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Negotiating the Machine: Teacher and Student Resistance to Linguistically Unequal AI in Moroccan Multilingual Education

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ABSTRACT

Educational AI deployment in multilingual contexts often assumes passive adoption, yet little research examines how users respond to systems positioning languages unequally. This ethnographic study investigated teacher and student responses to perceived and observed differences in AI-mediated feedback across French and Arabic versions of an educational platform in Moroccan secondary schools. Eighteen months of fieldwork across four schools included classroom observations (N = 78), interviews (N = 15), and student focus groups (N = 60). Thematic analysis revealed three patterns: teachers developed systematic appropriation strategies in 67% of lessons (78% in Arabic-medium contexts), students recognized differential treatment (78%) and created tactical workarounds, and collective resistance emerged through professional networks and advocacy. Findings challenge technological determinism by showing that teacher and student resistance can function as a professional and experiential critique of platform limitations. Teacher and student adaptations specify requirements for equitable educational AI, offering essential design knowledge that vendors currently ignore.

Keywords: teacher agency , student voice, educational artificial intelligence,

multilingual education, resistance, Morocco

INTRODUCTION

During an observed mathematics lesson at Lycée Ibn Khaldoun in Rabat, Fatima, a mathematics teacher, received AI-generated feedback directed at one of her students: "يجب عليك مراجعة القواعد الأساسية" ("You must review the basic rules"). Rather than accepting the feedback as pedagogically sufficient, she turned off the classroom screen and stated, "Let me show you how I would explain this." The lesson then shifted into a ten-minute code-switched Arabic-French discussion in which Fatima transformed the AI's deficit-oriented comment into an exploration of alternative solution strategies.

In a later explanation of her intervention, she observed that the machine did not understand local learning practices, since it treated errors as problems to be corrected rather than as opportunities for exploration. For her, such an approach did not constitute teaching. Similar incidents, observed in different forms across seventy-eight lessons, point to a critical dynamic largely absent from educational technology policy discourse: teachers and students do not merely accept algorithmic systems passively. Instead, they negotiate, resist, and reshape them through everyday classroom practice.

The deployment of educational AI in Morocco is grounded in assumptions of technological neutrality reflected in the Morocco Digital 2030 strategy. This policy framework presents artificial intelligence as a tool for modernization capable of expanding access to educational quality across linguistic and socioeconomic divisions (Ministry of Industry, Trade and Digital Economy, 2020).

However, this technologically deterministic view overlooks key questions concerning the interaction between AI systems and the complex realities of multilingual classrooms, where French, Arabic, Amazigh, and Darija coexist within hierarchies shaped by colonial histories and contemporary global pressures (Ennaji, 2005). When AI tools are experienced by participants as representing French as a language of possibility and agency while positioning Arabic within frames of obligation, correction, and deficiency, teachers and students are placed in a position where they must either accept or challenge these linguistic framings.

Resistance to such framings is frequently interpreted as technophobia or as a failure of implementation. However, it can also be understood as a rational form of professional judgment and critical pedagogical practice (Ertmer & Ottenbreit-Leftwich, 2010; Selwyn, 2016). When teachers adapt, question, or reject educational technologies, they often draw on pedagogical expertise and contextual knowledge that imported systems fail to capture. This is particularly significant in multilingual postcolonial contexts, where educational technologies may reproduce linguistic biases that threaten educational equity (Priestley et al., 2015; Warschauer, 2004).

Although scholarship on algorithmic bias in education has expanded in recent years (Baker & Hawn, 2022; Benjamin, 2019; Noble, 2018), limited attention has been given to how teachers and students experience and respond to linguistically unequal AI systems in actual classroom settings. Existing research on resistance to educational technology has largely focused on Anglophone contexts (Selwyn, 2021; Williamson, 2017), while critical algorithm studies have often documented bias without fully examining the agency of users who must navigate biased systems. Most importantly, there remains a lack of ethnographic research in North Africa on how teachers and students in multilingual classrooms respond to AI tools that participants experience as privileging colonial languages over indigenous and local ones.

The present study addresses these gaps through eighteen months of ethnographic fieldwork in Moroccan secondary schools. It examines the following research question: In what ways do teachers and students take up, resist, or reframe AI discourses that construct French and Arabic differently in classroom practice? The article first reviews relevant scholarship on teacher agency, critical digital literacy, resistance, and participatory design in Section 2. It then presents the ethnographic methodology in Section 3, followed by findings on appropriation, critical awareness, and collective resistance in Section 4. The final sections discuss the theoretical and practical implications of the study before offering concluding remarks in Sections 5 and 6.

LITERATURE REVIEW

2.1 Teacher Agency in Educational Technology Adoption

Teacher agency in technology-mediated education has become an important theoretical concept for understanding implementation outcomes beyond narrow distinctions between adoption and rejection. Priestley et al. (2015) define agency not as a fixed individual trait, but as an ecological accomplishment shaped by the interaction between teachers' beliefs, available resources, contextual limitations, and orientations toward past experiences and future possibilities. This perspective challenges deficit-based explanations that attribute unsuccessful technology integration to teacher resistance or lack of competence. Instead, it emphasizes the

institutional conditions that either support or restrict teachers' capacity to act with professional judgment. Similarly, Biesta and Tedder (2007) argue that agency depends on both capability and opportunity, stressing that teachers make informed decisions about when and how to engage with technological innovations according to their professional understanding of what supports learning in particular contexts.

When applied to educational AI, this body of scholarship suggests that teachers' responses to algorithmic systems should be understood as forms of rational professional practice rather than as irrational technophobia. Ertmer and Ottenbreit-Leftwich (2010) show that effective technology integration requires teachers to have the autonomy to adapt tools to local pedagogical objectives instead of simply following vendor-prescribed procedures. When AI-generated recommendations conflict with teachers' understanding of students' needs, professional judgment may legitimately take precedence over algorithmic authority. However, current research on teacher agency in AI contexts has largely concentrated on high-resource anglophone environments, where linguistic homogeneity often obscures differences in AI performance across languages, leaving the ways teachers exercise agency under linguistically unequal AI insufficiently examined.

Williamson (2017) and Selwyn (2016) further demonstrate that learning analytics and automated assessment systems increasingly position teachers as data collectors who implement algorithmic decisions rather than as autonomous professionals. This situation can generate resistance rooted in concerns about professional identity rather than in fear of technology. Nevertheless, this literature often frames resistance as a defensive attempt to protect professional authority, rather than as a productive form of critique that exposes the limitations of technological systems.

2.2 Student Voice and Critical Digital Literacy

Research on student voice challenges deficit-oriented views that represent young people as naive users of technology who need adult protection from digital risks. In contrast, a considerable body of evidence shows that students can develop sophisticated understandings of how digital technologies shape their lives and can express meaningful critiques when given appropriate opportunities. Studies on student participation in educational design further indicate that students possess unique knowledge of learning processes that adults, including teachers and designers, cannot fully access through observation alone (Cook-Sather, 2006). When educational technologies fail to support learning effectively, students may identify problems before teachers or administrators do, making their feedback an important but often underused resource for design improvement.

Critical digital literacy goes beyond functional competence in using technology. It involves the ability to recognize the power relations embedded in technological systems. Pangrazio (2016) distinguishes between literacies that

enable technology use and literacies that enable critical examination of how technologies influence knowledge, identity, and social relations. This includes awareness that algorithms shape access to information, that platforms profit from user data, and that automated systems may reproduce discriminatory patterns. Noble's (2018) analysis of algorithmic racism in search engines demonstrates that young people, especially those from marginalized communities, may develop critical awareness through direct encounters with algorithmic injustice rather than through formal instruction.

However, existing scholarship on critical digital literacy has focused mainly on social media, surveillance, and consumer technologies, while educational AI has received less attention. When students encounter biased AI systems within learning environments intended to support their development, important questions arise concerning how they interpret and respond to such experiences. It remains unclear whether students in multilingual contexts recognize unequal AI treatment across languages, and whether they are able to describe what more equitable systems should offer. These questions remain underexplored, despite their significance for the participatory design of educational technologies.

2.3 Resistance as Pedagogical Practice

A meaningful understanding of resistance requires moving beyond binary models of acceptance and rejection. It is necessary to examine how users appropriate technologies in ways that designers may not have anticipated. de Certeau (1984) distinguishes between strategies used by those who control systems and tactics used by individuals who must operate within constraints they cannot directly alter. Similarly, Scott (1985) explains that subordinated groups often resist through subtle forms of adaptation rather than open confrontation, using "weapons of the weak" to preserve autonomy without provoking direct punishment.

In the context of educational technology, these frameworks suggest that when teachers supplement AI-generated content, reinterpret automated feedback, or selectively disregard algorithmic recommendations, they engage in creative appropriation shaped by both technical systems and local educational contexts (Mingers, 2004; Selwyn, 2016). From this perspective, resistance should not be treated as an obstacle to implementation that requires stronger compliance measures. Rather, it should be regarded as evidence of design limitations and as a source of insight into the improvements that educational systems should incorporate.

2.4 Participatory Design and Co-Creation

Participatory design developed from the recognition that systems imposed without end-user involvement often fail to address actual needs and may produce resistance that weakens implementation. Instead of viewing users as passive recipients of solutions designed by experts, participatory approaches position them

as co-designers whose knowledge of work practices, contextual constraints, and desired outcomes is essential for developing effective systems (Muller & Druin, 2012). In educational contexts, this requires the involvement of teachers and students throughout the design process, rather than limiting their role to post-development testing (Penuel et al., 2007).

Educational AI creates specific challenges for participatory design because algorithmic systems involve technical complexity that obscures consequential design choices from non-expert users. Decisions about training data, model architecture, and optimization criteria are made in development settings remote from the classrooms where systems are deployed, complicating meaningful feedback incorporation.

In addition, vendors often treat algorithms as proprietary intellectual property, which limits transparency concerning how outputs are generated and restricts opportunities for user-driven modification. Furthermore, existing participatory design research has focused mainly on the creation of new systems rather than on resistance to systems that have already been deployed. When teachers and students encounter existing AI tools that encode biases they cannot directly change, everyday resistance may function as a form of informal participatory redesign by revealing what more equitable systems should provide.

2.5 Synthesis and Research Gaps

There remains a significant lack of ethnographic research in North Africa on how teachers and students in multilingual classrooms respond to AI systems that construct colonial languages as superior to indigenous and local ones. When AI tools privilege French while marginalizing Arabic, two questions remain underexplored: what strategies do teachers and students develop to navigate or contest such systems, and can users articulate more equitable design alternatives grounded in their own pedagogical and lived experience?

Addressing these questions requires moving beyond technology-centered analyses that examine AI systems in isolation. Instead, ethnographic approaches are needed to understand human responses within their social, linguistic, and educational contexts. The present study addresses these gaps through eighteen months of fieldwork in Moroccan secondary schools, documenting teacher and student agency in response to linguistically unequal AI systems. Although a growing body of work examines AI use in Moroccan classrooms (Maryam & Jamaa, 2025; Outamgharte et al., 2025), this research has focused on EFL teaching and teacher perceptions rather than on how multilingual students and teachers respond to systems that treat Arabic and French unequally.

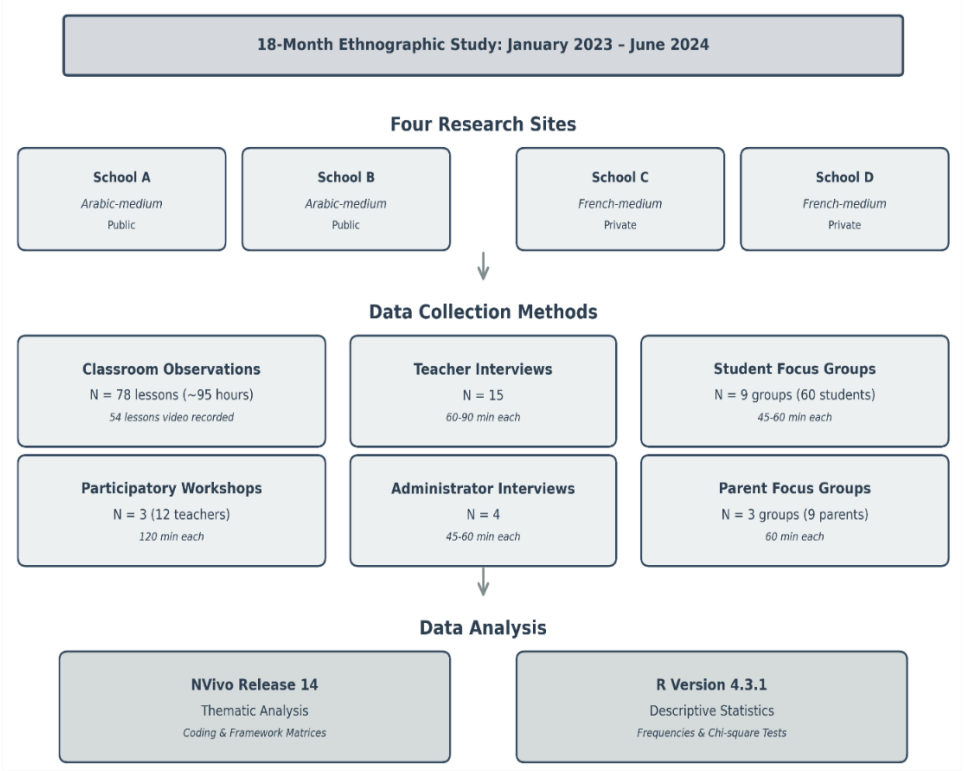
RESEARCH METHOD

3.1 Research Design

This study employed a qualitative methodology with embedded quantification to examine how teachers and students respond to, resist, and reframe AI systems that participants experienced as constructing French and Arabic differently in Moroccan classrooms. The approach prioritized interpretive analysis of resistance strategies and appropriation practices while incorporating systematic quantification of patterns to provide descriptive evidence of distribution and frequency (Creswell & Plano Clark, 2018).

Figure 1

Research Design Overview



Eighteen months of fieldwork (January 2023 through June 2024) involved classroom observations, semi-structured interviews, focus groups, and participatory workshops across four Moroccan secondary schools. This extended engagement enabled examination of how teacher and student responses evolved as familiarity with AI systems deepened and collective resistance strategies emerged. The ethnographic approach is informed by critical ethnography, which foregrounds

how power relations shape everyday classroom practices and institutional technology use (Carspecken, 1996).

3.2 The SmartLearn MA Platform

SmartLearn MA is a pseudonym used here to protect platform, vendor, and site confidentiality. It is the AI-mediated educational platform deployed across the four research sites for at least six months prior to data collection. The platform is operated by a single vendor and offered to schools as a unified product with two parallel language interfaces, French and Arabic, accessible through a shared user account structure. From the user perspective documented across 78 classroom observations, the platform combines three main functions: automated feedback on student responses to subject-matter exercises in mathematics and science, pacing and progression recommendations delivered to teachers and students, and a teacher-facing analytics dashboard reporting student performance against platform benchmarks.

Both language interfaces present the same instructional architecture, but, as the findings document, generate feedback that participants experienced as differing in tone, modality, and discursive framing across languages. Beyond these user-facing functions, deeper technical details, including the type of AI underlying feedback generation, the composition of training data for each language interface, the relationship between the French and Arabic output pipelines, and any algorithmic auditing conducted by the vendor or the Ministry, are not publicly disclosed by the vendor and were not made available upon request. This opacity is consistent with broader patterns in commercial educational AI, in which proprietary architectures limit external scrutiny (Williamson, 2017), and constitutes a feature of the deployment context that participants navigated rather than a gap external to the study.

Given these constraints, the study does not claim to evaluate the internal technical performance of SmartLearn MA or to reverse-engineer its algorithmic processes. Instead, it examines the platform as it was encountered, interpreted, and negotiated by teachers and students in everyday classroom practice.

3.3 Sites and Participants

Four secondary schools in Rabat-Salé-Kénitra were selected through maximum variation sampling (Patton, 2015; Palinkas et al., 2015), representing Arabic-medium public and French-medium private education. All schools had implemented the SmartLearn MA platform for at least six months. Al-Majd Preparatory and Ibn Khaldoun Secondary serve predominantly working and lower-middle-class students in Arabic with 15 to 22 students per device, while Lycée Descartes and Lycée Victor Hugo serve upper-middle and upper-class students in French with 5 to 9 students per device. Language medium correlates with school

sector due to Morocco's dual-track educational history (Ennaji, 2005), creating confounds that are addressed in the limitations section.

Teachers (N = 15) included eight from Arabic-medium schools and seven from French-medium schools, all teaching mathematics or science. Selection required a minimum of six months of AI experience and willingness to participate in observations and interviews. Teachers ranged from 4 to 22 years of teaching experience, held Master's or Bachelor's degrees in their subject areas, and spoke Arabic and French with varying proficiency.

Students (N = 60 across 9 focus groups) represented grades 10 to 12 (ages 16 to 18), with equal distribution across schools. Recruitment proceeded through teacher referrals and student councils, targeting students who regularly engaged with AI tools. Focus groups ranged from 6 to 8 participants and were balanced by gender where possible. School administrators (N = 4) included one principal or vice-principal per school, and parents (N = 9 across 3 focus groups) participated through parent association recruitment. All participation was voluntary and based on explicit consent.

3.4 Data Collection

Classroom observations (N = 78 lessons, approximately 95 hours) documented how teachers incorporated, adapted, or resisted AI tools during instruction. Fifty-four lessons were video recorded with consent, and structured field note protocols (Emerson et al., 2011) captured AI usage moments, teacher interventions, student responses, and code-switching practices. Teacher interviews (N = 15, 60 to 90 minutes each) explored AI implementation experiences, pedagogical decision-making, perceptions of linguistic bias, adaptation strategies, and reflections on professional autonomy. Interviews were audio-recorded and transcribed with code-switching patterns preserved.

Student focus groups (N = 9, 45 to 60 minutes each) examined experiences with AI tools, perceptions of French versus Arabic AI treatment, preferences between AI and teacher feedback, and suggestions for improvement. Audio recordings were transcribed using bilingual protocols. Participatory workshops (N = 3, 120 minutes each) engaged 12 teacher volunteers in co-design activities (Penuel et al., 2007), through which teachers identified AI problems, proposed improvements, and designed alternative feedback templates.

Workshops were documented through audio recording, photographs, and facilitation notes. Administrator interviews (N = 4, 45 to 60 minutes) and parent focus groups (N = 3, 60 minutes each) explored institutional perspectives and community concerns. Document analysis included teacher-created supplementary materials, student work samples, and school communications about AI implementation.

3.5 Data Analysis

Thematic analysis (Braun & Clarke, 2006) combined deductive coding from theoretical frameworks on teacher agency and resistance with inductive coding to allow pattern emergence. NVivo Release 14 (QSR International, 2023) supported data management and systematic coding, while R version 4.3.1 (R Core Team, 2023) enabled descriptive statistical analysis of quantified patterns.

Coding procedures

Bilingual team members transcribed all data, maintaining original language use. Two coders independently coded 20% of the data using deductive codes (appropriation, resistance, agency, advocacy) and emergent inductive codes. Inter-rater reliability yielded Cohen's $\kappa = 0.81$ (Landis & Koch, 1977). After resolving discrepancies through discussion, the coders divided the remaining data with regular calibration. The analysis generated 47 codes organized into 12 groups, achieving saturation (Saunders et al., 2018) after coding 70% of observations and 80% of interviews.

Theme development

NVivo framework matrices supported systematic cross-case comparison. Three themes emerged: (1) teacher appropriation strategies, (2) student critical awareness, and (3) collective resistance. Coded segments were exported to R for descriptive analysis, including frequencies (e.g., percentage of lessons with teacher intervention) and cross-tabulations (e.g., intervention rates by school type). Quantification describes patterns supporting qualitative interpretation rather than explaining phenomena.

Validation

Member checking with ten teachers and three student groups confirmed interpretive accuracy. Participants validated that resistance constituted professional judgment and that students possessed sophisticated awareness of AI bias. Credibility was strengthened through triangulation across data sources, prolonged engagement, and thick description, enabling transferability assessment (Tracy, 2010).

3.6 Ethics and Positionality

The study received Cadi Ayyad University IRB approval (Protocol #2023-EDU-052, December 2022). Informed consent was obtained from administrators, teachers, and parents, alongside student assent for minors. All participants received information sheets in Arabic and French explaining voluntary participation, the right to withdraw, and confidentiality protections. Pseudonyms were assigned to all participants and schools, identifying details were minimized in field descriptions, and all transcripts and artifacts were de-identified.

The lead researcher is a bilingual Moroccan scholar whose insider-outsider dynamics enabled cultural understanding while maintaining analytical distance (Muhammad et al., 2015). Fluency in Arabic, French, and Darija facilitated rapport and nuanced interpretation. The research practiced reciprocity by sharing findings with schools, conducting professional development sessions, and supporting parent advocacy efforts, avoiding extractive research relationships (Irani et al., 2010).

RESULTS

Analysis of classroom observations, interviews, focus groups, and participatory workshops identified three overarching patterns in how teachers and students responded to AI-mediated feedback that they experienced as treating French and Arabic differently: teacher appropriation strategies, student critical awareness and workarounds, and collective resistance through informal networks. NVivo thematic analysis revealed these patterns across all four schools, with variations in intensity related to language medium and institutional resources. We present findings organized by stakeholder group, reporting frequencies and distributions calculated through R statistical analysis, alongside qualitative examples illustrating each pattern.

4.1 Teacher Appropriation Strategies

Classroom observations documented widespread teacher intervention in AI-mediated learning interactions. Teachers intervened in 67% of observed lessons (n = 52/78), with Arabic-medium teachers intervening more frequently (78%, n = 31/40) than French-medium teachers (55%, n = 21/38), $\chi^2(1) = 4.89$, $p = .027$, Cramér's V = 0.25. Framework matrix analysis identified four primary appropriation strategies: supplementing AI content, reframing feedback language, code-switching pedagogy, and selective non-compliance with AI recommendations.

4.1.1 Supplementing and Reframing AI Feedback

In 58% of lessons involving AI feedback (n = 27/47), teachers provided supplementary explanations, alternative examples, or additional context. This pattern occurred particularly when AI feedback employed directive language. Fatima, an Arabic-medium mathematics teacher, explained her practice: "The machine uses يجب (must) and خطأ (error) constantly. I always add 'let's explore' or 'what if we tried.' That's teaching." Similar reframing appeared across 15 teacher interviews. Karim stated, "The AI thinks learning is fixing mistakes. I teach that learning is exploring possibilities."

French-medium teachers supplemented for different reasons. Leila created glossaries mapping French scientific vocabulary to Arabic equivalents, explaining:

"The AI assumes students know French terms. Mine are learning science and French simultaneously. I bridge that gap." Nine teachers (60%) reported creating supplementary materials, including vocabulary lists, alternative explanations, or cultural examples absent from AI content.

4.1.2 Code-Switching as Pedagogical Strategy

Analysis of classroom videos identified code-switching in 82% of observed lessons (n = 64/78), occurring more frequently in Arabic-medium schools (88%, n = 35/40) than French-medium schools (76%, n = 29/38). Teachers switched between Arabic, French, and Darija in contexts where AI operated monolingually.

Leila's physics lesson exemplified this practice. When the French-only AI used "force résultante," she explained: "Quand le système dit 'force résultante,' on peut dire en arabe القوة المحصلة. C'est la même chose" (When the system says resultant force, we can say in Arabic resultant force. It's the same thing). She stated: "The AI expects French-only, but thinking happens in all our languages."

Arabic-medium teachers used code-switching to explain French loanwords. Hassan switched to French when Arabic AI used transliterated terms: "Le système utilise 'carbon' écrit en arabe. On peut dire الفحم en arabe classique, mais en sciences on utilise الكربون" (The system uses carbon written in Arabic. We can say coal in classical Arabic, but in science we use carbon).

4.1.3 Selective Ignoring and Strategic Non-Compliance

Across the 15 teacher interviews, we coded 30 interview statements related to AI analytics use; 13 statements indicated regular consultation of the analytics dashboard. We also coded 24 interview statements related to trust in AI metrics; 17 statements indicated that teachers trusted their own assessments over AI-generated metrics. Hassan explained: "The dashboard says my students are 'behind.' Behind what? The AI doesn't know my students' starting points. I use my assessments because I understand context."

Nabil described ignoring AI pacing recommendations: "The system wants three units per month. But if students don't understand foundations, speed doesn't help. I slow down when needed." This pattern appeared across eight teacher interviews. Table 1 summarizes teacher appropriation strategies with frequencies from NVivo coding and R analysis.

Across interviews, teachers framed pacing non-compliance as an equity practice, arguing that rigid AI timelines penalized learners with weaker prior preparation. To avoid misrepresenting students as “behind” due to platform benchmarks, they relied on formative checks and classroom observation to determine when to extend or revisit units.

Table 1

Teacher Appropriation Strategies: Frequency and Distribution by School Type

Strategy	Overall Frequency	Arabic-Medium	French-Medium	Example
Supplementing AI content	58% of AI lessons (n=27/47)	65% (n=15/23)	50% (n=12/24)	Creating vocabulary lists
Reframing deficit language	45% of lessons (n=35/78)	53% (n=21/40)	37% (n=14/38)	Changing "must" to "explore."
Code-switching pedagogy	82% of lessons (n=64/78)	88% (n=35/40)	76% (n=29/38)	Translating terms
Selective ignoring of AI dashboards/metrics (interview statements)	71% of coded interview statements (n = 17/24)	—	—	Trusting one's own assessments over AI metrics
Creating materials	60% of teachers (n=9/15)	75% (n=6/8)	43% (n=3/7)	Making glossaries

Note. Frequencies from 78 classroom observations and 15 teacher interviews. For observation-based rows, percentages represent the proportion of lessons (or AI-feedback opportunities, where specified). For interview-based rows, percentages represent the proportion of coded interview statements addressing that topic.

4.2 Student Critical Awareness and Agency

Focus group analysis revealed that 78% of students (n = 47/60) spontaneously mentioned noticing differential AI treatment without interviewer prompting, with 64% (n = 39/60) articulating specific examples of language-based differences.

4.2.1 Recognizing Differential Treatment

Students described noticing that AI employed different language across French and Arabic contexts. Amina explained: "I was helping my cousin. She goes to Lycée Descartes. Same math problem, but different AI help. She said, 'try different methods, explore approaches.' Mine said يجب عليك مراجعة القواعد (you must review rules). Same problem, different response."

Youssef stated, "My neighbor uses Arabic AI. His feedback is always about fixing errors and following rules. Mine gives hints, suggests explorations. We're learning the same material, but AI treats us differently." Sara connected these patterns to broader perceptions: "The AI thinks French students are creative explorers and Arabic students need strict rules."

4.2.2 Developing Workarounds and Tactical Responses

Analysis identified four primary student workarounds. Language switching occurred among 52% of students (n = 31/60). Sara explained: "Sometimes I type my question in French even though I'm in Arabic school. The French AI gives better hints. "Peer translation networks emerged in Arabic-medium schools, reported by 47% of students (n = 28/60). Mohamed stated: "When AI uses French words in Arabic like الكربون or الأوكسيجين, we help each other figure out meaning."

Preferring teacher feedback appeared across 73% of students (n = 44/60). Salma stated: "I click through AI to get to the next question, but don't read feedback carefully. I wait for the teacher to explain." Students estimated attending carefully to AI feedback in approximately 40% of interactions. Table 2 summarizes student awareness patterns and workarounds.

This selective attention suggests that many students treated the platform as a gatekeeping mechanism for progressing through tasks rather than as a trusted instructional source. In focus groups, students linked this preference to the AI's tone and language handling, reporting that teacher explanations felt more motivating and better aligned with how they typically learn in multilingual classrooms.

Table 2

Student Critical Awareness and Workaround Strategies

Pattern	Frequency	Representative Quote
Noticed differential treatment	78% (n=47/60)	"French AI encourages, Arabic AI scolds."
Articulated specific examples	64% (n=39/60)	"Mine said must, hers said explore"
Language switching	52% (n=31/60)	"I type in French to get better hints."
Peer translation	47% (n=28/60)	"We help each other understand terms."
Preferred teacher feedback	73% (n=44/60)	"I wait for the teacher to explain."
Wanted bilingual AI	68% (n=41/60)	"Why can't it speak both languages?"

Note. Frequencies from nine focus groups (N = 60). Multiple responses per student are possible.

4.2.3 Articulating Alternative Designs

When asked, "If you could redesign the AI, what would you change?" students proposed consistent alternatives across focus groups. Analysis of focus group transcripts and student council documents revealed that students identified eight categories of AI problems with corresponding proposed solutions. Across the

focus groups, students repeatedly identified problems related to feedback tone, linguistic bias, technical vocabulary, excessive formality, lack of code-switching, cultural relevance, error-focused evaluation, and rigid pacing.

Hicham's articulation captured common themes across focus groups: "Make it speak as we do. Switch between Arabic and French naturally. Use Moroccan examples, not Paris or New York. Talk like a helpful friend, not a strict teacher." Students consistently proposed bilingual capability, growth-oriented language, conversational tone, and culturally relevant examples as primary improvements.

The consistency of these proposals suggests that students did not reject AI as a learning tool in itself. Rather, they resisted forms of AI that reproduced linguistic distance, cultural unfamiliarity, and deficit-oriented evaluation. Their redesign suggestions show an emerging learner agency in which students moved from merely identifying problems to imagining more inclusive, multilingual, and pedagogically supportive AI systems.

4.3 Collective Resistance and Advocacy

Resistance emerged through three collective pathways: teacher professional networks, parent advocacy, and student organizational channels. These collective forms involved coordination across multiple actors rather than isolated individual responses.

4.3.1 Teacher Professional Networks

Twelve teachers (80%) reported participating in informal WhatsApp groups or faculty discussions about AI challenges. Nabil described creating a group where teachers shared supplementary materials and adaptation strategies: "We realized we were all fixing AI problems independently. When we started sharing, we built a library of better materials."

Participatory workshops generated concrete design recommendations. Teachers created alternative feedback templates, sketched interface mockups incorporating code-switching capabilities, and proposed culturally grounded examples to replace generic content. Teachers expressed skepticism about vendor implementation. Leila stated, "We'll document what we need and submit formally. But I don't expect changes."

Workshop analysis identified six categories of teacher-generated design recommendations with consistent proposals across all three workshops. Table 3 presents these systematic critiques of current AI features alongside teacher-proposed alternatives.

Table 3

Teacher-Generated Design Recommendations from Participatory Workshops

AI Feature Critique	Current AI Problem	Teacher-Proposed Solution	Workshop Frequency
Feedback language	Uses obligation modals (يجب, must)	Use possibility modals (يمكن, can/could)	100% (3/3 workshops)
Feedback tone	Deficient (error, wrong, incorrect)	Growth-oriented (explore, try, consider)	100% (3/3 workshops)
Language flexibility	Monolingual (Arabic OR French only)	Code-switching capability (both languages)	100% (3/3 workshops)
Technical vocabulary	French loanwords without explanation	Provide Arabic equivalents with translations	67% (2/3 workshops)
Cultural examples	Generic or European-centric scenarios	Moroccan contexts (medina, souk, couscous)	67% (2/3 workshops)
Pacing flexibility	Fixed unit timelines regardless of mastery	Adaptive pacing based on comprehension	33% (1/3 workshops)

Note. Based on workshop artifacts, audio recordings, and facilitation notes from three participatory design workshops.

4.3.2 Parent Association Advocacy

Parent focus groups revealed frustration leading to formal advocacy. Al-Majd parent association submitted a letter to the school administration and Ministry of Education requesting a "linguistic equity audit." The letter stated: "This system treats Arabic students as requiring constant correction while treating French students as creative explorers. This is educational discrimination disguised as technological neutrality."

Ibn Khaldoun's parent association threatened to refuse AI consent forms unless the school demonstrated linguistic equity. One parent explained, "We chose Arabic education because we value our language. Then this machine tells our children they're wrong constantly while speaking to French students with respect." Multiple parents connected AI discourse patterns to postcolonial dynamics, using phrases like "the French AI looks down on us" and "technology reproducing old hierarchies."

4.3.3 Student Organizational Channels

Student councils at two schools created formal feedback mechanisms. Ibn Khaldoun student council compiled a document titled "Student Recommendations

for Fairer Educational Technology," listing concerns: excessive obligation modals creating stress, French terms in Arabic AI without explanation, error-focused evaluation, and inflexible pacing. The document concluded: "We want technology that helps us learn, not technology that makes us feel inadequate." Administrative responses varied across schools. Ibn Khaldoun's administration incorporated feedback into vendor discussions, while Al-Majd dismissed complaints. The student representative stated, "They listened and said they'd raise it with the company. But we don't think anything will change".

Cross-case comparison revealed systematic variation in resistance intensity by language medium and school type. Teacher intervention rates were consistently higher in Arabic-medium schools (Al-Majd 80%, Ibn Khaldoun 75%) than in French-medium schools (Lycée Descartes 58%, Lycée Victor Hugo 53%), and active teacher WhatsApp networks formed only in the Arabic-medium sites. Parent advocacy and student council action occurred exclusively at Arabic-medium schools, where administrative responses ranged from dismissive at Al-Majd to consultative at Ibn Khaldoun, while French-medium schools pressured teachers toward greater AI fidelity. Full school-level data, including observation counts, network membership, and administrative responses, are presented in the Appendix.

DISCUSSION

This study examined how teachers and students respond to AI-mediated feedback that participants experienced as constructing French and Arabic differently in Moroccan secondary schools. Analysis of eighteen months of ethnographic fieldwork revealed systematic patterns of appropriation, resistance, and collective advocacy challenging assumptions that users passively accept algorithmic outputs. Findings are interpreted through frameworks on teacher agency, student critical digital literacy, and participatory design, connecting patterns to broader debates about technological determinism and linguistic justice in educational AI.

5.1 Resistance as Professional Expertise: Challenging Technological Determinism

Findings fundamentally challenge technological determinist assumptions underlying Morocco Digital 2030 and similar educational AI policies that presume deployment automatically improves learning regardless of context (Ministry of Industry, Trade and Digital Economy, 2020). Policy discourse frames AI as a neutral modernization tool requiring only technical infrastructure and teacher training for successful implementation. The findings demonstrate instead that human agency mediates technological effects, with teachers actively negotiating rather than passively receiving AI-mediated instruction.

These adaptations constitute rational professional practice rather than implementation failure. Administrators at two schools pressured teachers toward greater AI fidelity, interpreting deviation from vendor-prescribed workflows as technological incompetence; the findings reveal the opposite, that teacher interventions apply contextual knowledge AI systems lack.

The substantive content of teacher adaptation illustrates this expertise. Teachers who reframed deficit language ("you must review rules") into growth-oriented language ("let's explore possibilities") applied pedagogical knowledge that deficit framing undermines self-efficacy while growth orientation supports persistence (Dweck, 2006). Similarly, teachers who created supplementary Arabic scientific vocabulary where AI offered only French loanwords compensated for inadequate localization, contributing linguistic expertise about multilingual science education that monolingual AI development fails to incorporate.

Code-switching practices particularly illustrate professional sophistication. Teachers switched between Arabic, French, and Darija in 82% of lessons, matching how multilingual cognition actually operates (García & Wei, 2014; Li, 2018). AI systems constrained to monolingual operation fail to support translanguaging pedagogies, increasingly recognized as effective for multilingual learners. Teachers who code-switched despite AI constraints exercised professional autonomy, protecting pedagogically sound practices from technological limitations.

Recent scholarship in educational technology has begun to recognize that AI-enabled translanguaging can support rather than constrain multilingual learners when systems are designed to enable fluid transitions between languages (Waluyo & Rouaghe, 2025), reinforcing the design implication that monolingual AI architectures are not technologically inevitable but design choices with pedagogical consequences.

Selective ignoring of AI analytics similarly reflects professional judgment about meaningful assessment. Teachers who stated "the AI doesn't know my students' starting points" articulated legitimate critiques of decontextualized metrics. Algorithmic comparisons to abstract benchmarks ignore systemic inequalities shaping student preparation, rendering "behind" classifications pedagogically meaningless without contextual interpretation (Eubanks, 2018).

5.2 Student Voice as Credible Design Critique

Student critical awareness challenges deficit framings that position young people as naive technology users requiring adult protection. The findings show that 78% of students spontaneously recognized differential treatment without formal critical digital literacy instruction, supporting Pangrazio's (2016) argument that critical awareness emerges from the lived experience of technological injustice rather than from abstract media literacy curricula. Students connected micro-level linguistic patterns (obligation modals, error focus) to macro-level ideologies about

language communities, an analytical move from textual features to ideological assumptions that demonstrates sophisticated critical discourse awareness (van Dijk, 2015). Students lacked technical vocabulary to describe algorithmic processes but accurately identified their discriminatory effects, validating Noble's (2018) documentation that marginalized communities recognize algorithmic oppression even without understanding technical implementation.

Systematic reviews of AI literacy in K-12 settings indicate that empirical research has focused primarily on curricular interventions rather than on the spontaneous critical awareness students develop through direct experience with AI systems (Tan & Tang, 2025), making the present documentation of student-led recognition of linguistic bias a useful complement to that literature.

Student workarounds further demonstrate active navigation rather than passive consumption. The 52% who switched languages to access better feedback exemplify de Certeau's (1984) distinction between strategies available to system designers and tactics employed by users navigating constraints they cannot directly change. When students click through AI outputs perfunctorily while reserving attention for teacher explanations, they communicate through behavior that current AI fails basic usability criteria.

Student-proposed design improvements reveal credible expertise often dismissed by vendors. Requests for bilingual capability, growth-oriented language, conversational tone, and cultural relevance align precisely with participatory design principles (Penuel et al., 2007). The consistency of proposals across nine focus groups and two student council documents demonstrates that these were not idiosyncratic preferences but systematic identification of design failures.

5.3 Resistance as Informal Participatory Redesign

Findings reveal that teacher and student resistance constitutes informal participatory design that specifies what more equitable systems should provide. Teacher WhatsApp groups sharing adaptation strategies built collective knowledge repositories, compensating for vendor inadequacies. Participatory design literature advocates involving users as co-designers (DiSalvo et al., 2012), yet vendors rarely compensate teachers for this intellectual work or systematically incorporate their improvements into system updates.

Workshop-generated design recommendations specify concrete improvements: replace obligation with possibility modals, shift from deficit to growth orientation, enable code-switching, provide Arabic technical vocabulary, incorporate Moroccan cultural contexts, and allow adaptive pacing. These proposals emerged from hundreds of hours observing AI failures in actual classrooms. Teachers possess unique expertise about what works pedagogically that remote developers cannot access through laboratory testing (Irani et al., 2010), yet vendors treat teacher feedback as optional input rather than essential design knowledge.

Student council documents similarly constitute design specifications grounded in user experience. When students documented that excessive obligation modals create stress, they identified psychological harm vendors did not assess during development; when they noted that error-focused evaluation demotivates, they articulated outcome data about actual versus intended system effects. These user reports should trigger urgent redesign, yet both schools reported minimal vendor responsiveness.

Parent advocacy adds a community voice to individual user critique. When parent associations demanded linguistic equity audits, they articulated values AI systems should honor: respect for the Arabic language, rejection of deficit framings, and insistence on equal treatment. Consent withdrawal threats represent collective leverage that users can exercise when institutional channels fail, positioning parents as stakeholders with authority over technological access to their children.

5.4 Limitations

Four limitations constrain generalizability and require honest acknowledgment. The most consequential involves a structural confound between language medium, school sector, and material resources. The Arabic-medium sites in this study are public schools serving working and lower-middle-class students at device ratios of 15 to 22 students per device, while the French-medium sites are private schools serving upper-middle and upper-class students at device ratios of 5 to 9 students per device (Section 3.3). Language medium, therefore, co-varies with sector and with resource provision, and resistance patterns observed in Arabic-medium contexts may reflect the interaction of linguistic bias, resource disparities, institutional culture, and social class composition.

Three lines of evidence nonetheless support interpreting language as a salient factor in participants' responses. First, the discourse patterns participants identified, including obligation modals (يجب, must), error-focused framing, and absence of code-switching, are textual features of platform output that exist independently of device ratios. Second, parent advocacy at Arabic-medium sites explicitly named language and tone rather than infrastructure, with letters demanding "linguistic equity audits" rather than additional devices. Third, French-medium teachers also intervened in the majority of lessons (55%), indicating that linguistic constraints affect both groups even though unevenly. These variables nonetheless cannot be fully isolated within the present design, and follow-up research should compare schools with similar resource levels but different language media, or examine the same platform version across urban and rural schools, in order to disentangle the contributions of language, sector, and resource environment more clearly.

A second limitation concerns methodological scope. This study did not conduct a direct computational audit of SmartLearn MA's outputs across

languages. The claims advanced here concern user-reported and ethnographically observed differential treatment, not algorithmically measured bias in system outputs. Future work should pair user response studies of this kind with controlled comparative discourse audits of platform outputs, ideally combining systematic sampling of feedback messages across matched task types with corpus-linguistic and computational text analysis to test whether the patterns participants identified are confirmed at the level of platform behavior.

A third limitation concerns temporal scope. The eighteen-month fieldwork period captures a snapshot of evolving dynamics rather than longitudinal trajectories. Resistance strategies, professional networks, and vendor responses may strengthen, fragment, or reconfigure across multi-year horizons in ways that a single fieldwork window cannot capture, and longitudinal designs tracking the same schools across three to five years would clarify whether the patterns documented here represent a transitional adaptation phase or stable features of teacher and student engagement with educational AI.

A fourth limitation concerns geographic and platform scope. Fieldwork was confined to urban Rabat, and rural contexts with different infrastructure, language ideologies, and Amazigh-speaking communities may generate distinct dynamics not represented here. The study also documents responses to a single vendor's platform, and different commercial systems with different training data, feedback templates, and localization choices may elicit different user responses, limiting claims about educational AI broadly.

5.5 Implications for Theory, Practice, and Policy

These findings carry implications across domains. Theoretically, they extend teacher agency frameworks and critical digital literacy scholarship into algorithmic educational contexts: resistance reveals not user deficiency but system inadequacy, inverting traditional implementation failure attributions and positioning users as credible critics whose adaptations constitute design knowledge.

Practically, teacher professional development should validate resistance as legitimate practice rather than framing it as non-compliance. Training that helps teachers recognize linguistic bias, develop critical AI literacy, and share adaptation strategies would support professional expertise. Schools should create formal channels for teacher and student feedback, treating user experience reports as essential quality assurance data rather than optional input.

For policy, findings challenge Morocco Digital 2030's assumptions that AI deployment automatically democratizes education. Procurement frameworks must require empirical demonstration of linguistic equity as an adoption criterion, including comparative discourse audits showing equivalent treatment across languages. Vendor accountability mechanisms should mandate responsiveness to user feedback, with contract renewal contingent on addressing documented problems.

Public investment in Arabic NLP infrastructure independent of commercial vendors could reduce reliance on products optimized for dominant language markets. Achieving linguistic justice in educational AI ultimately requires recognizing technology as political rather than neutral, with every design choice about training data, localization, feedback templates, and interface language carrying consequences for whose knowledge is valued and whose agency is recognized.

CONCLUSION

This study examined how teachers and students in Moroccan secondary schools responded to perceived and observed differences in AI-mediated educational feedback across French and Arabic versions of the SmartLearn MA platform. Drawing on eighteen months of ethnographic fieldwork across four schools, the findings show that users did not passively accept AI-generated outputs. Instead, teachers and students interpreted, adapted, resisted, and informally redesigned AI-mediated instruction through practices grounded in professional expertise, multilingual classroom realities, and student experience.

The study contributes to scholarship on teacher agency, student voice, critical digital literacy, and participatory design by showing that resistance to educational AI should not automatically be understood as technophobia or implementation failure. In the classrooms examined, teacher resistance often functioned as informed pedagogical judgment. Teachers supplemented AI feedback, reframed deficit-oriented language, code-switched across Arabic, French, and Darija, and selectively relied on their own assessments when platform metrics did not reflect students' actual learning conditions. These practices reveal that professional expertise remains central in AI-supported education, especially in multilingual contexts where technological systems may not fully capture local pedagogical and linguistic complexity.

Students also demonstrated meaningful critical awareness. Many recognized differences in tone, feedback quality, vocabulary, and language flexibility across the French and Arabic interfaces. Their workarounds, including language switching, peer translation, selective attention to AI feedback, and preference for teacher explanation, were not signs of disengagement alone. They were also practical responses to platform limitations. Student proposals for bilingual feedback, culturally relevant examples, conversational tone, and growth-oriented language show that learners can provide valuable design knowledge when their experiences are taken seriously.

The findings further suggest that resistance can operate as an informal form of participatory redesign. Teacher networks, student councils, and parent advocacy did more than criticize the platform. They identified concrete design requirements for more equitable AI in education. Such recommendations indicate that users are

not merely recipients of educational technology. They are also evaluators and co-designers whose situated knowledge can improve system quality.

At the same time, the findings should be interpreted with caution. The study did not conduct a direct computational audit of SmartLearn MA's internal model, training data, or output pipelines. Its claims, therefore, concern classroom interaction, participant perception, and user response rather than technical proof of algorithmic bias. In addition, the language medium overlapped with the school sector and resource conditions, meaning that linguistic inequality and material inequality may have interacted in shaping resistance patterns.

Overall, the study shows that equitable educational AI cannot be achieved through technical deployment alone. It requires sustained attention to language, context, pedagogy, and user agency. In multilingual postcolonial settings such as Morocco, AI systems must be evaluated not only for efficiency or scalability, but also for how they position languages, learners, and teachers. More equitable AI will depend on whether policymakers, schools, and vendors treat teacher and student resistance not as a problem to eliminate, but as evidence to learn from.

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Ethical Approval

This study was conducted in accordance with ethical research standards and received approval from the Institutional Review Board of Cadi Ayyad University. Informed consent was obtained from all school administrators and teachers prior to classroom observations and interviews. Parental consent and student assent were obtained for all student participants under 18 years of age. All participants were informed of their right to withdraw from the study at any time without consequence. Data were anonymized during transcription, and all participants (teachers, students, administrators, and parents) were assigned pseudonyms to protect confidentiality. Schools have been assigned pseudonyms in all published materials. Audio and video recordings were stored on password-protected servers accessible only to the research team and will be deleted after five years in accordance with institutional data retention policies.

Conflict Of Interest Statement

The authors declare no conflicts of interest with respect to the research, authorship, and/or publication of this article. The authors have no financial or personal relationships with any organizations or vendors involved in educational AI development or deployment that could inappropriately influence this research.

Data Availability Statement

The datasets generated and analyzed during the current study are not publicly available due to the sensitive nature of classroom observations and participant confidentiality agreements. Anonymized excerpts from interview and focus group transcripts may be available from the corresponding authors on reasonable request, subject to institutional ethical approval and with appropriate additional anonymization protocols to ensure participant privacy cannot be compromised.

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APPENDIX

Cross-Case Comparison: Resistance Patterns and Administrative Responses by School

Table A1

Cross-Case Comparison of Resistance Patterns Across Four Research Sites

School	Language Medium	Teacher Intervention Rate	Teacher Network Activity	Parent Advocacy	Student Council Action	Administrative Response
Al-Majd Preparatory	Arabic	80% (16/20 observations)	Active WhatsApp group (4 teachers)	Formal letter to the Ministry	Feedback document created	Dismissive ("avoiding rigor")
Ibn Khaldoun Secondary	Arabic	75% (15/20 observations)	Active WhatsApp "AI Reality Check" (5 teachers)	Consent withdrawal threat	"Student Recommendations" document	Consultative (incorporated in vendor talks)
Lycée Descartes	French	58% (11/19 observations)	Informal lunch discussions (2 teachers)	None observed	None observed	Pressure for AI fidelity
Lycée Victor Hugo	French	53% (10/19 observations)	Minimal (1 teacher)	None observed	None observed	Pressure for AI fidelity
Overall Pattern	Arabic schools showed higher resistance across all measures	Arabic: 78% French: 55%	More organized in Arabic schools	Only Arabic-medium schools	Only Arabic-medium schools	Arabic: Mixed responses, French: Enforcement-oriented

Note. Based on 78 classroom observations, 15 teacher interviews, 4 administrator interviews, 3 parent focus groups, 9 student focus groups, and document analysis.

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