

INTEGRATING AI IN ENGLISH-MEDIUM INSTRUCTION: AN EXPLORATORY STUDY OF TEACHER PERCEPTIONS AND CHALLENGES IN ALGERIAN HIGHER EDUCATION

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Abstract: This study examines the integration of artificial intelligence (AI) tools in English-Medium Instruction (EMI) classrooms in Algerian higher education, drawing on the Technology Acceptance Model (TAM) and the Technological Pedagogical Content Knowledge (TPACK) framework to explore instructors' adoption, perceptions, and institutional readiness for AI-enhanced teaching. A mixed-method questionnaire was distributed via Google Forms to fifteen purposively selected EMI instructors from different Algerian public universities representing multiple disciplines, including physics, civil engineering, Sharia and law, hygiene and safety, and biology. The questionnaire comprised four sections covering demographic information, AI tool usage and educational objectives, challenges and perceptions, and institutional support requirements, incorporating both closed-ended and open-ended items to provide both quantitative and qualitative insights into current practices. Findings indicate that 53.3% of participants have incorporated AI tools into their teaching practices, primarily for lesson planning, material development, and course preparation, reflecting a growing interest in AI-supported pedagogical practices in EMI settings. Among the different categories of AI tools, Natural Language Processing tools showed universal adoption among AI users, highlighting their practical value in language-related academic tasks particularly in multilingual and disciplinary teaching contexts. Key challenges impeding effective integration include uncertainty about tool reliability, limited preparedness in prompt-engineering, unequal student access to technology, and difficulties with plagiarism detection. Regarding institutional readiness, only 27% of participants reported receiving adequate ethical guidance from their institutions. These findings suggest that sustainable AI integration in EMI requires comprehensive professional development programs, clear ethical guidelines, and stronger institutional support to ensure effective and responsible implementation across diverse Algerian higher education contexts and learning environments.

Keywords: Artificial intelligence tools; English-Medium Instruction; teacher perception; Technology Acceptance Model; Algerian higher education.

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1. Introduction

The rapid advancement of technology, particularly in AI, has revolutionized numerous fields, and education is no exception. In parallel, the global shift toward English-Medium Instruction (EMI) -where English is used to teach academic subjects in non-English speaking countries- has gained attention as universities seek to internationalize and enhance students' competitiveness in the global job market (Macaro et al., 2018). Algeria, like many other countries, has become increasingly interested in implementing EMI in higher education as part of educational reforms aimed at modernization and global integration.

In this context, AI tools such as ChatGPT, Grammarly, and AI- powered language translation systems offer new opportunities for EMI as they are increasingly being adopted to enhance teaching and learning (Zawacki-Richter et al., 2019). These technologies have significant benefits, including automated feedback, personalized learning experiences, and effective lesson planning (Hwang et al., 2020). However, their implementation also raises some concerns about academic integrity, limited teacher training, and the potential erosion of teacher autonomy (Cotton et al., 2024). These challenges can be further aggravated in countries such as Algeria, where universities are actively promoting and implementing EMI programs but lack the infrastructure and training to support educators in integrating AI effectively. In this case, instructors face a dual issue: mastering specialized content in English while simultaneously learning how to use evolving AI tools with minimal institutional guidance. This necessitates an urgent need for research that examines how AI is being adopted in EMI settings, the challenges educators face, and the support needed to ensure successful implementation

This study investigates the current use of AI tools among EMI instructors in Algerian universities, identifying the challenges educators encounter when integrating AI into their teaching practices, assessing institutional readiness and support mechanisms for AI adoption in EMI contexts, and proposing practical strategies for effective AI integration in EMI settings. Based on these objectives, this research attempts to answer the following questions:

2. To what extent are generative AI tools such as ChatGPT, Grammarly, and machine translation applications utilized by EMI instructors at Algerian universities?
3. What are the major obstacles that hinder effective AI integration in EMI teaching practices, including technical, pedagogical, and institutional barriers?
4. To what extent do EMI educators believe AI enhances or hinders course delivery, student engagement, and instructional quality?
5. What institutional support mechanisms — including training, ethical guidelines, and infrastructure — are needed to optimize AI use in EMI contexts?

2. Review of Literature

1.1 Theoretical Framework: Technology Acceptance in Educational Contexts

This study draws on the Technology Acceptance Model (TAM) (Davis, 1989) and the Technological Pedagogical Content Knowledge (TPACK) framework (Koehler & Mishra, 2009) to examine AI integration in EMI contexts. TAM posits that perceived usefulness and ease of use are critical determinants of technology adoption, while TPACK emphasizes that effective technology integration requires the intersection of technological knowledge, pedagogical expertise, and content mastery. In EMI settings, where instructors must navigate both linguistic and disciplinary demands, the TPACK framework is particularly relevant as it highlights the complex competencies required for successful technology-enhanced teaching (Shoukat et al., 2024). While TAM explains instructors' willingness to adopt AI tools, TPACK provides insight into how these tools can be pedagogically integrated into EMI classrooms. Together, the two frameworks offer a comprehensive lens for understanding both

technology acceptance and instructional implementation in EMI contexts. These frameworks guide our investigation into how EMI instructors perceive, adopt, and implement AI tools within their teaching practices.

1.2 Artificial Intelligence in Higher Education: Opportunities and Challenges

Artificial intelligence has increasingly permeated educational contexts, with tools ranging from generative language models (e.g., ChatGPT, Claude) to writing assistants (e.g., Grammarly) and machine translation systems (e.g., DeepL, Google Translate). Research demonstrates that AI offers significant pedagogical affordances, including personalized learning pathways (Luckin, 2018), automated formative feedback (Hwang et al., 2020), and enhanced student engagement (Peláez-Sánchez et al., 2024). AI-powered adaptive learning systems can analyse student performance data to tailor content delivery, potentially addressing diverse learning needs more effectively than traditional one-size-fits-all approaches (Zawacki-Richter et al., 2019). Despite these advantages, the literature does not present AI integration as universally positive.

While many studies emphasize the pedagogical benefits of AI, others raise ethical, pedagogical, and practical concerns regarding its integration into higher education. Critics highlight concerns about academic integrity and plagiarism (Cotton et al., 2024), the potential deskilling of educators as AI automates traditional teaching function and the perpetuation of algorithmic bias that may disadvantage marginalized student populations (Baker & Hawn, 2022). Furthermore, the rapid evolution of AI tools creates a "moving target" problem for educators, who must continuously update their technological skills while maintaining pedagogical quality. These contradictions underscore the need for context-specific research examining how AI is actually being used in diverse educational settings.

1.3 English-Medium Instruction: Linguistic and Pedagogical Complexities

English-Medium Instruction (EMI), defined as the use of English to teach academic content in contexts where English is not the dominant societal language (Macaro et al., 2018), has expanded rapidly in higher education worldwide as institutions pursue internationalization agendas. However, EMI implementation presents substantial challenges for both instructors and students. Research indicates that teaching through a non-native language increases cognitive load (Roussel et al., 2017), may compromise content depth (Dafouz & Smit, 2020), and creates linguistic barriers that disadvantage students with lower English proficiency (Rose et al., 2020).

EMI instructors face a "triple burden" of mastering disciplinary content, developing pedagogical expertise, and acquiring sufficient English proficiency to deliver comprehensible instruction (Vu & Burns, 2014). Studies in various contexts reveal that many EMI teachers lack formal training in language-aware pedagogy and struggle to scaffold linguistic complexity while maintaining academic rigor (Macaro et al., 2018). The linguistic demands of EMI create particular challenges in reading, writing, and academic discourse, areas where AI tools may offer targeted support. Nevertheless, existing EMI research has focused on linguistic and pedagogical challenges without sufficiently examining how emerging AI technologies may help instructors address these difficulties in practice.

1.4 The AI-EMI Nexus: Emerging Research

The intersection of AI and EMI remains relatively underexplored in educational research. Preliminary studies suggest that AI language tools can assist EMI instructors in several ways: it can support language teaching, enhance content development, and facilitate assessment processes (Bannister et al., 2023). Dabingaya (2022) found that AI-powered language tools enhanced student engagement and reduced anxiety in science courses, while Kikuchi reported improvements in both language comprehension and students' engagement when AI tools were systematically integrated into EMI curricula. These findings suggest that

AI tools may enhance both linguistic accessibility and classroom engagement in EMI settings. However, the literature also indicates that the integration of AI in EMI contexts remains uneven and context-dependent.

Research also reveals implementation challenges. Macaro et al.(2018) identified significant variation in teachers' AI literacy and willingness to adopt these tools, with resistance stemming from concerns about additional workload, loss of pedagogical control, and English language proficiency. Additionally, unequal access to technology infrastructure and digital literacy skills creates equity issues, particularly in under-resourced educational contexts (Mishra & Varshney, 2024). Moreover, much of the existing research has been conducted in technologically advanced or Asian educational contexts, leaving developing and multilingual settings such as Algeria largely underrepresented. Critically, while existing studies document both the affordances and risks of AI in higher education, they rarely examine how these dynamics play out when linguistic, infrastructural, and institutional constraints intersect — precisely the conditions that characterise EMI implementation in contexts like Algeria. This gap motivates the present study, which seeks to provide empirical evidence on AI adoption patterns, instructor perceptions, and implementation challenges in an under-resourced, multilingual EMI context.

1.5 The Algerian Higher Education Context

Algeria has increasingly prioritized EMI in higher education as part of broader educational reforms aimed at internationalization and global competitiveness. However, Algerian universities face persistent challenges including limited infrastructure, large class sizes, insufficient English language support for students, and inadequate professional development for instructors transitioning to EMI delivery (Ghouali & Bouabdallah, 2024). A recent longitudinal study conducted at Constantine 3 University further confirms these challenges, highlighting persistent issues related to instructors' language proficiency, disparities between STEM and humanities disciplines, and the need for stronger systemic and institutional support in EMI implementation (Bouguebs, 2025). Research on technology integration in Algerian higher education reveals a digital divide, with uneven access to reliable internet, hardware, and technical support across institutions (Hanifi, 2023). While previous research has explored EMI challenges and technology integration separately within the Algerian context, little attention has been given to the specific role of AI in EMI classrooms. More importantly, existing studies rarely examine instructors' perceptions, patterns of AI use, or the institutional factors shaping technology adoption in EMI settings. This absence is particularly significant given the unique linguistic, pedagogical, and infrastructural challenges associated with Algerian higher education.

Accordingly, this study addresses an important gap in the literature by investigating how EMI instructors across selected Algerian universities engage with AI tools, what factors influence their adoption decisions, and what challenges and support mechanisms shape implementation practices. By focusing on the Algerian context, the study contributes to the broader discussion on AI integration in EMI while providing context-sensitive insights that may inform institutional policy and professional development initiatives.

3. Methodology

3.1.Context

To answer the research questions raised, this study employed a questionnaire-based design as the primary data collection instrument. The questionnaire was designed to examine the integration of AI tools in English-Medium Instruction (EMI) classrooms across Algerian higher education institutions. The study's approach was informed by perspectives from the TAM (TAM) (Davis, 1989) and the TPACK (TPACK) framework(Koehler & Mishra, 2009),

which provide useful lenses for understanding technology adoption patterns and pedagogical integration in educational contexts.

3.2.Participants

Participants were selected through purposive sampling, targeting EMI instructors actively teaching in Algerian universities during the 2024–2025 academic year. The sample comprised fifteen EMI instructors drawn from different Algerian public universities including the University of Constantine 1 Frères Mentouri, the University of Algiers 2, and the University of 20 Aût 1955 Skikda. Participants represented diverse academic disciplines including physics, civil engineering, mathematics, Sharia and law, Industrial hygiene and safety, and biology. While the sample size is relatively small, it is appropriate for an exploratory study in an under-researched context and allows for in-depth analysis of emerging patterns in AI adoption among EMI instructors.

3.3.Procedures

The study employed a questionnaire that was distributed electronically via Google Forms to ensure accessibility and convenience for participants from various Algerian higher education institutions. All data collection procedures strictly adhered to standard research ethics protocols, following established academic and institutional guidelines. Particular attention was given to maintaining participant confidentiality, voluntary participation, and informed consent at every stage of the research process. Before completing the questionnaire, participants were presented with a clear consent form outlining the study's purpose, procedures, expected duration, and their right to withdraw at any point without any negative consequences. No personal identifiers, such as names, institutional affiliations, or contact information, were collected, thereby ensuring anonymity and protecting participants' privacy.

The questionnaire incorporated both closed-ended questions, which assessed the frequency and types of AI tool utilization, and open-ended questions, which explored challenges, institutional support needs, and ethical concerns regarding AI use in EMI contexts. This mixed-methods design not only provided quantitative data for analysis but also allowed participants to express nuanced insights while ensuring that all responses were gathered and managed in full compliance with ethical research standards. The instrument comprised four main sections:

Section 1: Demographic Information collected data on academic discipline, institutional affiliation, and years of EMI teaching experience, providing contextual variables for understanding adoption patterns across different fields and experience levels.

Section 2: AI Tool Usage and Educational Objectives identified which AI tools instructors currently use (e.g., ChatGPT, Grammarly, Google Translate) and for what specific educational purposes, such as lesson planning, material development, assessment design, or language support. This section captured actual usage behaviours and pedagogical objectives driving AI adoption.

Section 3: Challenges and Perceptions explored both the barriers instructors encounter when incorporating AI tools (technical difficulties, reliability concerns, academic integrity issues, students' unequal access) and their attitudes toward AI's impact on teaching effectiveness, student engagement, and instructional quality.

Section 4: Institutional Support Requirements investigated the resources and support mechanisms instructors believe are necessary for successful AI integration, including professional development programs, ethical guidelines, technical infrastructure, and institutional policies.

Quantitative data from closed-ended questions were analysed using descriptive statistics to identify patterns in AI tool usage, frequency of adoption, and common challenges. Qualitative data obtained from open-ended responses were analysed to identify recurring themes and perspectives that elaborate on the quantitative patterns. This combined approach offered a comprehensive examination of both measurable trends and contextual factors in AI integration in EMI contexts.

To clarify the instrument's structure: the questionnaire comprised four thematic sections, each containing multiple items. Section 1 included three demographic items. Section 2 contained six closed-ended items identifying AI tools used and their educational purposes. Section 3 included eight items (a mix of Likert-scale and open-ended questions) exploring challenges and perceptions. Section 4 contained five items on institutional support needs. In total, the instrument comprised 22 items. The results presented in this study focus on the items most directly relevant to the four research questions, applying descriptive statistics to closed-ended responses and thematic analysis to open-ended ones. A full item-level breakdown is available from the corresponding author upon request.

3.4. AI Use Policy

AI tools were used in a limited and transparent manner during the preparation of this manuscript. Specifically, AI-assisted language tools were employed to improve the clarity, coherence, and grammatical accuracy of the text. These tools did not generate, alter, or interpret any research data, nor did they contribute to the analytical, methodological, or theoretical aspects of the study. All critical analysis, interpretation of findings, and scholarly insights were entirely the author's own work. The use of AI was strictly supportive, serving only to refine language and presentation while maintaining full adherence to ethical research and writing standards.

4. Results

4.1. Current Use of AI among EMI Instructors

Addressing the first research question — regarding the extent and purposes of AI tool utilization among EMI instructors — the analysis of participant responses revealed the following patterns in AI adoption. Data demonstrate that 53.3% of respondents (n=8 of 15 instructors) currently incorporate AI tools into their teaching practice (see Figure 1).

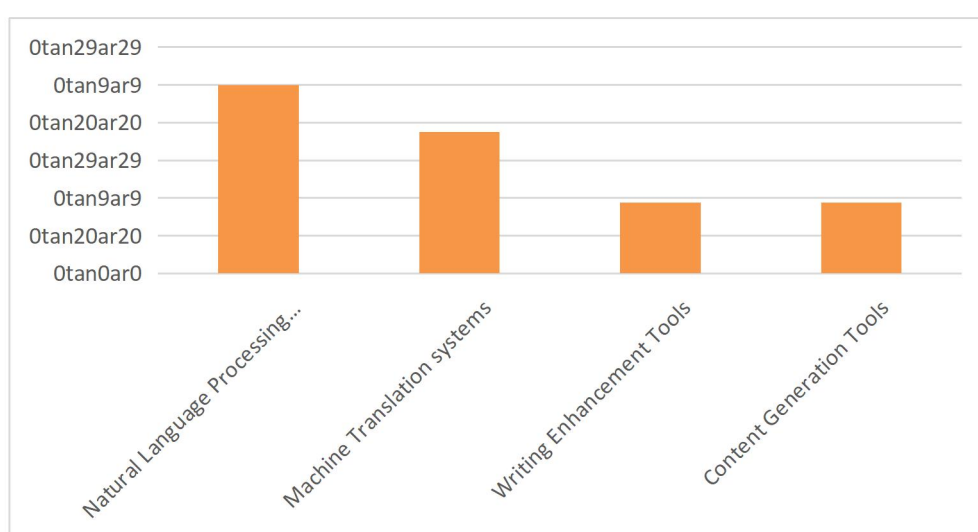


Figure 1:

Categories and Adoption Rates of AI Tools among Surveyed EMI instructors (n=8 AI users)

The data reveal that among AI users, Natural Language Processing (NLP) tools show 100% adoption (n=8 of 8 instructors who use AI), followed by machine translation systems (75%, n=6 of 8), writing enhancement tools (37.5%, n=3 of 8), and content generation tools (37.5%, n=3 of 8).

This investigation examined the purposes of using AI tools as well. Hence, participants were asked to state the educational objectives of using these tools. Figure 2 below provides a clear visual representation of AI tools adoption purposes.

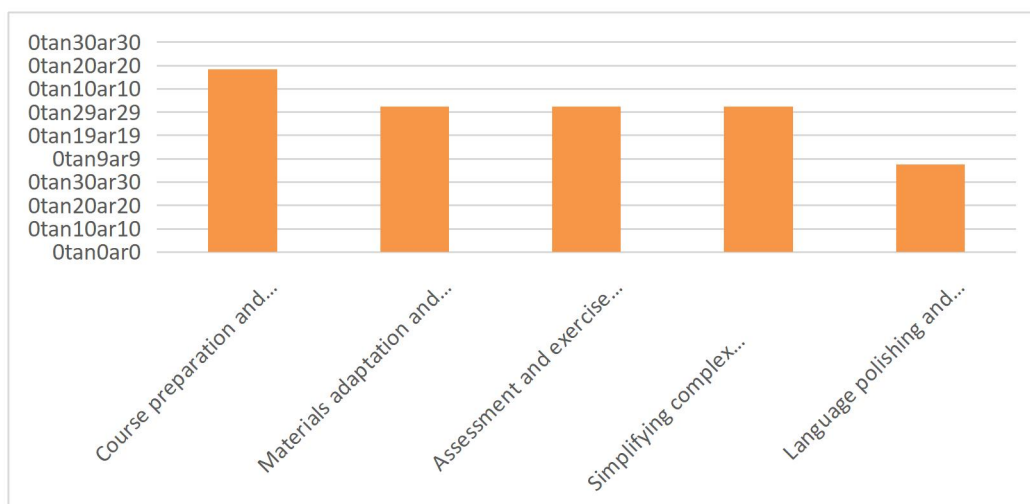


Figure 2:

Educational Objectives of using AI Tools

Among AI users, 87.5% (n= 7 of 8) utilize AI tools for course preparation and lesson planning. 62.5% (n= 5 of 8) use AI for materials adaptation, translation, assessment and exercise creation, and simplifying complex concepts. Only 37.5% (n=3 of 8) reported using AI for language polishing and proofreading.

4.2.Challenges of AI Integration in EMI Contexts

In response to the second research question on obstacles to effective AI integration, and while 86.7% of respondents (n=13 of 15 instructors) agreed that AI tools help them teach better, educators identified several obstacles to effective integration (See Table 1).

Table 1*Key Challenges in AI Integration Identified by Surveyed EMI Instructors*

Challenge Category	Number of Instructors Reporting	Representative Quote
Tool Reliability and Trustworthiness	8	"I have to evaluate every AI tool before using it actually, I mean considering whether is it reliable, believable, trustful" (Instructor E, University of 20 Août 1955 Skikda)
Plagiarism Detection and Academic Integrity	7	"Detecting plagiarism in students' assignments is one of the key challenges I am currently facing, particularly if students are using sophisticated tools to disguise their work" (Instructor E, University of 20 Août 1955 Skikda)
Unequal Student Access to Technology	5	"Some students may not have reliable access to devices or internet connectivity, hindering their ability to use AI tools" (Instructor D, University of Algiers 2)
Limited Teacher Preparedness	3 (explicitly); multiple implicit	"I believe most teachers are not competent/at least skilled in using AI tools although we would like to benefit from them" (Instructor C, University of Constantine 1)

The major challenges reported include tool reliability and trustworthiness (n=8 instructors), plagiarism detection and academic integrity issues (n=7 instructors), unequal student access to technology (n=5 instructors), and limited teacher preparedness (n=3 explicitly, with multiple others acknowledging general skill deficiency). Three instructors specifically identified prompt writing mastery as a barrier.

4.3. Educators' Perceptions of AI Integration in EMI Classrooms

Turning to the third research question, which concerns educators' views on whether AI enhances or hinders EMI delivery, the data revealed a nuanced picture. The majority of surveyed instructors (86.7%, n=13) recognized AI's benefits for teaching effectiveness. However, 53% (n=8) expressed concerns about over-reliance on AI for content and language mastery, while 33% (n=5) disagreed with this concern and 14% (n=2) remained neutral.

Regarding institutional support, only 27% (n=4) of participants agreed their universities provide adequate guidance on ethical AI use, while 47% (n=7) reported that no such support exists, and 26% (n=4) remained neutral.

4.4. Institutional Support Requirements for AI Integration

With respect to the fourth research question on support mechanisms needed for effective AI integration, participants were asked to select all forms of support that would facilitate their AI use, allowing for multiple responses per participant (see Figure 3).

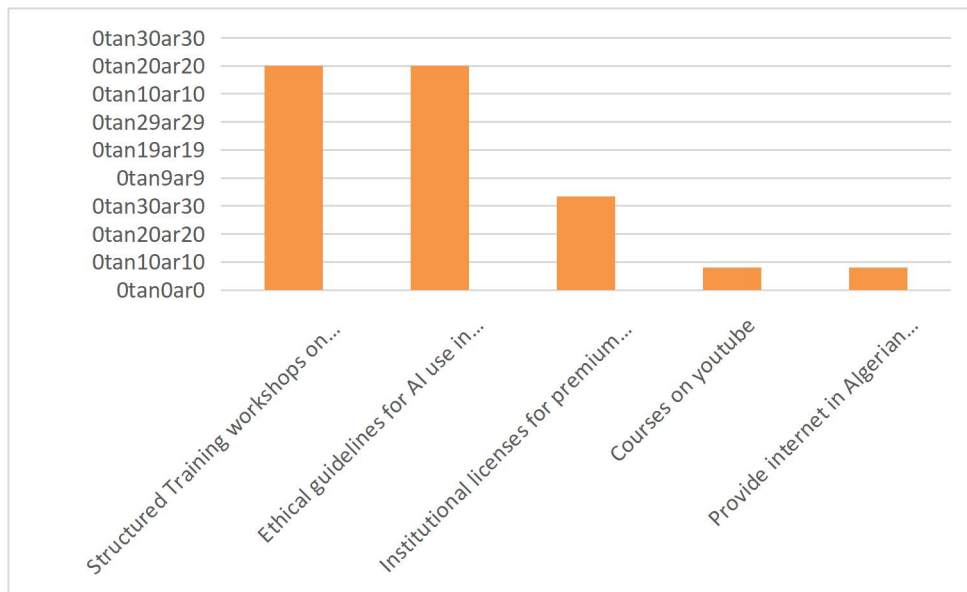


Figure 3:

Support Needed for Effective AI implementation

Structured training workshops and clear ethical guidelines for AI use in education emerged as the most requested form of support (80%, n=12), followed by technical and institutional licenses for premium AI tools (33.3%, n=5). One Instructor added two suggestions: courses on YouTube and providing internet in Algerian universities.

5. Discussion

This exploratory study investigated the integration of AI (AI) tools in English-Medium Instruction (EMI) classrooms across various Algerian higher education institutions, aiming to better understand how educators perceive, adopt, and implement these emerging technologies in their teaching practices. The research examined the extent to which AI has been incorporated into EMI settings, the purposes for which it is used, the factors influencing instructors' acceptance, and the challenges that hinder effective utilization. By analyzing data collected from instructors representing different disciplines and institutional backgrounds, the study provides a nuanced picture of how AI integration is currently unfolding within the Algerian higher education context.

5.1. Research question 1: 1. To what extent are generative AI tools such as ChatGPT, Grammarly, and machine translation applications utilized by EMI instructors at Algerian universities?

Regarding the first research question about the extent and purposes of AI tool utilization in Algerian EMI classrooms, the findings indicate that 53.3% of surveyed EMI instructors have incorporated AI tools into their teaching practices, with Natural Language Processing tools showing universal adoption among AI users (100%). This moderate adoption rate suggests that AI integration in Algerian EMI contexts is still in its early stages, with nearly half of instructors not yet utilizing these technologies. The dominance of NLP and machine translation tools (75% adoption among AI users) reflects the linguistic demands of EMI instruction, where language support is paramount. Instructors primarily employ AI tools for course preparation and lesson planning (62.5% of AI users) rather than for language polishing of their own work (37.5%), indicating that pedagogical applications take precedence over personal language support needs. These findings align with international research

demonstrating that language-related AI functions are particularly valued in multilingual educational contexts (Bannister et al., 2023; Kikuchi, 2024).

5.2. Research question 2: What are the major obstacles that hinder effective AI integration?

Concerning the second research question about major obstacles hindering effective AI integration, the study identified four primary challenges: tool reliability concerns, limited teacher preparedness, unequal student access to technology, and plagiarism detection difficulties. These challenges align with the TAM's emphasis on perceived usefulness and ease of use as critical adoption factors (Davis, 1989). When instructors lack confidence in AI reliability, perceived usefulness diminishes; when they lack necessary skills, perceived ease of use decreases, both of which inhibit adoption.

The reliability concerns expressed by surveyed instructors reflect broader debates in the literature about AI accuracy and trustworthiness (Cotton et al., 2024). The finding that instructors spend significant time verifying AI outputs contradicts the efficiency narrative often associated with AI adoption and parallels concerns raised by Zou et al. (2023) regarding teachers' hesitation to trust AI-generated content. This verification burden may explain why adoption remains moderate despite high perceived usefulness.

Limited teacher preparedness, particularly in prompt-engineering, emerged as a significant barrier. This finding supports the TPACK framework's assertion that effective technology integration requires not just content and pedagogical knowledge but also specialized technological expertise (Koehler & Mishra, 2009; Shoukat et al., 2024). The emphasis on prompt writing skills as a distinct competency highlights how AI tools require new literacies beyond traditional digital skills, a challenge amplified in contexts where professional development opportunities are limited.

The digital divide identified in this study—where students lack reliable access to devices and internet connectivity—reflects broader infrastructural challenges in Algerian higher education documented by Hanifi (2023) and Ghouali and Bouabdallah (2024). This access inequality creates an ethical dilemma for instructors who must balance pedagogical innovation with equity concerns, a tension that research in under-resourced contexts has consistently highlighted (Mishra & Varshney, 2024).

Plagiarism detection difficulties represent a critical concern that extends beyond technical challenges to fundamental questions about academic integrity and student learning. The finding that students use AI primarily for content generation rather than deeper learning mirrors international concerns about AI undermining critical thinking development (Cotton et al., 2024; Baker & Hawn, 2022). This challenge is particularly acute in EMI contexts where linguistic barriers may incentivize over-reliance on AI-generated text.

5.3. Research question 3: To what extent do EMI educators believe AI enhances or hinders course delivery, student engagement, and instructional quality?

Addressing the third research question about whether educators believe AI enhances or hinders EMI delivery, the findings reveal a paradoxical perspective: while 86.7% of surveyed instructors believe AI enhances teaching effectiveness, 53% simultaneously worry about over-reliance on these tools. This ambivalence reflects the "promise versus peril" discourse in educational technology literature, where enthusiasm for innovation coexists with concerns about unintended consequences (Zawacki-Richter et al., 2019).

The high recognition of AI's benefits suggests that surveyed instructors perceive these tools as addressing genuine pedagogical needs, particularly the linguistic and cognitive load challenges associated with EMI instruction (Roussel et al., 2017; Dafouz & Smit, 2020). This aligns with research demonstrating that AI can provide valuable scaffolding for both instructors and students navigating content learning through a non-native language (Rose et al., 2020).

However, the concern about over-reliance indicates awareness that AI tools might create dependency rather than developing independent competencies. This worry resonates with critiques about potential "deskilling" effects when technology automates traditional educational functions (Baker & Hawn, 2022). The tension between efficiency and skill development represents a fundamental challenge in educational technology adoption that requires careful pedagogical consideration.

The finding that only 27% of surveyed instructors feel their institutions provide adequate ethical guidance, while 47% report no institutional support, reveals a significant gap between technological adoption and institutional preparedness. This lack of support leaves instructors navigating complex ethical terrain without clear frameworks, potentially leading to inconsistent practices and heightened anxiety about AI integration. This finding underscores the importance of institutional leadership in technology adoption, as emphasized in organizational change literature.

5.4. Research question 4: What institutional support mechanisms — including training, ethical guidelines, and infrastructure — are needed to optimize AI use in EMI contexts?

Regarding the fourth research question about support mechanisms needed to optimize AI use in EMI, the overwhelming demand for structured training workshops (80% of surveyed instructors) highlights the critical gap between technological availability and pedagogical capacity. This finding aligns with the TPACK framework's emphasis on developing integrated technological, pedagogical, and content knowledge. The high demand suggests that instructors recognize their need for systematic skill development beyond informal experimentation. The request for ethical guidelines (80% of surveyed instructors) reflects the uncertainty documented throughout the findings regarding appropriate AI use, academic integrity, and assessment practices. This need for institutional guidance parallels international calls for clear AI policies in higher education as these technologies become more prevalent and sophisticated. Collectively, these findings paint a picture of cautious, pragmatic AI adoption among surveyed Algerian EMI instructors. They recognize AI's potential to address genuine pedagogical challenges, particularly those related to the linguistic demands of EMI instruction. However, adoption is constrained by practical barriers (infrastructure, access), skill gaps (prompt-engineering, tool evaluation), and institutional factors (lack of training, absence of ethical guidelines).

The findings demonstrate that AI integration in EMI contexts is not simply a matter of providing access to tools. Rather, it requires a comprehensive ecosystem of support including professional development, clear institutional policies, adequate infrastructure, and ongoing guidance. This aligns with sociotechnical perspectives on educational technology that emphasize the interdependence of technological, pedagogical, institutional, and social factors in successful innovation adoption.

Compared to previous research in better-resourced contexts, this study reveals how infrastructural and institutional limitations amplify the challenges of AI integration. While international research has documented similar concerns about reliability, ethics, and academic integrity, the Algerian context adds layers of complexity related to resource scarcity, large class sizes, and limited professional development opportunities. These contextual factors

suggest that implementation strategies developed in well-resourced settings may require substantial adaptation for contexts like Algeria. The study's findings contribute to the emerging literature on the AI-EMI nexus by providing empirical evidence from an under-researched context. While preliminary studies have demonstrated AI's potential benefits for EMI instruction (Bannister et al., 2023; Kikuchi, 2024), this research highlights the implementation challenges that may prevent these benefits from being realized in practice, particularly in developing country contexts.

6. Conclusion

This exploratory study investigated AI integration in EMI classrooms across Algerian higher education institutions, focusing on usage patterns, teacher perceptions, and implementation challenges. Findings indicate that while 53.3% of EMI instructors have adopted AI tools — primarily for lesson planning and materials development — effective integration remains constrained by concerns about tool reliability, limited preparedness in prompt-engineering, unequal student access, and the absence of institutional guidance on ethical AI use. Although 86.7% of respondents recognised AI's potential to enhance teaching effectiveness, only 27% reported receiving adequate institutional support, highlighting a critical gap between technological availability and institutional readiness. Viewed through TAM and TPACK, the findings suggest that while perceived usefulness drives initial adoption, concerns about ease of use, limited digital competence, and inadequate institutional backing constrain effective long-term implementation. Instructors identified several critical support needs: 80% requested structured training workshops and clear ethical guidelines, while 33.3% emphasised the necessity of institutional licences for premium tools to ensure equitable access. For Algerian higher education institutions, the findings point to several actionable strategies: developing comprehensive professional development programmes focused on AI integration in EMI, establishing transparent ethical and pedagogical guidelines, investing in digital infrastructure to reduce access inequalities, and providing institutional support through tool licensing and ongoing technical assistance.

Several limitations should be acknowledged in this study. The small sample size ($n=15$) limits the generalizability of the findings beyond the surveyed participants and institutions, as it may not represent the full diversity of EMI instructors in Algeria. The exclusive focus on instructor perspectives further restricts the scope of the study, as it does not capture students' experiences, perceptions, or actual learning outcomes. Moreover, the reliance on self-reported data introduces the possibility of bias, as participants' responses may not fully reflect their real classroom practices or the complexity of AI integration in authentic teaching contexts. Additionally, the cross-sectional design provides only a single snapshot of AI adoption at a given moment in time, without accounting for possible changes, developments, or long-term adoption trajectories.

To address these limitations, future research should employ larger and more representative samples that encompass instructors from a broader range of institutions and disciplines. It should also incorporate longitudinal research designs to track AI adoption patterns and pedagogical transformations over time. Including student perspectives and direct learning outcome measures would offer a more holistic understanding of AI's impact on EMI classrooms. Furthermore, observational studies of actual classroom implementation could reveal discrepancies between teachers' reported and enacted practices. Comparative studies across different national and cultural contexts are also recommended to identify which challenges are context-specific and which are globally shared.

Despite these limitations, this exploratory study provides meaningful insights into an under-researched phenomenon and establishes a valuable foundation for future investigation. As AI technologies continue to evolve rapidly, sustained empirical research, collaborative inquiry, and evidence-based policy development will be crucial to ensure that their integration enhances, rather than complicates, EMI instruction in Algeria and comparable educational settings worldwide.

AI Use Policy

AI tools were used in a limited and transparent manner during the preparation of this manuscript. Specifically, AI-assisted language tools were employed to improve the clarity, coherence, and grammatical accuracy of the text. These tools did not generate, alter, or interpret any research data, nor did they contribute to the analytical, methodological, or theoretical aspects of the study. All critical analysis, interpretation of findings, and scholarly insights were entirely the author's own work. The use of AI was strictly supportive as it only served to refine language and presentation while maintaining full adherence to ethical research and writing standards.

Ethical Declaration

This study adhered to ethical principles for research involving human participants. The questionnaire included an informed consent statement at the beginning, and participation proceeded only after participants provided their consent. Participation was voluntary, participants could withdraw at any time, and all responses were anonymized by coding participants' identities to ensure confidentiality.

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Author Contributions

The authors jointly conceived and designed the study, conducted the literature review, collected and analyzed the data, interpreted the findings, drafted and revised the manuscript, and approved the final version for publication.

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