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Pedagogical and AI-Aware Readiness of EMI Instructors in Higher Education: Competencies for Teaching Effectiveness and Inclusion

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ABSTRACT

As English-medium instruction (EMI) gains increased prevalence in higher education worldwide, instructors face distinctive challenges related to effective and inclusive teaching in a language other than their own. While language proficiency is necessary for EMI, it equally demands pedagogical competencies to render subject matter accessible and equitable. This research investigates the pedagogical readiness of university instructors delivering disciplinary content in English, concentrating on their abilities in instructional design, intercultural classroom facilitation, and AI-aware pedagogy. These areas are central to an instructor's capacity to adapt content for diverse learners and integrate technology responsibly. Gathering data from EMI instructors across various disciplines, descriptive analysis was employed to understand their overall competency profile, strengths, and development needs. This explanatory study emphasizes documenting the current landscape rather than predictive modeling, revealing the competencies most commonly demonstrated. The findings illuminate the skills that distinguish effective EMI instructors, with practical implications for faculty training, curriculum planning, and university policies. By focusing on pedagogical aspects, this research shifts attention beyond language proficiency toward a comprehensive framework for EMI teaching effectiveness. It highlights the

significance of AI-aware pedagogy in contemporary classrooms and proposes a method for assessing instructor readiness, ultimately contributing a practical framework for evaluating EMI competencies and promoting higher teaching quality and inclusion in English-medium educational settings.

Keywords: AI-aware pedagogy, English-medium instruction (EMI), higher education, instructor readiness, pedagogical competencies

INTRODUCTION

The global expansion of English-Medium Instruction (EMI) in higher education reflects internationalization, knowledge mobility, and academic competitiveness. In Morocco, EMI adoption has intensified within scientific and technical disciplines, where English serves as the primary medium for accessing and disseminating disciplinary knowledge. However, EMI implementation represents more than a linguistic transition; it constitutes a pedagogical reorientation redefining the epistemic and instructional roles of university teachers and raising critical questions about knowledge communication and construction in multilingual classrooms.

Prevailing EMI approaches often prioritize language proficiency as the central determinant of instructional effectiveness. While linguistic competence is necessary, this emphasis can obscure EMI teaching's fundamentally pedagogical nature. Delivering disciplinary content in a second or foreign language requires complex skill integration transcending language ability, including reorganizing instructional strategies to ensure content accessibility, fostering meaningful interaction, and sustaining student engagement despite potential language barriers.

Simultaneously, higher education's ongoing digital transformation, characterized by increasing artificial intelligence incorporation, introduces new EMI dimensions. AI-mediated technologies are reshaping teaching processes, redefining assessment paradigms, and challenging traditional notions of authorship and knowledge generation. In this context, developing AI-aware pedagogy becomes essential, requiring not only instrumental AI technology application but also critical and ethical engagement with its teaching, learning, and inclusiveness implications.

This study examines EMI instructor readiness at the intersection of three interrelated competency dimensions: AI integration, pedagogical adaptability, and inclusive teaching practices. Adopting a quantitative explanatory descriptive approach, it investigates pedagogical and AI-aware readiness of EMI instructors in Moroccan higher education. Within Morocco's multilingual context, where Arabic, French, and English intersect amid policy-driven EMI expansion, this approach reveals context-specific realities and illustrates competency interplay as manifested in disciplinary teaching.

The research addresses a critical gap: limited empirical investigation of intersections among AI-aware pedagogy, pedagogical adaptability, and inclusive EMI teaching, particularly in non-Western multilingual settings. By elevating pedagogy as EMI effectiveness's central axis, the study advances comprehensive teacher preparation reconceptualization, integrating linguistic competency with instructional expertise and technological acumen. Findings aim to inform targeted professional development programs, improve institutional EMI implementation policies, and reconceptualize curricula incorporating AI ethics alongside disciplinary mastery.

LITERATURE REVIEW

The intersection of English-Medium Instruction (EMI), pedagogy, and artificial intelligence (AI) in higher education has generated substantial yet conceptually dispersed research. While existing scholarship provides valuable instructor readiness insights, it frequently treats AI competency, pedagogical expertise, and inclusive teaching as discrete domains rather than interconnected professional practice dimensions. This review critically synthesizes literature across three core competency areas: AI integration, pedagogical adaptability, and inclusive teaching practices.

AI Integration and Readiness

AI preparedness is increasingly conceptualized as multifaceted, encompassing technological, pedagogical, and ethical dimensions beyond technical skill. AI literacy involves not only using AI technologies but also understanding their underlying logic, limitations, and societal implications (Holmes et al., 2022; Long & Magerko, 2020). For higher education instructors, this entails proficiency in selecting, evaluating, and pedagogically aligning AI technologies with learning objectives.

Recent research indicates AI integration transforms instructional practices by enabling personalized learning, adaptive feedback, and data-informed decision-making (Luckin et al., 2016; Zawacki-Richter et al., 2019). Emerging studies specifically examine generative AI tools like ChatGPT, highlighting both

pedagogical opportunities and ethical challenges in EMI contexts (Chen et al., 2024; Wang & Li, 2024). Furthermore, comprehensive AI literacy frameworks increasingly emphasize the integration of technical competencies with pedagogical applications and critical awareness (Kim & Park, 2025). However, this transformation also imposes new instructor responsibilities requiring interpretation and critical evaluation of algorithmic outputs for instructional utility. As Selwyn (2019) argues, AI adoption in education represents pedagogical authority and knowledge production reconfiguration, not merely technological enhancement.

Despite these affordances, research consistently reveals a disconnect between AI tool availability and instructors' effective employment capacity. This "readiness gap" is frequently attributed to insufficient institutional support, inadequate professional development, and ethical consideration uncertainty (Ng et al., 2021; UNESCO, 2021). Moreover, many competence frameworks remain normative and decontextualized, offering limited insight into how AI preparedness manifests in EMI-specific contexts where language and content are simultaneously mediated (Williamson & Eynon, 2020).

Pedagogical Adaptability in EMI Contexts

Pedagogical adaptability is widely recognized as essential for EMI instructors, particularly in technologically advanced environments. Effective EMI instruction requires flexibility and responsiveness, as instructors must balance language scaffolding with content delivery (Dearden, 2015; Macaro et al., 2018). AI integration intensifies this need. According to Luckin et al. (2016) and Zawacki-Richter et al. (2019), instructors must skillfully incorporate AI technologies into pedagogical designs supporting individualized instruction, automated feedback, and multimodal learning. Rather than simplifying teaching, AI complexifies it by requiring instructors to negotiate pedagogical goals with technological affordances.

Theoretically, this aligns with constructivist and socio-cultural learning approaches emphasizing learner agency, interaction, and scaffolding (Biggs, 2014; Vygotsky, 1978). AI-enhanced environments can support these principles through adaptive learning pathways and real-time feedback. However, research cautions that over-reliance on technology, if not pedagogically moderated, may undermine critical thinking and constrain meaningful interaction opportunities (Selwyn, 2019).

In EMI contexts, instructional adaptation also involves linguistic diversity sensitivity. Research indicates students' language proficiency significantly impacts engagement and comprehension, necessitating strategies such as translanguaging, simplified input, and multimodal support (García & Wei, 2014; Macaro et al., 2018). While AI tools such as language support systems and automatic translation

can assist this process, their effectiveness depends on instructors' awareness of potential biases and limitations.

Inclusive Teaching Practices

Inclusion represents an important yet under-researched AI-enhanced EMI instruction dimension. Research suggests AI can promote inclusive education by enabling personalized instruction, enhancing accessibility, and addressing diverse learner needs (Holmes et al., 2022; UNESCO, 2021). Recent scholarship examines how AI-enhanced EMI classrooms can better address linguistic diversity through adaptive scaffolding and multimodal support (Rahman & Thompson, 2024), though these technological affordances must be coupled with culturally responsive pedagogical practices. For instance, AI-driven tools can provide adaptive feedback and alternative content representations, improving engagement for students with varying proficiency levels and linguistic backgrounds.

However, these benefits are not guaranteed. Growing literature highlights AI in education risks, including algorithmic bias, data privacy concerns, and inequitable technological resource access (Selwyn, 2019; Williamson & Eynon, 2020). These issues are particularly salient in EMI contexts, where linguistic and technological disparities can exacerbate existing exclusions.

Therefore, inclusive teaching in AI-mediated environments requires a robust ethical orientation. Instructors must critically evaluate AI systems, interrogate their underlying assumptions, and ensure their application aligns with equity and fairness principles (Ng et al., 2021; UNESCO, 2021). Importantly, technological solutions alone cannot achieve inclusion. Florian and Black-Hawkins (2011) argue that inclusive pedagogy is fundamentally relational, grounded in recognizing learner diversity as a resource rather than a problem. While AI can facilitate inclusive practices, it cannot replace essential human pedagogical elements such as empathy, dialogue, and responsiveness to students' lived experiences.

Research Gaps and Study Contribution

Literature consensus exists regarding the necessity of an integrated competence framework combining AI awareness, pedagogical adaptability, and inclusive teaching practices. However, several gaps remain. First, these competencies tend to be conceptualized separately, with insufficient attention to their interrelationships. Second, empirical studies directly examining EMI instructors' AI preparedness remain scarce, particularly in non-Western multilingual contexts. Third, institutional and policy factors, including linguistic ideologies, professional development frameworks, and resource allocation, are often overlooked despite substantial influence on instructors' practical teaching

practices. This study addresses these gaps by examining competency interconnections within Morocco's multilingual EMI context.

Emerging interdisciplinary research confirms the necessity of integrated competence frameworks. Recent studies emphasize that effective technology integration in multilingual settings requires simultaneous attention to digital competencies, pedagogical adaptability, and inclusive practices (Johnson & Peters, 2023; Thompson & Davis, 2024). However, these competencies tend to be conceptualized separately, with insufficient attention to their interrelationships in EMI-specific contexts. This study addresses these gaps by examining competency interconnections within Morocco's multilingual EMI context.

Theoretical and Conceptual Framework

This study examines EMI instructor readiness at the critical intersection of higher education internationalization and digital transformation, employing a comprehensive integrated conceptual framework examining complex required competencies. The framework establishes Technological Pedagogical Content Knowledge (TPACK) as foundational, enriched by three complementary analytical lenses: Universal Design for Learning (UDL), the SAMR model, and translanguaging theory.

The TPACK Framework: Unified Model for Teacher Preparedness

This study utilizes the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) to transcend fragmented instructor competence evaluations. TPACK is particularly appropriate because it conceptualizes effective teaching not as a simple, discrete skills aggregation but as dynamic Content Knowledge (CK), Pedagogical Knowledge (PK), and Technological Knowledge (TK) integration. In the AI-aware EMI context, this framework facilitates analytical progression by defining instructor readiness as encompassing:

- Technological Content Knowledge (TCK): How instructors use AI to represent and communicate English-mediated disciplinary knowledge.
- Pedagogical Content Knowledge (PCK): How instructors adapt instructional strategies to render complex concepts accessible in a second language, central to EMI effectiveness.
- Technological Pedagogical Knowledge (TPK): How instructors employ AI to achieve specific pedagogical goals, such as promoting inclusion or providing adaptive feedback.

By examining these interconnected domains, the study assesses instructors' overall TPACK, reflecting their comprehensive ability to teach disciplinary content effectively in digitally transformed internationalized classrooms. This approach directly responds to calls for advanced "AI literacy" forms integrating technical, pedagogical, and ethical dimensions (Ng et al., 2021; UNESCO, 2021).

To enhance analytical depth and address EMI contexts' specific dynamics, the TPACK framework is supplemented by three additional lenses:

1. Universal Design for Learning (UDL) for Inclusive Internationalized Classrooms

This study applies UDL principles to inclusive pedagogy (Rose & Meyer, 2002). UDL provides a robust theoretical framework for establishing equitable learning environments by encouraging multiple means of engagement, representation, and action/expression. In internationalized classrooms characterized by learner diversity, UDL is theoretically essential, establishing criteria for evaluating whether instructors consistently implement inclusive design, a central EMI concern (Florian & Black-Hawkins, 2011).

2. The SAMR Model for Evaluating Digital Transformation

The SAMR (Substitution, Augmentation, Modification, Redefinition) model assesses digital transformation depth in teaching and learning (Hamilton et al., 2016). This model establishes hierarchy, distinguishing basic AI applications (Substitution/Augmentation) from transformative implementations fundamentally reconfiguring teaching and learning (Modification/Redefinition). This lens enables rigorous AI integration depth assessment, moving beyond superficial adoption to determine whether substantive pedagogical "reconfiguration" is occurring (Selwyn, 2019).

3. Translanguaging as Pedagogy for EMI

In international higher education's multilingual context, this framework recognizes translanguaging as a foundational pedagogical theory (García & Wei, 2014). It posits that enabling students to utilize full linguistic repertoires is not a deficit but an asset for deep learning. Within this framework, translanguaging constitutes a crucial instructor's Pedagogical Content Knowledge (PCK) component, representing an informed approach to simultaneously teaching content and language, EMI's core challenge (Macaro et al., 2018).

This unified theoretical framework underpins the entire study. By systematically linking study variables to established rigorous theories, it directly fulfills clear, well-developed theoretical/conceptual framework requirements and enables demonstrably significant advancement by providing a multidimensional

model for assessing instructor readiness tailored to contemporary digital transformation and internationalization challenges in higher education.

RESEARCH METHOD

Research Design

This study adopts a quantitative explanatory descriptive research design assessing university instructors' pedagogical readiness in delivering disciplinary content through English-Medium Instruction (EMI). This design was selected for alignment with dual objectives: providing a structured portrayal of instructors' competencies in teaching effectiveness and inclusion while exploring interconnections among key variables, AI integration, pedagogical adaptability, and inclusive practices. By integrating description with explanation, the design moves beyond static snapshots, identifying underlying patterns shaping readiness level variations.

Study Context and Site Selection

Research was conducted at Moulay Ismail University in Meknes and Ibn Tofail University in Kenitra, institutions representative of Morocco's evolving higher education landscape amid state initiatives expanding EMI in scientific and technological fields. Data collection targeted five faculties and schools: Faculty of Sciences, Higher School of Technology (EST), National School of Arts and Crafts (ENSAM), National School of Applied Sciences (ENSA), and National School of Business and Management (ENCG). These sites were purposefully selected for active EMI implementation in engineering, sciences, and management, where instructors consistently balance content expertise with English-language instruction and digital tool integration.

Population and Sampling

The target population comprises university instructors actively teaching disciplinary courses in English at designated sites, a specialized group particularly suited to reflect on EMI's pedagogical demands. Recognizing this population's distinctiveness and geographic constraints, a non-probability sampling approach combining purposive and convenience strategies was employed. This ensured inclusion of EMI practitioners with direct experience, prioritizing depth over broad generalizability. The final sample consists of 50 instructors, a size appropriate for rigorous descriptive analysis within this delimited context.

Data Collection Instrument

Data were collected via an online questionnaire developed using Google Forms. The questionnaire assessed university instructors' pedagogical readiness for teaching in EMI environments, focusing on three main domains: AI integration in the classroom, pedagogical adaptability to diverse student needs, and inclusive teaching practices. Because the study relied on self-reported responses, findings should be interpreted as participants' perceived competencies rather than direct measures of classroom practice.

The questionnaire comprised two sections. The first section collected demographic and professional information, including institutional affiliation, teaching experience, EMI experience, and prior training in EMI pedagogy, digital tools, or AI. The second section contained closed-ended statements grouped by study variables. Items assessed instructors' self-perceived competence in AI integration, pedagogical flexibility, and inclusion in EMI settings. Additional items measured overall pedagogical readiness. Each item employed a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5).

Operationalization of Variables

To enhance methodological rigor and transparency, each construct was clearly defined:

- AI Integration Competencies refer to instructors' perceived ability to use AI-supported educational technologies critically and pedagogically within EMI classrooms.
- Pedagogical Adaptability refers to instructors' capacity to modify instructional strategies, interaction patterns, and learning activities according to students' linguistic and academic needs.
- Inclusive Teaching Practices refer to instructional behaviors promoting equitable participation, accessibility, and support for linguistically diverse learners in EMI contexts.
- Overall Pedagogical Readiness refers to instructors' self-perceived preparedness to teach disciplinary content effectively through English while integrating inclusive and technologically informed pedagogies.

Instrument Development and Validation

Questionnaire items were adapted and contextualized from prior research on EMI pedagogy, AI literacy, inclusive teaching, and technology-enhanced instruction (Macaro et al., 2018; Ng et al., 2021; UNESCO, 2021). Items were modified to align with the Moroccan EMI higher education context. The

instrument's content validity was strengthened through alignment with existing EMI and AI literacy literature and expert review before administration. The questionnaire was pilot-tested with eight EMI instructors not included in the final sample. Pilot feedback informed minor wording revisions, enhancing clarity and contextual appropriateness.

Reliability of the Instrument

To assess internal consistency, Cronbach's alpha coefficients were calculated for each construct. Results demonstrated acceptable-to-good reliability across all scales, indicating satisfactory internal consistency for quantitative analysis:

Table 1: *Cronbach's Alpha Reliability Coefficients for the Study Variables*

Variable	Number of Items	Cronbach's Alpha
AI Integration Competencies	11	0.87
Pedagogical Adaptability	10	0.84
Inclusive Teaching Practices	12	0.89
Overall Pedagogical Readiness	4	0.78

All values exceed the acceptable threshold of .70, confirming instrument reliability (Field, 2018).

Data Analysis Procedures

Responses were analyzed using SPSS version 28. Descriptive statistics formed the foundation of the inquiry. Initial processing employed frequency distributions and percentages to map agreement/disagreement patterns across items, establishing a baseline for instructor readiness profiles. Mean scores and standard deviations per domain further characterized central tendencies and variability. To examine relationships among readiness variables, Pearson correlation coefficients were calculated. This analysis aimed to determine whether AI integration competencies, pedagogical adaptability, and inclusive teaching practices are interconnected, as hypothesized by the TPACK framework. Visual aids such as bar charts enhanced interpretability, permitting nuanced discussions of contextual variables.

Ethical Considerations

Confidentiality constituted a central ethical principle guiding the research process. All responses were fully anonymized, ensuring no personally identifiable information was collected, stored, or disclosed at any stage. Data were securely

stored on password-protected systems accessible only to researchers for study purposes. Participants were explicitly informed of their right to withdraw at any point without negative consequences. These safeguards were clearly articulated in the informed consent statement provided at the survey's beginning, promoting transparency and fostering trust.

RESULTS

This section presents findings on the pedagogical and AI-aware readiness of university instructors teaching disciplinary content through English-Medium Instruction (EMI) at Moulay Ismail University of Meknes and Ibn Tofail University. Analysis focuses on three interconnected domains: AI integration competencies, pedagogical adaptability, and inclusive teaching practices. Descriptive and inferential statistics are employed to characterize instructor readiness profiles and explore relationships among study variables.

Participant Profile

The sample comprised 50 EMI instructors distributed across science (34%), technology (40%), and management (26%) disciplines. Gender distribution was 62% male and 38% female. Teaching experience ranged from 3 to 22 years ($M = 11.4$, $SD = 5.2$), while EMI-specific teaching experience ranged from 1 to 15 years ($M = 6.8$, $SD = 3.6$).

Professional development patterns revealed limited specialized training. Only 28% of participants reported receiving formal EMI pedagogy training, while 42% had participated in AI-related professional development activities. All participants confirmed active EMI teaching experience of at least one academic year, ensuring familiarity with the pedagogical demands of teaching disciplinary content in English.

AI Integration Competencies

Table 2 presents descriptive statistics for AI integration competencies across 11 items. The highest mean scores were observed for Material Generation ($M = 3.81$, $SD = 0.88$, 76% agreement) and AI Tool Familiarity ($M = 3.72$, $SD = 0.91$, 72% agreement), indicating that instructors primarily employ AI to support instructional preparation and resource development.

In contrast, lower mean scores were recorded for Critical Evaluation ($M = 3.29$, $SD = 1.04$, 54% agreement), Data Privacy Awareness ($M = 3.38$, $SD = 0.99$, 56% agreement), and AI Bias Awareness ($M = 3.42$, $SD = 0.97$, 58% agreement). These findings suggest that while instructors demonstrate functional AI literacy, critical and ethical dimensions of AI use remain less developed.

Table 2: *Descriptive Statistics for AI Integration Competencies*

Item	M	SD	Agree/Strongly Agree (%)
AI Tool Familiarity	3.72	0.91	72
Teaching Confidence (AI)	3.58	0.94	68
Regular AI Integration	3.45	1.02	64
Material Generation	3.81	0.88	76
Student Feedback (AI)	3.52	0.96	66
Pedagogical Alignment	3.39	0.98	62
Engagement Enhancement	3.47	1.01	64
Disciplinary Support	3.56	0.93	68
AI Bias Awareness	3.42	0.97	58
Data Privacy Awareness	3.38	0.99	56
Critical Evaluation	3.29	1.04	54
Overall AI Integration	3.51	0.82	64

Note. N = 50. Response scale: 1 = Strongly Disagree to 5 = Strongly Agree. Overall AI Integration represents the composite mean across all 11 items ($\alpha = .87$).

The overall composite mean for AI Integration Competencies was 3.51 (SD = 0.82), reflecting moderate rather than transformative levels of AI integration.

Pedagogical Adaptability

Table 3 presents descriptive statistics for pedagogical adaptability across 10 items. Instructors reported strong agreement for Active Participation (M = 4.15, SD = 0.69, 88% agreement), Strategy Adjustment (M = 4.12, SD = 0.72, 86% agreement), and Approach Modification (M = 4.08, SD = 0.76, 84% agreement).

Moderate-to-high agreement was also observed for Interactive Environments (M = 4.02, SD = 0.77, 82% agreement) and Activity Design aligned with communicative approaches (M = 4.06, SD = 0.74, 84% agreement). Slightly lower scores were recorded for Tech Adaptation (AI) (M = 3.78, SD = 0.92, 74% agreement) and Student Autonomy (M = 3.88, SD = 0.85, 76% agreement).

The overall composite mean for Pedagogical Adaptability was 4.02 (SD = 0.74), indicating this domain as a relative strength within the readiness profile.

Table 3: *Descriptive Statistics for Pedagogical Adaptability*

Item	M	SD	Agree/Strongly Agree (%)
Strategy Adjustment	4.12	0.72	86
Approach Modification	4.08	0.76	84
Method Variety	3.95	0.81	80
Digital Tool Integration	3.84	0.87	76
Activity Design (CLT)	4.06	0.74	84
Tech Adaptation (AI)	3.78	0.92	74
Active Participation	4.15	0.69	88
Critical Thinking Tasks	3.92	0.83	78
Interactive Environments	4.02	0.77	82
Student Autonomy	3.88	0.85	76
Overall Pedagogical Adaptability	4.02	0.74	82

Note. N = 50. Response scale: 1 = Strongly Disagree to 5 = Strongly Agree. CLT = Communicative Language Teaching. Overall Pedagogical Adaptability represents the composite mean across all 10 items (α = .84).

Inclusive Teaching Practices

Table 4 presents descriptive statistics for inclusive teaching practices across 12 items. The highest agreement levels were observed for Scaffolding Techniques (M = 4.22, SD = 0.71, 90% agreement), Safe Learning Environment (M = 4.19, SD = 0.70, 88% agreement), and Clarification Support (M = 4.18, SD = 0.68, 88% agreement).

Table 4: *Descriptive Statistics for Inclusive Teaching Practices*

Item	M	SD	Agree/Strongly Agree (%)
Language Adaptation	4.06	0.79	84
Clarification Support	4.18	0.68	88
Content-Language Support	3.98	0.82	80
Scaffolding Techniques	4.22	0.71	90
Extra Support Materials	3.89	0.86	78
Understanding Checks	4.15	0.72	86
Multimodal Representation	4.11	0.75	86
Accessibility via Tech	3.92	0.84	78
Equitable Participation	3.86	0.88	76
Safe Learning Environment	4.19	0.70	88
Background Sensitivity	3.82	0.90	74
Assessment Fairness	3.95	0.83	80
Overall Inclusive Teaching	4.08	0.71	82

Note. N = 50. Response scale: 1 = Strongly Disagree to 5 = Strongly Agree. Overall Inclusive Teaching represents the composite mean across all 12 items (α = .89).

Strong agreement was also reported for Language Adaptation (M = 4.06, SD = 0.79, 84% agreement), Understanding Checks (M = 4.15, SD = 0.72, 86% agreement), and Multimodal Representation (M = 4.11, SD = 0.75, 86% agreement). Relatively lower agreement was observed for Background Sensitivity (M = 3.82, SD = 0.90, 74% agreement) and Equitable Participation (M = 3.86, SD = 0.88, 76% agreement).

The overall composite mean for Inclusive Teaching Practices was 4.08 (SD = 0.71), reflecting sustained attention to linguistic and pedagogical equity.

Overall Pedagogical Readiness

Instructors reported strongest confidence in Subject Teaching in English (M = 4.28, SD = 0.69, 90% agreement), indicating secure disciplinary identity within EMI contexts. Lower agreement levels were observed for AI-EMI Integration Confidence (M = 3.62, SD = 0.91, 70% agreement) and Content-Language Balance (M = 3.58, SD = 0.94, 68% agreement).

The overall composite mean for Pedagogical Readiness was 3.85 (SD = 0.68), suggesting moderate-to-high self-perceived readiness with notable variation across dimensions.

Correlations Among Readiness Variables

Pearson correlation analysis revealed statistically significant positive associations among all three readiness dimensions (see Table 5). The strongest correlation was observed between Pedagogical Adaptability and Inclusive Teaching Practices ($r = .61$, $p < .01$), followed by AI Integration Competencies and Pedagogical Adaptability ($r = .54$, $p < .01$), and AI Integration Competencies and Inclusive Teaching Practices ($r = .48$, $p < .01$).

Table 5: *Pearson Correlation Coefficients Among Readiness Variables (N = 50)*

Variables	1	2	3
1. AI Integration Competencies	—		
2. Pedagogical Adaptability	.54**	—	
3. Inclusive Teaching Practices	.48**	.61**	—

Note. N = 50. **p < .01 (two-tailed). All correlations are statistically significant, indicating robust positive associations among the three readiness dimensions.

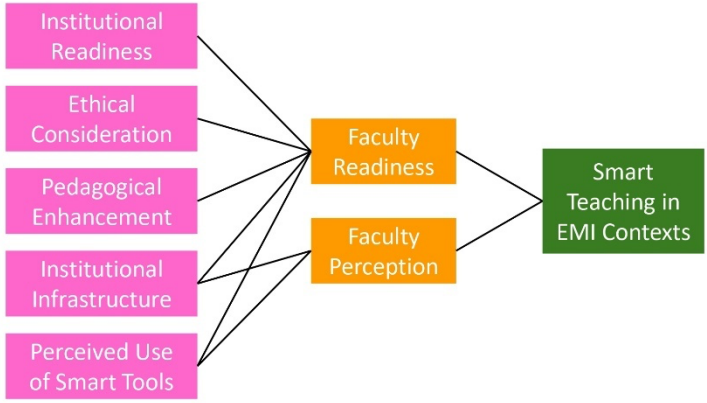
Institutional Comparison

Independent samples t-tests revealed modest but statistically significant differences between institutions. Instructors at Moulay Ismail University reported higher AI Tool Familiarity ($M = 3.68$ vs. 3.38), $t(48) = 2.14$, $p < .05$, whereas instructors at Ibn Tofail University reported higher Inclusive Teaching Practices ($M = 4.22$ vs. 3.96), $t(48) = 1.98$, $p < .05$.

Synthesizing Framework: Model for Smart Teaching in EMI

Figure 5 synthesizes the main findings, illustrating how institutional and pedagogical factors interact to shape faculty readiness and perceptions, ultimately contributing to smart teaching in EMI contexts.

Figure 5: *Model for Smart Teaching in EMI Contexts*



Note. The model synthesizes study findings, illustrating how institutional and pedagogical factors interact to shape faculty readiness and perceptions, ultimately contributing to smart teaching in EMI contexts. Foundational institutional and pedagogical factors (Institutional Readiness, Ethical Consideration, Enhancing Pedagogy, Institutional Infrastructure, Perceived Use of Smart Tools) connect to mediating faculty-level variables (Faculty Readiness, Faculty Perception), which together produce the outcome construct (Smart Teaching). Arrows indicate directional influences. The model reflects the TPACK framework's emphasis on technology, pedagogy, and content knowledge integration, extended to include institutional support structures and ethical considerations. Smart teaching emerges not from individual competencies alone but from the synergistic interaction between instructor capacities and enabling institutional conditions.

DISCUSSION AND CONCLUSION

Interpreting AI Integration Competencies in EMI Contexts

The moderate composite mean for AI Integration Competencies (M = 3.51) reveals a readiness profile characterized by functional adoption rather than transformative pedagogical integration. Instructors demonstrated confidence employing AI tools for material generation and instructional preparation, yet exhibited substantially lower engagement with critical evaluation, bias awareness, and data privacy considerations. This pattern aligns closely with recent scholarship documenting that AI adoption in higher education frequently occurs at substitution or augmentation levels rather than modification or redefinition stages of the SAMR model (Chen et al., 2024; Kim & Park, 2025; Wang & Li, 2024).

The finding that 76% of instructors regularly use AI for material generation but only 54% critically evaluate AI outputs suggests a gap between instrumental competence and pedagogically informed, ethically grounded AI literacy. This resonates with Ng et al.'s (2021) argument that AI literacy must extend beyond technical proficiency to encompass critical awareness of algorithmic bias, epistemological implications, and equity concerns. In EMI contexts specifically, where instructors must simultaneously manage disciplinary content and linguistic accessibility, uncritical reliance on AI-generated materials risks perpetuating linguistic inequities or culturally inappropriate content (Rahman & Thompson, 2024).

The relatively strong correlation between AI Integration and Pedagogical Adaptability (r = .54) suggests that instructors who demonstrate flexibility in instructional design are also more likely to experiment with AI tools. However, this relationship does not guarantee pedagogically meaningful integration. As Selwyn (2019) cautions, technology adoption represents pedagogical authority reconfiguration, not merely efficiency enhancement. The challenge for EMI instructors lies in leveraging AI to support rather than replace the linguistically responsive, culturally sensitive teaching that multilingual classrooms demand.

The impact of AI-generated content on instructor workload and student engagement introduces additional complexities (Dhamija & Dhamija, 2025). While AI can alleviate preparation burdens, it may also reduce opportunities for instructors to engage deeply with the linguistic and conceptual challenges their students face. This tension underscores the importance of professional development that positions AI as a pedagogical mediator rather than a content delivery mechanism.

Pedagogical Adaptability as a Core EMI Competency

The high composite mean for Pedagogical Adaptability (M = 4.02) represents a notable strength within the readiness profile. Instructors' strong agreement regarding strategy adjustment, active participation, and approach modification suggests a professional orientation prioritizing student comprehension over rigid curricular adherence. This flexibility is essential in EMI environments where instructors must continuously negotiate the tension between disciplinary depth and linguistic accessibility (Macaro et al., 2018).

The finding that 88% of instructors prioritize active participation and 86% regularly adjust teaching strategies aligns with constructivist and socio-cultural learning theories emphasizing learner agency, interaction, and scaffolding (Biggs, 2014; Vygotsky, 1978). In EMI contexts, these principles become especially salient because students' linguistic proficiency directly impacts their capacity to engage with complex disciplinary content. Instructors who adapt instructional pacing, simplify linguistic input, and employ multimodal representations effectively lower affective filters, creating environments where non-native speakers can participate meaningfully.

However, the relatively lower scores for Student Autonomy (76% agreement) and Tech Adaptation (74% agreement) suggest that adaptability may be stronger at the level of real-time classroom responsiveness than systematic instructional design. As Cohen et al. (2018) argue, effective EMI teaching demands deliberate planning that integrates content mastery, language scaffolding, and interactive pedagogy rather than relying on spontaneous adjustment alone.

Recent pedagogical innovations such as collaborative online international learning and project-based approaches offer promising models for simultaneously developing disciplinary knowledge and language proficiency while maintaining learner engagement across varying proficiency levels (Chu & Takahashi, 2024). The strong positive correlation between Pedagogical Adaptability and Inclusive Teaching Practices (r = .61) indicates that instructors who demonstrate flexibility in one domain tend to exhibit it across others, suggesting that these competencies develop synergistically rather than in isolation.

Inclusive Teaching Practices in Multilingual EMI Classrooms

The high composite mean for Inclusive Teaching Practices (M = 4.08) reflects sustained instructor attention to equity in linguistically diverse settings. The finding that 90% of instructors employ scaffolding techniques and 88% prioritize safe learning environments indicates widespread recognition that EMI implementation must be accompanied by deliberate strategies to mitigate linguistic barriers.

The prominence of scaffolding, clarification support, and multimodal representation aligns with Universal Design for Learning (UDL) principles advocating multiple means of engagement, representation, and action/expression (Rose & Meyer, 2002). In EMI classrooms, these strategies function as "linguistic bridges," enabling students with varying English proficiency levels to access disciplinary content without compromising conceptual rigor. By prioritizing language adaptation and understanding checks, instructors effectively operationalize Florian and Black-Hawkins' (2011) conceptualization of inclusive pedagogy as fundamentally relational, grounded in recognizing learner diversity as a resource rather than a deficit.

However, the relatively lower agreement levels for Background Sensitivity (74%) and Equitable Participation (76%) suggest that while instructors excel at technical and linguistic scaffolding, culturally responsive dimensions of inclusion may require further development. This pattern reflects a broader challenge within EMI scholarship: the tendency to frame inclusion primarily in linguistic rather than socio-cultural terms. As UNESCO (2021) emphasizes, genuinely inclusive pedagogy requires attending not only to language proficiency differences but also to students' varied epistemological traditions, prior educational experiences, and cultural frames of reference.

Recent research examining AI-enhanced EMI classrooms underscores the importance of coupling technological affordances with culturally sensitive instructional design (Rahman & Thompson, 2024). While AI-driven tools can provide adaptive scaffolding and alternative content representations, their effectiveness depends on instructors' capacity to critically evaluate whether such tools align with principles of equity and fairness (Ng et al., 2021). The correlation between AI Integration and Inclusive Teaching Practices ($r = .48$), though moderate, suggests that instructors who embrace technological innovation also tend to prioritize equitable participation, indicating potential synergies between digital competence and inclusion-oriented pedagogy.

The ROAD-MAPPING framework developed by Dafouz and Smit (2020) offers a valuable lens for understanding these findings. By positioning EMI as a comprehensive pedagogical undertaking requiring coordinated attention to epistemological, sociological, and pedagogical dimensions, the framework challenges reductive notions that position EMI as mere language replacement. Instead, it situates instructor competency as a systemic concern shaped by institutional cultures, linguistic ideologies, and resource structures beyond individual control.

An Integrated Competency Framework for EMI Readiness

The statistically significant positive correlations among AI Integration Competencies, Pedagogical Adaptability, and Inclusive Teaching Practices provide empirical support for the TPACK framework's core proposition: that effective teaching in technology-mediated environments depends on the dynamic interaction among Content Knowledge, Pedagogical Knowledge, and Technological Knowledge rather than their independent development (Mishra & Koehler, 2006).

The strongest correlation observed between Pedagogical Adaptability and Inclusive Teaching Practices ($r = .61$) suggests these competencies develop in tandem, reinforcing the argument that flexibility in instructional design and commitment to equitable participation are mutually constitutive rather than separate professional capacities. Similarly, the moderate correlations between AI Integration and both Pedagogical Adaptability ($r = .54$) and Inclusive Teaching ($r = .48$) indicate that technological competence, when pedagogically grounded, can enhance rather than undermine inclusive practice.

This integrated competency profile challenges prevailing EMI approaches that prioritize language proficiency as the primary determinant of instructional effectiveness. While linguistic competence remains necessary, findings suggest that EMI readiness is more accurately understood as a multidimensional construct encompassing digital literacy, pedagogical flexibility, and inclusion-oriented practice. The theoretical framework employed in this studyin tegrating TPACK with UDL, SAMR, and translanguaging theory offers a robust model for conceptualizing these interrelationships.

The application of translanguaging theory within this framework is particularly significant. By recognizing that enabling students to utilize their full linguistic repertoires constitutes an asset for deep learning rather than a deficit to be remediated (García & Wei, 2014), the framework positions translanguaging as a crucial component of instructors' Pedagogical Content Knowledge (PCK). This perspective directly addresses EMI's core pedagogical challenge: teaching content and language simultaneously without compromising either dimension (Macaro et al., 2018).

The institutional comparison revealing modest differences in AI familiarity and inclusive teaching practices between universities underscores the importance of local contexts in shaping readiness profiles. These findings suggest that pedagogical competence cannot be fully understood independent of the institutional cultures, professional development opportunities, and resource structures within which instructors operate. This contextualized understanding challenges one-size-fits-all professional development models, indicating that effective EMI capacity-building must be responsive to institutional variation rather than premised on standardized interventions.

Conclusion

This study examined the pedagogical and AI-aware readiness of university instructors teaching disciplinary content through English-Medium Instruction in Moroccan higher education. Findings indicate moderate-to-high perceived readiness levels (M = 3.85) across three interconnected domains: AI integration competencies, pedagogical adaptability, and inclusive teaching practices. However, this readiness is not uniform. Instead, it reflects a developing professional profile in which some competencies, particularly pedagogical adaptability and inclusive scaffolding, appear more firmly established, while others, notably critical AI literacy and culturally responsive pedagogy, remain areas requiring continued development.

The study makes several important contributions to EMI scholarship. First, it demonstrates that instructor readiness in EMI contexts cannot be reduced to content expertise or language proficiency alone but must be understood as a multidimensional construct shaped by the dynamic interaction among digital competence, pedagogical flexibility, and inclusion-oriented practice. Second, it provides empirical support for integrating TPACK with UDL, SAMR, and translanguaging theory as a comprehensive framework for assessing EMI instructor competencies. Third, by documenting significant positive correlations among readiness dimensions, it challenges fragmented approaches to professional development, indicating that technological, pedagogical, and inclusive competencies develop synergistically rather than in isolation.

The findings also reveal important tensions. While instructors demonstrate functional AI literacy and employ AI tools to support instructional preparation, deeper pedagogical integration and critical ethical engagement remain less consolidated. Similarly, while scaffolding techniques are widely implemented, culturally responsive dimensions of inclusive pedagogy require further reinforcement. These patterns suggest that current professional development initiatives may emphasize technical proficiency and linguistic support at the expense of critical reflection and culturally grounded practice.

In sum, this study contributes to ongoing EMI debates by offering a nuanced, empirically grounded account of what instructor readiness entails in technologically evolving and linguistically diverse higher education environments. While instructors are making meaningful progress, sustained institutional support remains essential for deepening AI integration, consolidating adaptive pedagogy, and enacting inclusive teaching practices consistently and equitably.

IMPLICATIONS

Practical Implications for Faculty Development

Findings carry important implications for the design and implementation of professional development programs supporting EMI instructors. The moderate readiness levels observed across AI integration, pedagogical adaptability, and inclusive teaching suggest that capacity-building initiatives must move beyond fragmented, skill-based workshops toward sustained, integrative programs addressing these competencies coordinately.

Integrated Professional Development Models. Given the significant positive correlations among readiness dimensions, professional development should be designed to foster synergies among digital competence, pedagogical flexibility, and inclusive practice rather than treating them as discrete skill sets. Programs might adopt community of practice models where instructors collaboratively explore how AI tools can support linguistically responsive pedagogy, share strategies for scaffolding complex content in multilingual classrooms, and critically examine the ethical implications of technology-mediated teaching.

Moving Beyond Instrumental AI Training. The gap between functional AI adoption and critical AI literacy indicates an urgent need for professional development that transitions instructors from basic operational training toward sophisticated critical evaluation of AI-generated content. Training programs should explicitly address algorithmic bias, data privacy, epistemological implications of AI-mediated knowledge production, and strategies for evaluating whether AI tools align with principles of equity and inclusion. This is particularly crucial in EMI contexts, where uncritical reliance on AI-generated materials risks perpetuating linguistic or cultural inappropriateness.

Scaffolding Content-Language Integration. While instructors demonstrate strong subject matter confidence, the lower readiness levels for Content-Language Balance indicate a need for targeted support in integrating disciplinary teaching with language development. Professional development might incorporate translanguaging strategies, Content and Language Integrated Learning (CLIL) methodologies, and evidence-based approaches for making complex disciplinary concepts accessible without oversimplifying content. Collaborative planning sessions pairing content specialists with applied linguists could foster deeper understanding of how to teach disciplinary literacy alongside disciplinary knowledge.

Culturally Responsive Pedagogy. The relatively lower agreement levels for Background Sensitivity suggest that professional development should extend beyond linguistic scaffolding to address the socio-cultural dimensions of inclusive teaching. Programs might incorporate critical reflection on how cultural frames of

reference shape disciplinary knowledge construction, strategies for recognizing and validating diverse epistemological traditions, and approaches for fostering equitable participation in multilingual, multicultural classrooms.

Peer Learning and Reflective Practice. Given the institutional differences observed between universities, professional development might benefit from establishing cross-institutional networks enabling instructors to share context-specific strategies, collaboratively address common challenges, and engage in sustained reflective practice. Such networks could facilitate the exchange of pedagogical innovations such as collaborative online international learning and project-based EMI approaches that have shown promise in simultaneously developing content knowledge and language proficiency.

Institutional and Policy Implications

Reconceptualizing EMI Policies. Findings challenge prevailing EMI policies that prioritize language proficiency as the primary criterion for instructor selection and evaluation. Institutional policies should recognize that effective EMI teaching requires multidimensional competencies encompassing technological literacy, pedagogical adaptability, and commitment to inclusive practice. Faculty evaluation frameworks might incorporate assessment of instructors' capacity to integrate AI responsibly, adapt instruction to diverse learners, and employ evidence-based scaffolding strategies.

Infrastructure and Resource Allocation. The moderate AI readiness levels underscore the importance of institutional investment in technological infrastructure, access to AI tools, and ongoing technical support. However, infrastructure alone is insufficient. Institutions must also allocate resources for sustained professional development, course release time enabling instructors to redesign curricula incorporating inclusive and technology-enhanced pedagogy, and recognition systems rewarding pedagogical innovation.

Curriculum Redesign. EMI program curricula should be reconceptualized to integrate AI ethics, inclusive instructional design, and linguistically responsive pedagogy alongside disciplinary content. This might involve developing interdisciplinary courses examining the intersection of technology, language, and pedagogy, creating collaborative planning structures pairing EMI instructors with educational technologists and applied linguists, and establishing institutional repositories of pedagogically vetted, culturally appropriate teaching materials.

Reducing Instructor Burden. The findings reveal that many instructors are compensating individually for broader linguistic and structural challenges beyond their control. Institutions should implement systemic supports reducing this burden, such as collaborative teaching models, team-based course design, formalized mentoring programs for novice EMI instructors, and policies ensuring adequate preparation time for developing linguistically accessible materials.

Language Support Services. While instructor readiness is essential, institutional responsibility extends to providing robust language support services for students. This might include embedded language specialists co-teaching EMI courses, discipline-specific writing centers, peer tutoring programs, and pre-sessional academic English programs designed to develop both general and discipline-specific language proficiency.

Research Implications and Future Directions

Mixed-Methods Research Designs. This study's reliance on self-reported data, while valuable for understanding instructor perceptions, does not fully capture actual classroom practices. Future research should employ mixed-methods designs integrating surveys with classroom observations, analysis of teaching artifacts (lesson plans, assessment tasks, instructional materials), student focus groups, and learning outcome measures. Such designs would enable triangulation between perceived and enacted readiness, revealing potential gaps between instructors' self-assessments and observable practice.

Longitudinal Studies. Cross-sectional data cannot illuminate how readiness evolves over time or in response to professional development interventions. Longitudinal research tracking instructors' competency development across multiple semesters or academic years would reveal trajectories of growth, identify critical periods for intervention, and clarify whether observed correlations among readiness dimensions reflect developmental interdependencies or independent trajectories.

Comparative and Cross-Cultural Research. The study's focus on Moroccan universities, while contextually rich, limits generalizability. Comparative research across diverse multilingual contexts—examining, for example, how EMI readiness manifests differently in Asian, European, African, and Latin American settings would clarify which findings are context-specific and which reflect more generalizable patterns. Such research could also illuminate how national language policies, institutional cultures, and disciplinary traditions shape instructor readiness.

Intervention Studies. While descriptive research establishes baseline readiness levels, experimental and quasi-experimental designs examining the effects of specific professional development interventions would provide stronger evidence for practice recommendations. Intervention studies might compare the effectiveness of different training models (e.g., intensive workshops vs. sustained communities of practice), examine how various components of integrated professional development contribute to readiness development, or test whether targeting one competency domain (e.g., AI literacy) produces spillover effects in others (e.g., inclusive teaching).

Student-Centered Research. This study focused exclusively on instructor perspectives. Future research should foreground student experiences, examining how instructor readiness levels relate to student learning outcomes, satisfaction, engagement, and perceptions of inclusion. Student-centered research might also explore how different scaffolding strategies, AI-mediated supports, and inclusive practices impact students with varying language proficiency levels, revealing which instructional approaches most effectively support equitable learning.

Disciplinary Variation. The study aggregated data across science, technology, and management disciplines. Future research might examine whether readiness profiles, pedagogical strategies, and professional development needs vary systematically by discipline. Such research could reveal, for example, whether STEM instructors face distinct challenges compared to social science or humanities instructors, informing more targeted, discipline-responsive professional development.

Technology-Enhanced EMI Pedagogies. Emerging AI technologies continue to reshape higher education. Future research should examine how novel tools such as advanced language models, automated translation systems, AI-driven assessment platforms, and immersive learning environments can be leveraged pedagogically in EMI contexts. Such research should maintain critical attention to equity, accessibility, and ethical considerations, ensuring that technological innovations enhance rather than undermine inclusive practice.

Policy Analysis. Finally, research examining the relationship between national EMI policies, institutional implementation strategies, and instructor readiness would illuminate how macro-level policy decisions shape micro-level classroom realities. Such research might compare countries with varying approaches to EMI expansion, examine how policy rhetoric aligns (or misaligns) with instructional practice, and identify policy features most conducive to sustainable, equitable EMI implementation.

Study Limitations

This study presents several limitations requiring consideration when interpreting findings. First, reliance on self-reported data may be affected by response bias, particularly social desirability bias, whereby instructors may rate their competencies more favorably than actual classroom practices reflect. While self-perceptions remain important indicators of readiness orientation, they may not fully capture enacted practice. Future research employing mixed-methods designs incorporating classroom observations, teaching artifact analysis, and student perspectives would provide more comprehensive readiness assessment.

Second, the study's explanatory descriptive design, while useful for identifying and characterizing instructors' competency profiles, does not permit causal inference or full explanation of underlying factors shaping pedagogical

readiness. Longitudinal research tracking instructor development over time could illuminate how readiness evolves with professional development interventions and institutional support changes.

Third, the use of non-probability purposive and convenience sampling limits generalizability beyond participating institutions. Because the sample was restricted to instructors from selected Moroccan universities actively implementing EMI, findings may not fully represent the broader EMI practices landscape across Moroccan higher education or other multilingual contexts. Future studies employing larger, more diverse samples across multiple institutional and national contexts would strengthen external validity and enable comparative analyses illuminating how contextual factors shape readiness profiles.

Finally, while correlation analysis revealed significant associations among readiness dimensions, the study design does not establish causality. Experimental or quasi-experimental research designs examining professional development interventions' effects on specific competency domains would provide stronger evidence for practice recommendations.

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