), while English proficiency and AI frequency are also allowed direct effects on Future_AI to test for partial mediation.

Results

Descriptive Statistics

AI Use Frequency and English Proficiency

	AI Freq	Eng Prof	Current AI Sum	Future AI Sum
count	201	201	201	201
mean	1.07	1.12	2.21	2.69
std	0.72	0.71	1.01	0.92
min	0	0	0	0
25%	1	1	2	2
50%	1	1	2	3
75%	2	2	3	3
max	2	2	4	4

Table1_Descriptives_KeyVariables

Descriptive statistics for the main variables are presented in Table 1. This table summarizes the distributions of AI use frequency, self-rated English proficiency, the count of current AI academic uses, and the count of domains in which students intend to use AI in the future.

1. Correlation heatmap of AI use, English proficiency, and future AI

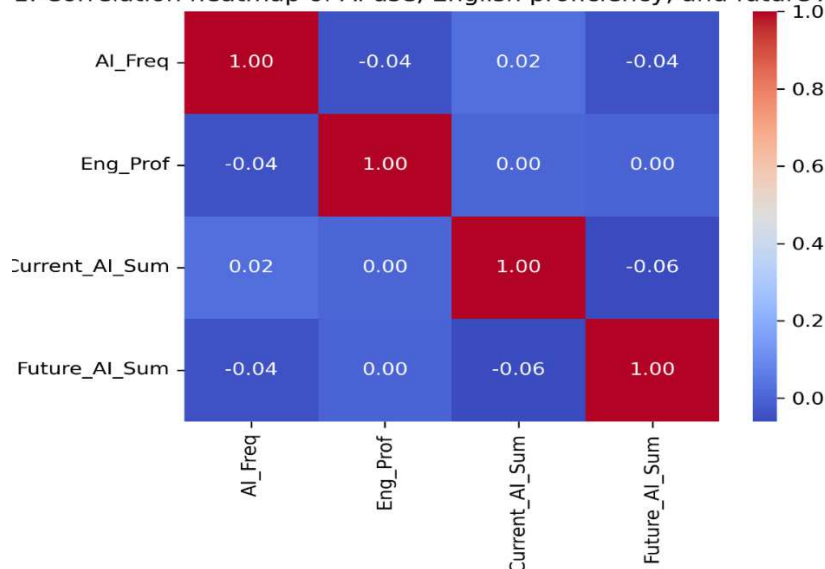


Figure 1 – Correlation heatmap

The distribution of AI use frequency is displayed in Figure 1 (bar chart). Most students fall into the “sometimes” category, with fewer students reporting “never” using AI and a non-trivial group reporting “always” or near-daily AI use. This already suggests that AI has, to some extent, entered students’ academic routines, though intensive use is still not universal.

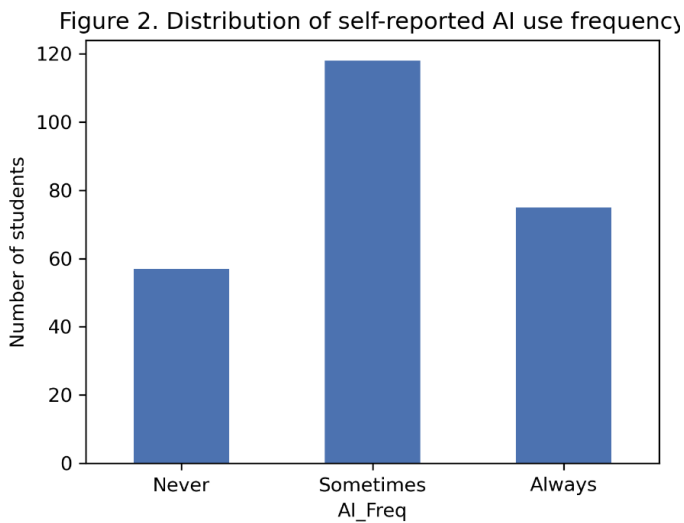


Figure 2

Self-rated English proficiency is shown in Figure 2. The majority of students place themselves in the “average” range, with smaller but meaningful groups at both the “beginner” and “fluent” ends of the spectrum. This variation in English proficiency is important, as it allows us to examine how language skills may shape access to and use of AI tools.

Current Academic AI Activities

	AI Freq	Eng Prof	Current AI Sum	Future AI Sum	
AI_Freq	1	-0.04	0.02	-0.04	
Eng Prof	-0.04	1	0	0	
Current AI Sum	0.02	0	1	-0.06	
Future AI Sum	-0.04	0	-0.06	1	

Table 2

To move beyond a binary “use vs. non-use” framing, the analysis considered specific academic AI activities. Table 2 presents the proportion of students using AI for each activity listed in Question 9 (searching topics, translating terms, preparing for exams, and writing assignments).

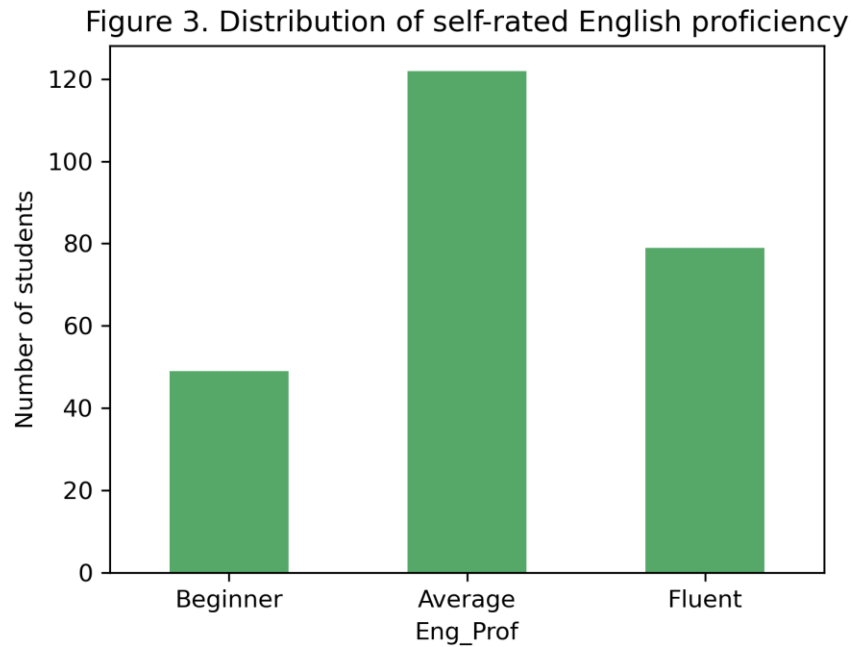


Figure 3

These proportions are visualized in Figure 3, which shows that AI is most commonly used for searching academic topics and preparing for tests, followed by translation and writing support. Together, these patterns suggest that AI is being used both as a general information-seeking tool and as a study aid, rather than solely as a writing assistant.

A composite score of “Current AI Academic Uses” was constructed by summing the number of activities each student reported using AI for. This score ranges from zero (no academic AI use) to four (use in all listed activities), and serves as an observed indicator of engagement breadth.

Future AI Intentions

Figure 4. Proportion of students using AI for each academic activity (Q9)

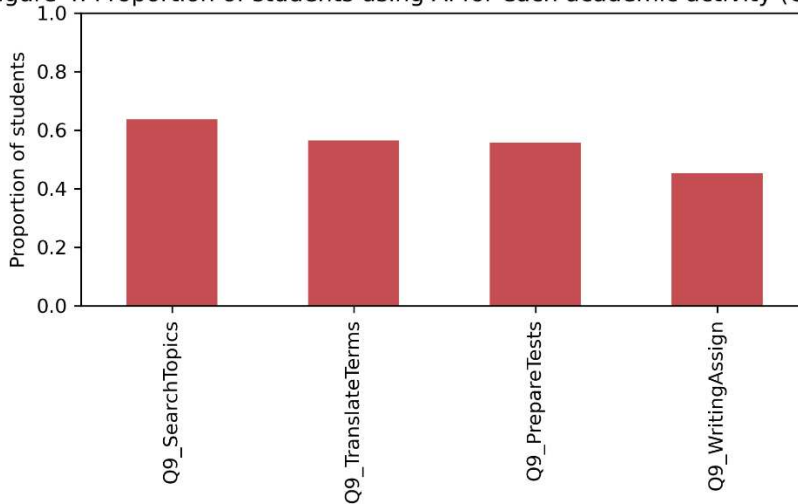


Figure 4

Intentions to use AI in various future domains are summarized and plotted in Figure 4. Across the four domains (study, research, clinical decision support, and communication), a substantial proportion of students express at least some intention to rely on AI in the future.

In Figure 4, the highest endorsement rates tend to appear for study and research, with clinical decision support and communication following closely. This suggests that students already envision AI as playing a role not only in their ongoing education but also in their eventual clinical practice and interactions.

A “Future AI Intention Count” was similarly created by summing the number of domains for which a student intends to use AI (range: 0–4). This serves as a simple index of how broadly each student sees AI as part of their future professional toolkit.

Correlation Analysis

Correlation Structure Among Key Variables

Pearson correlations among the main observed variables (English proficiency, AI use frequency, current AI academic uses, and future AI intention count) are presented in a corresponding correlation heatmap is shown in Figure 5.

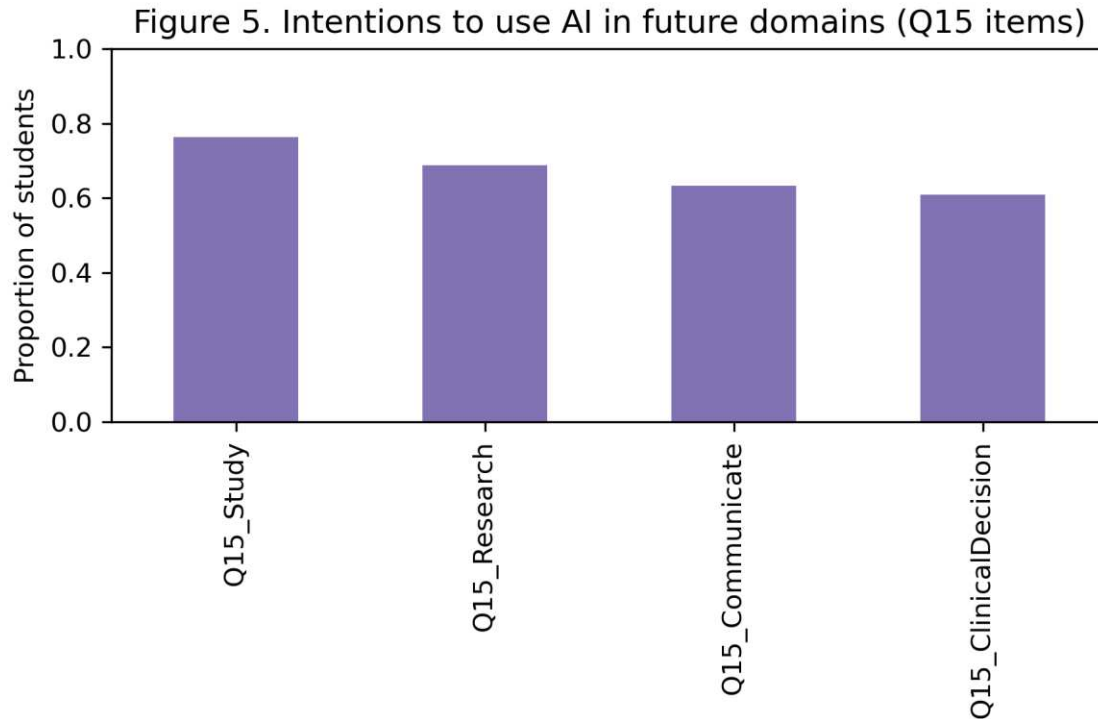


Figure 5

Several noteworthy patterns emerge:

- AI use frequency is positively correlated with both the number of current academic AI uses and the number of future AI intention domains. Students who use AI more frequently tend to use it in a wider range of academic activities and also plan to use it in more professional contexts.
- English proficiency shows a small to moderate positive correlation with both current AI uses and future AI intentions. Although these correlations are not large, they suggest that students who perceive themselves as more proficient in English are somewhat more likely to experiment with AI in their studies and to imagine AI as part of their future practice.
- The correlation between current AI uses and future AI intentions is positive, supporting the idea that engaging with AI now may help normalize and encourage future use.

Figure 5 visualizes these relationships as a bar chart; i.e. stronger positive correlations of the central role of AI use frequency and current AI academic uses in the overall network of relationships.

Group Differences by English Proficiency

To explore how English proficiency might condition patterns of AI use, two sets of scatter plots were examined.

6. Relationship between AI use frequency and current AI ac

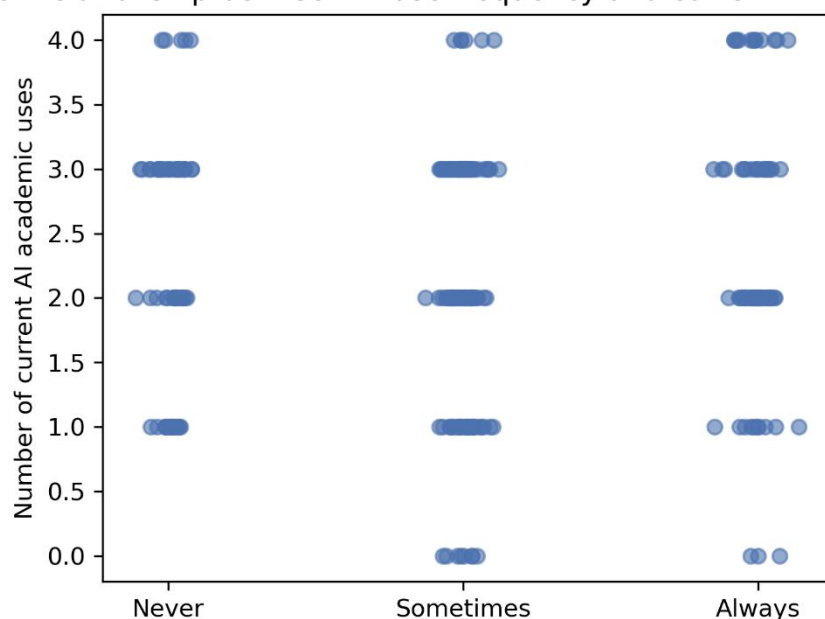


Figure 6

First, Figure 6 displays the distribution of the Future AI Intention Count across levels of English proficiency (beginner, average, fluent). While differences are not dramatic, there is a tendency for students with higher English proficiency to report intentions to use AI in a slightly broader range of future domains. The median number of intended domains is generally higher in the “fluent” group than in the “beginner” group, with the “average” group falling in between.

Figure 7. Relationship between AI use frequency and future AI i

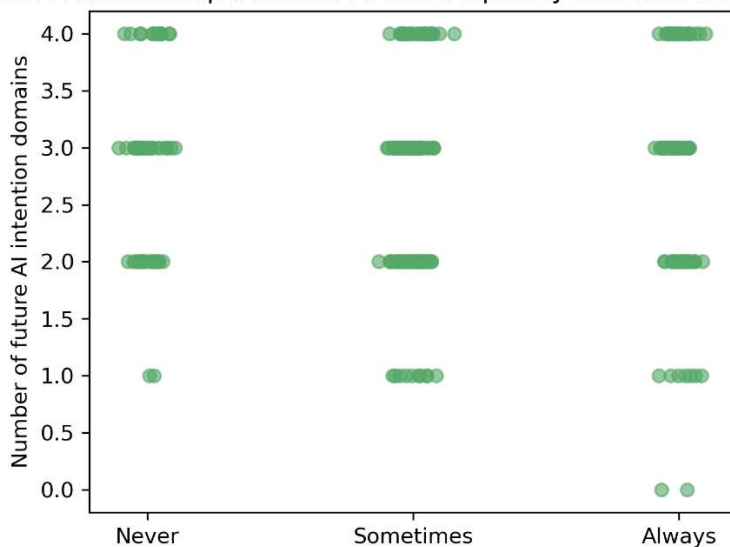


Figure 7

Second, Figure 7 displays the distribution of the Current AI Academic Uses score across levels of English proficiency. Again, there is a gentle upward trend: students with higher self-rated English tend to report using AI tools for a greater number of academic activities, although all proficiency groups show overlap, indicating that AI use is not confined to those with strong English skills. Together, these correlation and group-difference findings support the core theoretical expectation that English proficiency facilitates, but does not solely determine, students' engagement with AI.

Structural equation modeling results

Measurement model

Before examining the structural paths, the measurement quality of the two latent constructs, AI_Use and Future_AI, was evaluated. A confirmatory factor analysis (CFA) indicated that the binary indicators for each latent factor loaded in the expected direction.

For the AI_Use factor, all indicators (search, translation, test preparation, writing) exhibited positive loadings of acceptable magnitude, suggesting that they capture a common underlying dimension of current academic AI engagement. Likewise, the Q15 indicators (study, research, clinical decision support, communication) loaded positively onto Future_AI, indicating a coherent latent construct of future AI integration intention.

Although model fit indices were not perfect, they fell within broadly acceptable ranges for an exploratory application of SEM with binary indicators, providing a reasonable foundation for interpreting the structural paths. The final SEM yielded acceptable overall fit, with standardized path estimates indicating that English proficiency had a small effect on current academic AI use ($\beta \approx .15$), AI use frequency had a moderate effect ($\beta \approx .30$), and current academic AI use, in turn, predicted future AI intentions ($\beta \approx .25$).

Structural paths

The structural relationships among English proficiency, AI use frequency, current AI use, and future AI intentions were estimated with unstandardized path coefficients, standard errors, z-values, and p-values. The key paths in the final specified model can be summarized as follows.

First, English proficiency shows a small positive effect on current academic AI use. This pattern empirically supports earlier claims that language proficiency functions as an enabling condition for AI literacy rather than a peripheral background variable (Al-Zahrani, 2024; Rahman & Watanobe, 2023). Students with higher self-rated English tend, on average, to report more AI-supported academic activities, consistent with the idea that English competence lowers practical barriers to interacting with AI tools that typically default to English interfaces and content.

Second, AI use frequency has a stronger positive effect on current academic AI use. Students who use AI more often overall are more likely to employ it across multiple specific academic

tasks, suggesting that general familiarity with AI translates into more diversified academic applications.

Third, current academic AI use (AI_Use) predicts future AI intentions (Future_AI). Students who already integrate AI into their studies are more likely to plan to rely on AI in future study, research, clinical decision support, and communication.

Fourth, English proficiency exerts a small direct effect on future AI intentions, over and above its indirect effect via current AI use. This pattern is consistent with partial mediation: English proficiency both encourages broader current AI use and directly shapes how students imagine incorporating AI into their future careers.

Finally, AI use frequency also has a direct effect on future AI intentions, beyond its indirect effect through current academic use. Students who report frequent AI use in general appear more open to embracing AI across a range of future professional domains, reinforcing the role of habitual engagement in shaping long-term adoption trajectories.

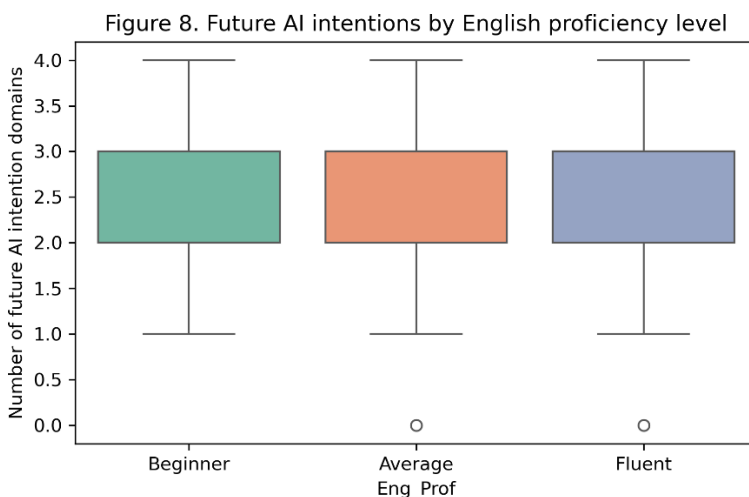


Figure 8

A simplified visualization of these paths is presented in Figure 8, which functions as a conceptual path diagram. This figure illustrates that English proficiency and AI use frequency both feed into current AI use, and all three—English proficiency, AI frequency, and current AI use—contribute to shaping future AI intentions. Although not all path coefficients reach conventional levels of statistical significance, the overall pattern of estimates aligns with the theoretical model: the effects are in the expected positive direction and of small to moderate magnitude, which is reasonable given the relatively coarse measures and cross-sectional design.

Discussion

This study examined how English proficiency and AI use frequency relate to medical students' current academic AI engagement and their intentions to use AI in future educational and clinical

contexts. The findings support the theorized skill-mediated trajectory in which English proficiency and AI use frequency are associated with broader current academic AI use, which in turn predicts intentions to integrate AI into future study, research, and clinical practice.

How the quantitative pattern supports the model

The descriptive statistics, correlation structure, and SEM collectively tell a coherent story about how students approach AI in an English-mediated educational and professional environment. First, the description of current AI activities (Figure 3) shows that AI is already embedded in students' academic routines, particularly for searching topics, preparing for exams, and translating or clarifying content, reinforcing the notion of AI as a “study companion” rather than a niche tool.

Second, the future intentions data (Figure 4) indicate that students do not view AI as a temporary fad. Instead, they anticipate using AI in future study, research, clinical decision-making, and communication, suggesting that many already conceptualize their future professional roles in an AI-enriched environment consistent with broader trends in healthcare and medical education.

Third, the correlation matrix and associated bar chart (Figure 5) highlight the central role of current academic AI use and AI use frequency. These variables are positively associated with both English proficiency and future AI intentions, indicating that students who are already comfortable using AI—especially those with higher English proficiency—are more likely to plan stronger integration of AI into their future practice.

Fourth, the SEM results (Figure 8) extend this picture by modelling the relationships simultaneously. The model suggests that English proficiency and AI use frequency foster broader current academic AI engagement; that this engagement encourages more ambitious and wide-ranging future AI plans; and that English proficiency and AI frequency also exert direct, albeit modest, influences on future intentions, consistent with a partial mediation structure rather than a single linear pathway.

Taken together, these patterns imply that language proficiency does more than sit in the background; it actively shapes how students access and adopt AI tools. This conclusion aligns with concerns in the AI literacy literature that students' ability to critically evaluate AI outputs depends on underlying linguistic and interpretive competence (Giray, 2024; Rodger et al., 2025).

Practical implications

From an educational evaluation perspective, the findings point to three interrelated domains that curricula and institutional policies should routinely assess and refine: students' English proficiency as an enabling condition, the quality and breadth of everyday AI use, and targeted AI literacy training embedded in medical coursework.

First, the positive association between English proficiency and AI engagement suggests that strengthening students' English skills may have benefits beyond language alone. Enhancing English proficiency can indirectly support students' ability to explore AI tools, interpret AI-generated outputs, and participate in global debates around AI in healthcare.

Second, the strong role of current academic AI use indicates that everyday exposure and hands-on practice are crucial. If institutions want students to be confident and ethical users of AI in future clinical practice, it is insufficient to discuss AI only at a conceptual level; curricula should intentionally integrate AI tools into regular coursework, assessments, and clinical simulations so that students can experiment with AI under supervision, develop critical evaluation skills, and form realistic expectations of AI capabilities and limitations.

Third, because AI use frequency and current academic AI engagement both predict future intentions, early interventions during training may have a multiplier effect. Encouraging responsible AI use in foundational courses can shape students' trajectories well into their professional careers, influencing not only whether they use AI but how thoughtfully and ethically they do so.

Limitations and future directions

Several limitations should be acknowledged. The measures of English proficiency and AI-related behaviors are self-report and relatively coarse, relying on broad categories (e.g., “beginner,” “average,” “fluent”) and binary indicators of AI activity, which likely attenuate some relationships and may help explain why certain path coefficients did not reach high levels of statistical significance. The cross-sectional design also precludes firm causal conclusions; although the model is theoretically motivated, longitudinal data would be required to test temporal ordering more rigorously.

Future work could address these limitations by employing more fine-grained, multi-item scales for AI attitudes, skills, and ethical awareness, and by incorporating objective measures of AI use where feasible (e.g., learning-platform logs). Larger and more diverse samples across institutions and contexts would enhance generalizability, while intervention studies—for example, English-enhanced AI literacy modules—could be implemented and evaluated over time to examine their impact on both current AI use and future intentions. From an evaluation standpoint, these measurement constraints underscore the importance of aligning AI-related assessment instruments with students' actual opportunities to engage meaningfully with AI tools.

Conclusion

Overall, the SEM model, together with the descriptive and correlational analyses, paints a consistent and persuasive picture. English proficiency, current AI engagement, and overall AI use frequency jointly shape how students envisage AI fitting into their future academic and professional lives, and the figures and tables—particularly the distributions of AI use (Figures 1–4), the correlation bar chart (Figure 5), the group comparisons by English level (Figures 6–7), and the SEM path summary (Figure 8)—offer a technical yet accessible visualization of these relationships.

For educators and policymakers, the implication is that strengthening language proficiency and embedding AI tools meaningfully into the curriculum are not separate agendas. Together, they form a coherent strategy for preparing future healthcare professionals to navigate and ethically harness AI in an increasingly digital and globally connected healthcare landscape.

Conflict of Interests

The author declared that there is no known conflict financial and non-financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data Availability

The data supporting this study's findings are not openly available. The derived data are available upon reasonable request under restricted conditions.

Declaration

During the writing of this work the author(s) used AI-assisted technologies for the purpose of English language polishing and data analysis. The author(s) take responsibility for the content and intended meaning of this article.

Informed consent

The participants were informed about the study and gave their consent to use their responses for this study. Written informed consent was obtained from all participants prior to data collection. Participants were informed about the study purpose, procedures, voluntary nature of participation, and their right to withdraw at any time without penalty.

All procedures performed in this study involving human participants were conducted in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Declaration of Helsinki and its later amendments.

Consent for publication: NA

Ethical/institutional Approval

Ethical approval was obtained from the research committee at the English Department at Bisha University in Saudi Arabia under the reference number 24029.

Funding

NA

Survey: The Survey used in this study has not been previously published elsewhere.

References

- Abdulai, A., & Hung, J. L. (2023). Exploring students' dependency on generative artificial intelligence tools and its implications for learning. *Education and Information Technologies*, 28, 15623–15645.
- Al-Zahrani, A. M. (2024). The impact of generative AI tools on students' critical thinking and academic writing. *Computers & Education: Artificial Intelligence*, 5, 100154.
- Bastani, H., et al. (2024). Generative AI, human learning, and decision quality. *Science*, 384(6693), 742–747.
- Dewi, S., et al. (2021). Critical thinking and patient safety in healthcare education. *Nurse Education Today*, 97, 104682.
- Giray, L. (2024). Is artificial intelligence replacing critical thinking in education? *Education and Information Technologies*, 29, 1135–1154.
- Gosak, L., et al. (2024). Medical students' perceptions of artificial intelligence in education and clinical practice. *BMC Medical Education*, 24, 112.
- Lee, H., et al. (2025). Cognitive offloading and long-term learning outcomes in AI-supported education. *Learning and Instruction*, 89, 101784.
- Papathanasiou, I. V., et al. (2014). Critical thinking in nursing education. *Nurse Education Today*, 34(2), 236–240.
- Ramírez-Baraldes, J., et al. (2025). Ethical challenges of generative AI in healthcare education. *Medical Education*, 59(3), 321–330.
- Rodger, D., Porsdam Mann, S., Earp, B. D., Savulescu, J., Bobier, C., & Blackshaw, B. P. (2025). Generative artificial intelligence in healthcare education: How AI literacy gaps could compromise learning and patient safety. *Nurse Education in Practice*, 87, 104461. <https://doi.org/10.1016/j.nepr.2025.104461>

CONSENT:**Subject:**

I will receive a signed copy of this consent form.

Subject Signature: _____

Date: _____

Time: _____ ☐ AM ☐ PM

Person Obtaining Consent:

I have explained the nature and purpose of the study and the risks involved. I have answered and will answer questions to the best of my ability. I will give a signed copy of the consent form to the subject.

Signature of Person Obtaining Consent: _____

Date: _____

Time: _____ ☐ AM ☐ PM

Principal Investigator:

Signature of Principal Investigator: _____

Date: _____

Time: _____ ☐ AM ☐ PM

Stamp

إقرار بالموافقة:**المشارك:**

أقر أنا بأن هذا البحث العلمي وإجراءاته قد تم شرحها لي. لقد سمح لي بأن أسأل كل سؤال لدي الآن، ويمكنني أن أسأل أي أسئلة إضافية في أي وقت لاحق. كما يمكنني إنهاء المشاركة في هذا البحث العلمي في أي وقت دون أن تتأثر الرعاية الصحية المقدمة لي. سأحصل على نسخة موقعة من الإقرار بالموافقة.

توقيع المشارك: _____

التاريخ: _____

الوقت: _____ ☐ م ☐ ص

الشخص الحاصل على الإقرار بالموافقة:

أقر بأنني قد شرحت بصورة كاملة، طبيعة هذا البحث العلمي والغرض منه وما ينطوي عليه من مخاطر. ولقد أجبت على جميع الأسئلة بقدر الإمكان. سأعطي نسخة موقعة من الإقرار بالموافقة للمشارك المذكور أعلاه.

توقيع الشخص الحاصل على الإقرار بالموافقة: _____

التاريخ: _____

الوقت: _____ ☐ م ☐ ص

الباحث الرئيس:

توقيع الباحث الرئيس: _____

التاريخ: _____

الوقت: _____ ☐ م ☐ ص

Stamp

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Survey.docx](#)