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# The AI Promise in Moroccan Public Schools: ELT Teachers Between Innovation and Constraint

**Hajar Talouizet** * **and Mohammed Moubtassime**

CREDIF laboratory, Faculty of Letters and Human Sciences, Dhar El Mahraz, Sidi Mohamed Ben Abdellah University, Fes, Morocco

hajar.talouizet@usmba.ac.ma

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## Abstract

Artificial Intelligence (AI) is rapidly reshaping English Language Teaching (ELT) worldwide, prompting increasing attention to its integration within Moroccan public secondary education. Guided by Rogers' Diffusion of Innovations Theory (2003), this study examines public high school teachers' readiness for AI integration by exploring their adoption practices, perceptions, and the institutional barriers they encounter. A mixed-methods questionnaire, including both closed- and open-ended items, was administered to 97 public sector EFL teachers. Quantitative findings indicate a high level of grassroots engagement, with a large majority of respondents reporting active use of AI tools in their professional practice. In addition, most consider school-wide integration of AI to be feasible under current educational conditions. However, a Chi-square test of independence revealed a statistically significant association, suggesting a notable gap between usage and perceived effectiveness. While many teachers adopt AI in their preparatory routines, 54.6% report that it does not effectively address existing classroom challenges. Qualitative findings, interpreted through Rogers' framework, point to structural constraints that limit full integration. These include infrastructural limitations, techno-pedagogical challenges, and concerns about pedagogical effectiveness. Participants also expressed concerns regarding students' overreliance on AI, which they perceive as potentially undermining independent learning. The study concludes that although Moroccan EFL teachers demonstrate strong digital readiness and willingness to innovate, AI integration remains constrained by systemic and institutional limitations. Effective implementation requires strengthening infrastructure, providing localized pedagogical support, and aligning policy with classroom realities.

**Keywords**: ELT, artificial intelligence, Moroccan public schools, barriers, teacher perceptions

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# 1. Introduction

## 1.1. Background and rational:

In recent years, the Moroccan public education sector has experienced significant structural pressures driven by socio-technological change, most notably illustrated by the rapid shift toward emergency remote and online teaching during the COVID-19 period. As a result, public educational institutions now operate within a more complex and evolving pedagogical environment. Within this global context, Artificial Intelligence (AI) is increasingly reshaping language teaching practices, placing education systems such as Morocco at a critical point of digital transition.

However, the rapid development of AI technologies has outpaced the translation of national educational policies into sustainable classroom practices in English Language Teaching (ELT). Although macro-level reforms emphasize digital transformation, a persistent gap remains between policy intentions and classroom realities. This gap is particularly evident in resource-constrained public schools, where infrastructural and pedagogical limitations affect implementation.

This study is grounded in the assumption that meaningful educational innovation cannot be understood solely through its theoretical potential. Instead, it requires an examination of the interaction between policy expectations and the material conditions of classroom practice.

To analyze this dynamic, the study adopts Rogers' Diffusion of Innovations Theory (2003). Focusing on key attributes such as relative advantage and compatibility, the framework is used to examine how institutional, infrastructural, and pedagogical conditions shape the adoption of AI in Moroccan public secondary schools. This perspective shifts the analysis from individual teacher resistance to broader systemic factors that facilitate or constrain the diffusion of educational innovation.

## 1.2. Research problem:

Despite rapid global advancements in educational technology, the integration of Artificial Intelligence in Moroccan public secondary school English Language Teaching remains largely limited to early-stage classroom implementation. A clear paradox has emerged: while teachers increasingly use AI for preparatory and administrative purposes, its impact within classroom practice remains limited. This study examines the factors underlying this discrepancy between

adoption and pedagogical use. Drawing on Rogers' Diffusion of Innovations Theory (2003), the problem is framed as a compatibility gap between AI tools and the contextual conditions of public education. This gap is reflected in persistent infrastructural constraints and classroom-level pedagogical limitations. These conditions reduce the practicality of AI use in instructional settings, despite its perceived usefulness in professional preparation. As a result, teacher engagement with AI remains largely confined to individual and off-classroom practices rather than integrated instructional use.

### 1.3. Research Objectives:

- **Objective 1:** To investigate Moroccan ELT teachers' perceptions and attitudes regarding the pedagogical utility and effectiveness of Artificial Intelligence in the classroom.
- **Objective 2:** To explore and categorize the challenges that educators foresee in integrating AI tools within the public high school context.

### 1.4. Research Questions:

- **Question 1:** What are ELT teachers' perceptions of the use of Artificial Intelligence in teaching?
- **Question 2:** What challenges or obstacles do teachers foresee in integrating AI in public schools?

## 2. Literature Review

### 2.1. Abridged literature review

Education systems worldwide continue to exhibit structural inertia when responding to technological innovation, particularly within traditionally organized schooling models. Although Artificial Intelligence has been widely promoted as a catalyst for educational transformation, its integration remains uneven and often superficial in practice. Early conceptualizations of AI in education emphasized its capacity to enable personalized and adaptive learning environments. Systems such as Knewton illustrate how AI can dynamically adjust instructional content and pacing according to learner performance (Chen et al., 2017), while Intelligent Tutoring Systems (ITS) replicate aspects of human tutoring by adapting feedback and instructional strategies in real time (VanLehn et al., 2005). However, despite these

advances, such systems have not yet achieved widespread pedagogical integration in mainstream classrooms, largely due to institutional and contextual constraints.

In Second Language Acquisition (SLA), AI is often associated with reducing learners' affective barriers, particularly anxiety and inhibition in classroom participation. By providing interactive and non-judgmental environments, AI-powered tools may contribute to lowering the "affective filter" and encouraging language production in low-risk contexts. Nevertheless, this pedagogical promise remains contingent on how effectively teachers mediate these tools within real classroom conditions, where technological access, training, and curriculum constraints vary significantly.

Beyond individual learning processes, recent literature emphasizes AI's expanding role in assessment, feedback, and educational management. AI-based systems are increasingly capable of delivering immediate formative feedback, supporting adaptive instruction, and generating large-scale learning analytics (Rudolph et al., 2023). From a technical perspective, these developments are grounded in machine learning, natural language processing, and deep learning techniques that allow systems to analyze learner behavior, identify patterns, and predict performance trajectories (Zhang & Aslan, 2021). Adaptive learning environments further extend this logic by adjusting task difficulty and sequencing in response to learner progress (Guo et al., 2023). However, the pedagogical validity of such automated adaptation depends heavily on contextual interpretation by educators, which is often underexplored in implementation studies.

Importantly, AI is frequently framed as a tool for equity and inclusion, offering expanded educational access to learners in marginalized or underserved contexts, including students with disabilities, refugees, and those in remote areas. While this discourse is compelling, it often assumes infrastructural readiness that is not universally available. In many educational systems, particularly in developing contexts, digital inequality and limited institutional capacity constrain the realization of these inclusive potentials.

Similarly, AI-supported collaborative learning environments have been praised for enabling geographically distributed interaction and asynchronous knowledge construction. Systems that analyze online discussion forums can provide teachers with insights into student participation and discourse patterns (UNESCO, 2019). Yet, such monitoring raises questions about data interpretation, teacher workload, and the pedagogical use of analytics, which remain under-theorized in much of the literature.

In assessment practices, AI has been increasingly adopted for automated grading, including essay evaluation and standardized testing. Large-scale implementations, such as those reported in China and Latin America, demonstrate both the scalability and efficiency of such systems (Chen, 2018; Perera & Aboal, 2018). However, despite reported high levels of agreement between automated and human scoring, concerns persist regarding transparency, cultural bias, and the reduction of writing to measurable linguistic features. Within English Language Teaching (ELT), scholars caution that automated feedback must be critically mediated to avoid reducing writing development to algorithmic correction rather than communicative competence development (Pack & Maloney, 2024). Consequently, AI is increasingly conceptualized not as a replacement for teacher assessment but as a complementary "teaching partner" that supports, rather than replaces, pedagogical judgment (Song, 2024).

Within Computer-Assisted Learning (CAL), AI also enables the mapping of learner profiles by identifying individual strengths, weaknesses, and learning preferences (Schittek Janda et al., 2001). While this supports differentiation, it also raises concerns regarding data reductionism, where complex learner identities are simplified into algorithmic profiles.

At the institutional level, international frameworks such as UNESCO's ICT Competency Framework for Teachers emphasize the importance of integrating digital competencies into professional practice (UNESCO, 2019). However, emerging research suggests that general ICT competence is no longer sufficient. Instead, educators require AI literacy that enables critical evaluation, pedagogical adaptation, and ethical integration of AI tools in context-specific classroom environments (Kohnke & Zou, 2025). This shift highlights a growing gap between policy-level digital competence frameworks and the lived realities of classroom implementation.

### 2.2. Theoretical Framework: Rogers' Diffusion of Innovations Theory

To systematically interpret the findings, this study draws on Rogers' Diffusion of Innovations Theory (Rogers, 2003), which explains how, why, and at what rate new ideas and technologies spread within social systems. The theory emphasizes that adoption is shaped not only by individual willingness but also by perceived attributes of the innovation.

Rogers (2003) identifies five key characteristics that influence adoption: relative advantage, compatibility, complexity, trialability, and observability. This framework is particularly useful for understanding teachers' engagement with Artificial Intelligence, as it shifts the focus away

from simple notions of acceptance or resistance and toward a more nuanced process of negotiation between innovation and context.

In this study, teachers' responses are interpreted through the interaction between these attributes and the constraints of the school environment. Rather than reflecting resistance to innovation, the findings suggest structural tensions across key dimensions of the theory.

First, a compatibility gap emerges between AI tools and the realities of public-school contexts, including curricular constraints, infrastructural limitations, and institutional practices. Second, a tension between relative advantage and complexity is evident: while AI is perceived as highly beneficial for tasks such as lesson preparation and administrative work, its classroom implementation is hindered by technical difficulties and limited support systems.

Overall, Rogers' framework helps reframe the findings as a process of constrained diffusion, where adoption is driven by perceived usefulness but moderated by systemic and organizational barriers that limit full integration into classroom practice.

## 3. Research Methodology

A progressively exploratory mixed-methods design was used in this study. It was carried out in two stages. The first stage was purely qualitative. Eight Moroccan public high school ELT instructors participated in semi-structured interviews to determine institutional barriers and fundamental professional beliefs. These theme insights were employed in the quantitative step, which was the second stage, to create an online survey (N = 97). For further qualitative depth, the instrument included an open-ended "Other" option in addition to categorized choices based on the interviews. The triangulation of data from individual teacher narratives to a statistically significant overview of AI integration inside the Moroccan educational ecosystem was made possible by this dual-layered methodology.

The data was subjected to thematic analysis for the qualitative phase in order to find systemic obstacles and recurrent professional perceptions. Regarding the quantitative phase, descriptive statistics were the main focus of quantitative analysis utilizing "Excel" and "Jamovi". Also, AI tools such as ChatGPT and Gemini were used only for language editing and improving the clarity and academic style of the manuscript. All analytical decisions and interpretations remain entirely the responsibility of the researcher.

# 4. Results and Discussion

## 4.1. Phase 1: Qualitative Findings

The qualitative phase revealed a pronounced disconnect between teachers' individual willingness to engage with artificial intelligence and the institutional conditions necessary for its effective integration. While participants demonstrated considerable digital initiative and adaptability, their efforts were largely constrained by structural, pedagogical, and organizational limitations. The thematic analysis generated two overarching themes.

### 4.1.1. *Theme 1: Proactive Professional Agency*

Participants consistently portrayed themselves as active and self-directed users of AI technologies. Rather than perceiving AI as a threat to their professional role, most viewed it as a practical cognitive assistant capable of enhancing instructional efficiency and supporting daily professional responsibilities.

**+AI for instructional preparation.** Teachers reported using AI tools to reduce the time required for lesson planning and assessment design. For example, Participant 3 explained:

> *"I use chatbots to generate three different versions of the same exam in minutes..."*

This statement illustrates how AI is being leveraged to streamline routine pedagogical tasks, allowing educators to dedicate more time to instructional decision-making and student support.

**+AI for professional problem-solving.** Beyond content generation, participants described employing AI as a source of guidance for classroom management and workplace challenges. Participant 5 noted:

> *"I usually ask ChatGPT how to deal with classroom disruptions or with other day-to-day problems at work..."*

Such accounts suggest that teachers increasingly perceive AI as a form of on-demand professional support, capable of supplementing traditional sources of pedagogical advice. Collectively, these narratives indicate a high degree of professional agency, with teachers independently exploring innovative applications of AI despite the absence of formal institutional encouragement.

#### 4.1.2. *Theme 2: Systemic Friction Points*

While teachers demonstrated enthusiasm toward AI adoption, their experiences simultaneously revealed multiple structural barriers that hinder meaningful implementation. These challenges later informed the survey instrument and emerged as five interconnected sub-themes.

**+Infrastructural limitations.** Participants described persistent deficiencies in digital infrastructure, particularly unreliable internet connectivity and insufficient technological equipment. Participant 2 remarked:

> *"I have the lesson plan on my phone, but the school has poor signal and there's a lack of projectors.."*

This finding suggests that access to AI is constrained not merely by the availability of digital tools but by the broader technological ecosystem within which teachers operate.

**+Pedagogical uncertainty and implementation gaps.** Several participants expressed uncertainty regarding how AI could be effectively integrated into classroom practice. As Participant 7 stated:

> *"I don't know how to use the AI tools meant for teaching inside the classrooms, nor how can it be implemented within the classroom activities..."*

This reflects a broader absence of pedagogical guidance, professional development opportunities, and curriculum-aligned frameworks for AI integration.

**+Lack of technical support structures.** Teachers reported being solely responsible for resolving technical difficulties, often without access to specialized assistance. Participant 1 explained:

> *"We don't have technical staff in our high school... sometimes just using data show is still impossible."*

The absence of technical intermediaries increases teachers' workload and may discourage experimentation with new technologies.

**+Concerns about student dependency and academic integrity.** Participants also voiced reservations regarding the educational consequences of unrestricted AI use by students. Participant 4 observed:

> *"I worry that students blindly rely on AI. Cause if they do, it means the good quality essays they provide is not their production and I'm just correcting AI work..."*

Such concerns reveal an underlying tension between the pedagogical opportunities offered by AI and fears that these tools may undermine authentic learning, critical thinking, and independent language production.

#### 4.1.3. *Synthesis of Findings Through the Lens of Diffusion of Innovations Theory*

The interpretation of the findings was informed by Rogers' Diffusion of Innovations Theory (Rogers, 2003), which explains how innovations spread through a social system over time and emphasizes the role of organizational support, communication channels, and adopter characteristics in facilitating or hindering adoption. The participants in this study exhibited characteristics commonly associated with early adopters, demonstrating initiative, experimentation, and a willingness to explore AI independently for instructional and professional purposes. Their narratives suggest that AI is perceived as offering a relative advantage through increased efficiency, rapid content generation, and access to pedagogical support.

However, the findings also reveal that the diffusion process remains incomplete due to systemic constraints. According to Rogers (2003), successful adoption requires a supportive organizational environment that facilitates implementation and reduces uncertainty. In the present study, inadequate infrastructure, limited technical support, insufficient training opportunities, and the absence of clear pedagogical guidelines function as barriers that slow the transition from individual experimentation to institutionalized practice. Furthermore, concerns regarding student overreliance on AI and academic integrity contribute to uncertainty about the innovation's long-term educational value.

Consequently, AI integration within Moroccan public secondary schools appears to be situated at an early stage of diffusion, where adoption is largely driven by individual innovators and early adopters rather than by systemic educational policies. The findings suggest that while teachers possess the motivation to engage with AI, the broader educational system has not yet developed the structures necessary to support widespread and sustainable implementation. In this sense, the principal obstacle is not resistance to innovation but the absence of institutional mechanisms capable of transforming isolated adoption into collective educational change.

### 4.2. Phase 2: Quantitative Findings

The quantitative phase (N = 97) presents a descriptive and inferential statistical analysis of Artificial Intelligence adoption and perceived barriers among Moroccan EFL teachers. Given the nominal nature of the variables, the analysis primarily relies on frequency distributions, percentage comparisons, and Chi-square tests of independence to examine associations between key constructs. This phase provides a broader empirical overview of teachers' AI use, perceptions of effectiveness, and beliefs regarding the feasibility of AI integration in public education.

#### 4.2.1. *Cross-Tabulation 1: Practical AI Usage & Perceived Effectiveness*

This matrix tests whether active AI users are significantly more likely to believe that AI can overcome traditional teaching and behavioral challenges.

Chi-Square Test of Independence: $\chi^2(1) = 5.941$, p = 0.0148 ($p < 0.05$)

As shown in table 1, active AI users exhibit a significantly more optimistic view of AI's problem-solving capacity compared to non-users, though a pragmatic portion of users still recognize institutional limits.

***Table 1.*** *AI Usage and Perceived Effectiveness*

| AI Usage Status | AI Cannot Solve Challenges (No) | AI Can Solve Challenges (Yes) | Total |
|---|---|---|---|
| **Non-User** | 20 (20.6%) | 6 (6.2%) | 26 |
| **User** | 33 (34.0%) | 38 (39.2%) | 71 |
| **Total** | 53 (54.6%) | 44 (45.4%) | 97 |

#### 4.2.2. *Cross-Tabulation 2: Practical AI Usage & Perceived Integration Feasibility*

This matrix tests whether hands-on experience with AI influences an educator's belief in the structural feasibility of integrating these tools into public schools.

Chi-Square Test of Independence: $\chi^2(1) = 11.345$, p = 0.0008 ($p < 0.001$).

Similarly, table 2 demonstrates a strong dependency between active AI usage and positive feasibility perceptions. Educators with practical experience are drastically more confident that AI can be systematically integrated into the school framework.

*Table 2. AI Usage and Integration Feasibility*

| AI Usage Status | Integration is Not Feasible (No) | Integration is Feasible (Yes) | Total |
|---|---|---|---|
| **Non-User** | 15 (15.5%) | 11 (11.3%) | 26 |
| **User** | 14 (14.4%) | 57 (58.8%) | 71 |
| **Total** | 29 (29.9%) | 68 (70.1%) | 97 |

## 5. Discussion

To evaluate the relationships between nominal variables, a series of **Pearson's Chi-Square Tests of Independence** were conducted. First, the association between practical AI adoption and perceived educational efficacy was analyzed. The cross-tabulation revealed a statistically significant relationship, $\chi^2(1) = 5.941$, p = 0.0148 (p < 0.05), indicating that active AI users hold a significantly more favorable view of the technology's capacity to overcome traditional classroom constraints than non-users. Second, a highly significant association was observed between practical AI usage and institutional integration feasibility, $\chi^2(1) = 11.345$, p = 0.0008 (p < 0.001). Educators who actively utilize AI tools reported a profoundly higher confidence level regarding the structural integration of these technologies into secondary school environments (58.8%) compared to their non-using peers (11.3%). These empirical metrics confirm that teacher perceptions are strongly dependent on direct, practical experience with AI tools rather than abstract institutional expectations.

The empirical distribution of obstacles in figure 1 provides a clear structural explanation for the pragmatic skepticism highlighted by the previous Chi-Square tests. While actual tool experience strongly drives positive attitudes toward AI's long-term integration feasibility ($\chi^2(1) = 11.345$, p = 0.0008 p < 0.001) educators face substantial operational barriers that explain why the majority (54.6%) remain convinced that AI cannot independently solve deep-seated educational challenges ( $\chi^2(1) = 5.941$, p = 0.0148 p < 0.05)

This hesitation is directly tied to the severe material and systemic constraints visible in the data. First, **Infrastructural Precariousness** is emerging as the most critical barrier, an overwhelming **84.5%** (n=82) of EFL teachers flag severe physical infrastructure deficits within Moroccan public secondary schools.

Second**, Techno-Pedagogical and Efficacy Misalignment.** Operational friction is similarly high, with **68.0%** (n=66) reporting clear mismatches between available AI tools and the

curriculum, and **62.9%** (n=61) expressing explicit anxieties regarding its actual impact on student learning efficacy.

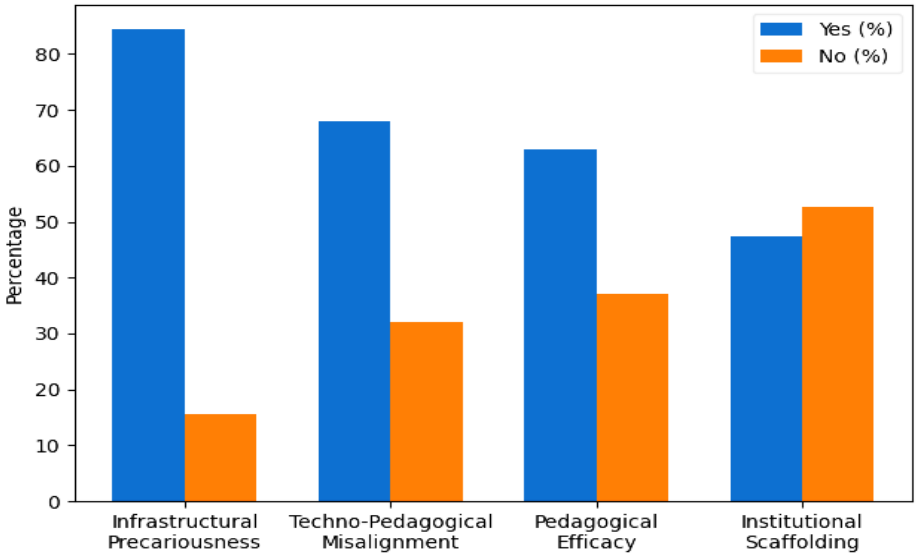


***Figure1.*** *Categorized Obstacles to AI Integration (N=97)*

Third**, Institutional Scaffolding Deficits.** This is the only barrier where the cohort splits nearly evenly, with **47.4%** (n=46) actively identifying an absence of official, structured administrative training and support frameworks.

All in all, these statistical insights paint a highly coherent picture: EFL teachers are eager, active users of AI who recognize its institutional potential, but they are severely bottle-necked by immediate, physical school deficits and a lack of official pedagogical guidance.

## 6. Conclusion

The empirical and qualitative findings of this study converge on a very crucial insight. The digitalization of public education cannot be explained by software adoption alone, but is strongly conditioned by the availability of physical infrastructure and institutional support systems. The results reveal a noticeable structural gap between teachers' individual professional practices and the material realities of the public classroom context.

While teacher readiness and voluntary engagement with Artificial Intelligence are relatively high, with many participants actively integrating AI tools into their preparatory and administrative work, this bottom-up momentum appears constrained by persistent infrastructural limitations within schools. Issues such as unstable connectivity, limited access to digital equipment, and the absence of technical support staff significantly restrict the translation of individual innovation into sustained classroom practice.

In addition, the findings suggest a functional divergence in AI usability across disciplines, where language education appears more naturally compatible with text-based AI systems, whereas other subject areas encounter greater operational and pedagogical constraints. This highlights that AI integration is not a uniform process, but one that is shaped by disciplinary needs, task structures, and classroom realities.

Overall, the study challenges overly general assumptions embedded in standardized digital literacy and AI integration frameworks. Instead, it suggests that successful implementation depends on a context-sensitive process of pedagogical adaptation, in which teachers act as mediators who critically interpret, adjust, and align AI-generated outputs with curricular expectations, cultural norms, and institutional constraints.

Until educational policy, infrastructure, and administrative support systems evolve in parallel with teacher-led innovation, the transformative potential of Artificial Intelligence is likely to remain partially realized, primarily confined to individual professional practice rather than fully embedded within classroom pedagogy.

### 6.1. Pedagogical, Institutional, and Global Implications

This study has several pedagogical and institutional implications that, while grounded in the Moroccan context, may also be relevant to other resource-constrained educational systems.

At the global level, the findings suggest that successful digital transformation in education depends heavily on the availability of stable infrastructure. Limitations in connectivity, equipment, and technical maintenance may hinder effective AI integration and risk reinforcing rather than reducing existing digital inequalities.

The results also highlight the need to move beyond standardized approaches to AI integration. Since AI systems are trained on broad and often non-local datasets, their outputs may not fully align with local curricula or cultural and pedagogical contexts. This underscores the importance of developing context-sensitive frameworks that support teachers in adapting AI-generated content to local educational needs.

Institutionally, the findings point to the importance of strengthening in-school technical support systems. Reducing the technical and administrative burden on teachers is essential to enable meaningful pedagogical innovation and sustained use of AI tools in classroom practice.

Finally, the study suggests that teacher education programs should extend beyond basic AI literacy to include skills in pedagogical adaptation, critical evaluation of AI outputs, and alignment with curriculum and classroom realities. Such competencies are essential for bridging the gap between technological potential and practical implementation.

### 6.2. Ethics, Consent to Participate, and Consent to Publish

This study adhered to ethical research standards. Informed consent was obtained from all participants prior to data collection, and participation was entirely voluntary. Participants were informed of the aims of the study and their right to withdraw at any stage. All data were anonymized to ensure confidentiality, and no identifiable personal information was collected. Consent for publication of anonymized data was also obtained from all participants.

## *Disclosure Statement*

*The authors declare that there is no conflict of interest regarding the publication of this article. No financial, personal, or professional relationships have influenced the research, analysis, or conclusions presented in this work.*

## *Notes on Contributors*

***Hajar Talouizet*** is a PhD student. Laboratoire : Cultures, Représentations, Education, Didactique et Ingénierie de Formation – CREDIF FLDM Fès.

hajar.talouizet@usmba.ac.ma

***Mohammed Moubtassime*** is the Dean of the Faculty of Letters and Human Sciences at FLDM Fez. Morocco.

## *ORCID*

*Hajar Talouizet* *https://orcid.org/0009-0008-2441-3295*

*Mohammed Moubtassime* *https://orcid.org/0000-0002-0211-3442*

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