T I E Journal
Volume 3 Issue 3, 2025
http://ijtie.com/v401/n40122
ISSN: 2820-7521

The International Journal of Technology, Innovation, & Education

Digitalization in Moroccan educational policy: The gap between official discourse and classroom practice in primary education

Anas El Berkouki

Department of Educational Sciences, Higher School of Teachers (École Normale Supérieure), Moulay Ismail University, Meknes, Morocco

a.elberkouki@edu.umi.ac.ma
* Corresponding author

Received: December 20, 2025; **Accepted**: January 28, 2026; **Published**: February 01, 2026

Abstract

This study investigated the gap between official policy discourse on educational digitalization and classroom practice in Moroccan primary education. Despite substantial government investment in digitalization initiatives over two decades, international assessments reveal persistent challenges in learning outcomes. Using a convergent parallel mixed-methods design, this study combined content analysis of five key policy documents with a cross-sectional survey of 385 primary school teachers in the Fez-Meknes region. The theoretical framework integrated TPACK and SAMR models to analyze policy emphases and classroom practices. Content analysis revealed that technical dimensions dominated policy discourse, with pedagogical, training, and managerial dimensions substantially underrepresented. Survey findings indicated that two-thirds of teachers perceived a significant policy-practice gap. Teachers rated infrastructure and training significantly lower than perceived barriers to integration. Statistically significant urban-rural disparities emerged across all domains, with large effect sizes indicating that rural teachers face systematically more challenging conditions. Teachers with ICT training demonstrated substantially higher integration practices than untrained peers. These findings provide context for understanding Morocco's performance in recent international assessments (TIMSS 2023, PIRLS 2021). The study concludes that successful digitalization requires rebalancing policy focus from equipment provision toward integrated approaches encompassing teacher preparation, pedagogical transformation, and equity considerations.

Keywords: educational digitalization, ICT integration, teacher training, primary education, TPACK, SAMR, Morocco

El Berkouki. A. (2026) Digitalization in Moroccan educational policy: The gap between official discourse and classroom practice in primary education. *The International Journal of Technology, Innovation, and Education*, *4*(1), 130–164. https://ijtie.com/v401/n40122

1. Introduction

The rapid advancement of digital technologies has fundamentally transformed educational landscapes worldwide, compelling education systems to reconceptualize their pedagogical approaches, administrative practices, and teacher preparation programs (Selwyn, 2016; Williamson, 2017). This digital transformation extends beyond the mere introduction of technological tools; it encompasses a comprehensive rethinking of how knowledge is created, disseminated, and acquired in contemporary educational contexts (Castells, 2010; Prensky, 2010). The integration of information and communication technologies (ICT) in education is no longer optional but has become an imperative for nations seeking to prepare their citizens for participation in knowledge-based economies and digitally mediated societies. The COVID-19 pandemic further accelerated this imperative, exposing both the potential and the limitations of technology-mediated education across different contexts (UNESCO, 2020; World Bank, 2021).

The global discourse on educational technology has evolved significantly over the past three decades. Early approaches in the 1990s and 2000s emphasized technology access and infrastructure deployment, operating under the assumption that providing equipment would naturally lead to improved educational outcomes. This "access paradigm" guided substantial investments in computer labs, internet connectivity, and digital devices across both developed and developing nations (Warschauer, 2003). However, accumulating evidence of limited impact prompted a shift toward more nuanced understandings of technology integration that emphasized the role of pedagogy, teacher preparation, and contextual factors in mediating technology's effects on learning (Voogt et al., 2013). Contemporary frameworks recognize that technology is neither inherently beneficial nor harmful for education; its effects depend entirely on how it is integrated into teaching and learning processes.

However, the relationship between technology integration and educational outcomes is neither linear nor straightforward, as evidenced by the mixed results observed across different contexts and implementation approaches (OECD, 2023; Tamim et al., 2011). Research consistently demonstrates that the mere presence of technology in classrooms does not automatically translate into improved learning outcomes (Cuban, 2001; Hew & Brush, 2007). Rather, effective technology integration depends on complex interactions among policy frameworks, infrastructure availability, teacher preparation, pedagogical approaches, and contextual factors

(Ertmer & Ottenbreit-Leftwich, 2010; Voogt et al., 2013). This complexity is particularly pronounced in developing countries, where resource constraints, infrastructure limitations, and capacity gaps often create significant barriers to effective implementation (Jhurree, 2005; Trucano, 2005).

Morocco, cognizant of these global trends and positioned within the broader context of educational modernization across the MENA region, has embarked on an ambitious journey to integrate ICT into its educational system since the early 2000s (Driouchi & Zouag, 2019; World Bank, 2018). This commitment has been manifested through a succession of strategic reforms and policy initiatives that reflect evolving understandings of technology's role in education. The National Charter for Education and Training (Kingdom of Morocco, 1999) established the foundational framework for educational reform, identifying ICT integration as a strategic priority. This was followed by the GENIE (Généralisation des Technologies d'Information et de Communication dans l'Enseignement) Program (2006-2013), which represented Morocco's first systematic attempt to deploy technology across the educational system (Ministry of National Education, 2009).

The Emergency Program (Programme d'Urgence, 2009-2012) sought to accelerate educational reform, including technology integration, in response to persistent challenges. Subsequently, the Strategic Vision 2015-2030, developed by the Higher Council for Education, Training, and Scientific Research (CSEFRS, 2015), adopted a more comprehensive approach, articulating 23 strategic levers for educational transformation, including specific provisions for digital integration. Most recently, the roadmap 2022-2026 (Ministry of National Education, Preschool, and Sports [MENPS], 2022) represents the current iteration of Morocco's educational digitalization policy, structured around three strategic objectives: quality, equal opportunity, and citizen promotion.

These policy initiatives have been accompanied by substantial and increasing financial investments. The education sector budget has grown significantly over recent years, increasing from 62 billion MAD (approximately 6.2 billion USD) in 2021 to 91 billion MAD (approximately 9.1 billion USD) in 2025, representing a 45% increase over four years (Government of Morocco, 2024). This budget represents approximately 21% of total government expenditure, placing Morocco among the highest education spenders in the MENA region as a proportion of government budget (World Bank, 2023). Morocco has also secured substantial international support, including a program-for-results agreement with the World

Bank valued at approximately 500 million USD for education sector development, with specific components addressing digital infrastructure and capacity building (World Bank, 2023).

However, a striking paradox emerges when examining the outcomes of these substantial investments. Morocco's performance in international assessments reveals a troubling disconnect between policy aspirations and educational outcomes. In the most recent Trends in International Mathematics and Science Study (TIMSS 2023), Morocco ranked 56th among 58 participating countries in fourth-grade mathematics with a score of 393 points, and 55th in science with 374 points, compared to the international CenterPoint of 500 (von Davier et al., 2024). These results represent a decline from previous assessment cycles, with Morocco's mathematics score dropping from 409 in TIMSS 2019 to 393 in TIMSS 2023 (Mullis et al., 2020). Similarly, the Progress in International Reading Literacy Study (PIRLS 2021) results indicated that 59% of Moroccan fourth-grade students failed to achieve minimum reading proficiency levels, with the country scoring 372 points and ranking 56th among 57 participating countries (Mullis et al., 2023). It is important to note that these assessment outcomes reflect multifactorial influences including curriculum quality, teaching methods, socioeconomic factors, and language policies—digitalization is one variable among many. This study does not claim that digitalization alone accounts for these outcomes, but rather examines whether digitalization policies have been implemented in ways that could reasonably be expected to contribute to educational improvement.

The school dropout phenomenon further compounds these challenges, representing a critical indicator of systemic dysfunction within the educational system. Recent statistics indicate that approximately 280,000 students abandon school annually in Morocco, with 160,000 dropping out at the middle school level alone (MENPS, 2025). This represents a significant loss of human capital and raises questions about the system's capacity to retain and engage students. The dropout rate exhibits significant territorial disparities, with rural areas experiencing rates of 5.7% at the primary level compared to 1.1% in urban areas (Ibourk et al., 2024). These disparities reflect broader patterns of educational inequality that technology integration policies have yet to effectively address.

The contradictory data presented above raises fundamental questions about the nature and implementation of educational digitalization policies in Morocco. While official discourse consistently emphasizes the transformative potential of technology in education, the evidence suggests a significant gap between policy rhetoric and classroom reality. Understanding this policy-practice gap is critical for several reasons. First, it can inform more effective policy formulation by identifying the specific dimensions of digitalization that require greater attention. Second, it can guide resource allocation decisions by highlighting areas where investments have not translated into improved outcomes. Third, it can support teacher professional development by identifying the barriers teachers face in implementing technology-enhanced instruction. Finally, it can contribute to the international literature on educational technology policy implementation in developing country contexts, providing comparative insights for other nations facing similar challenges.

This study addresses the following research questions:

- RQ1: What dimensions dominate official discourse on digitalization in Moroccan educational policy documents, and what is the relative emphasis on technical versus pedagogical aspects?
- RQ2: How do primary school teachers in the Fez-Meknes region perceive the current state of digitalization in their classroom practices across multiple domains (infrastructure, integration practices, training)?
- RQ3: What obstacles do teachers identify as impeding effective ICT integration in their teaching?
- RQ4: To what extent do teachers' perceptions align with official policy discourse, and what factors (geographic location, training status) moderate these perceptions?

2. Literature Review

2.1. Theoretical Framework

The Technological Pedagogical Content Knowledge (TPACK) framework, developed by Mishra and Koehler (2006), provides a comprehensive model for understanding the complex knowledge required for effective technology integration in education. Building upon Shulman's (1986) foundational work on Pedagogical Content Knowledge (PCK), the TPACK framework posits that effective teaching with technology requires the intersection and integration of three primary knowledge domains: Content Knowledge (CK), which encompasses the subject matter being taught; Pedagogical Knowledge (PK), which involves understanding of teaching and learning processes; and Technological Knowledge (TK), which comprises knowledge about technological tools and their capabilities (Koehler & Mishra, 2009).

The framework identifies seven knowledge domains arising from the interactions among these three primary domains. Technological Content Knowledge (TCK) addresses how technology can represent and transform subject matter. Technological Pedagogical Knowledge (TPK) concerns how technology can support various pedagogical strategies. At the center of the framework lies TPACK itself—the intersection of all three domains—representing the knowledge teachers need to integrate technology in pedagogically sound ways that are appropriate for specific content areas (Mishra & Koehler, 2006). Research has consistently demonstrated that teachers with stronger TPACK profiles demonstrate more sophisticated and effective technology integration practices (Chai et al., 2013; Voogt et al., 2013).

The SAMR model, developed by Puentedura (2006), offers a complementary framework for classifying and evaluating technology integration through four progressive stages arranged in a hierarchy. At the Enhancement level, Substitution involves technology serving as a direct substitute for traditional tools without functional change (e.g., word processing replacing handwriting), while Augmentation involves technology providing functional improvement over traditional methods (e.g., using spell-check features). At the Transformation level, Modification involves technology enabling significant task redesign (e.g., collaborative document editing), while Redefinition involves technology enabling creation of previously inconceivable tasks (e.g., global collaborative projects with students in different countries).

Research has consistently shown that most technology integration in educational settings remains at the Substitution and Augmentation levels, rarely achieving the transformative potential represented by Modification and Redefinition (Hamilton et al., 2016; Romrell et al., 2014). This pattern is particularly pronounced in developing countries, where infrastructure constraints and limited teacher preparation often restrict technology use to basic substitution activities (Hennessy et al., 2010). The SAMR model provides a useful lens for evaluating whether digitalization policies promote merely superficial technology adoption or enable genuine pedagogical transformation.

Together, the TPACK and SAMR frameworks provide complementary analytical lenses for this study. TPACK guides the analysis of policy emphasis on different knowledge domains (technical versus pedagogical), while SAMR provides a framework for understanding the level of technology integration achieved in classroom practice. These frameworks are particularly relevant for examining the policy-practice gap, as they highlight the multidimensional nature of effective technology integration and the insufficiency of purely technical approaches.

2.2. ICT Integration in Developing Countries

Research on ICT integration in developing countries consistently identifies a significant gap between policy intentions and implementation outcomes, a phenomenon sometimes referred to as the "implementation gap" or "policy-practice divide" (Jhurree, 2005; Khan et al., 2012; Tondeur et al., 2017). The challenges facing developing countries are distinct from those in developed nations: developing countries must simultaneously address fundamental challenges of access, infrastructure, and basic capacity while ensuring technology use is pedagogically meaningful—often with fewer resources (Kozma, 2011).

Infrastructure barriers include inadequate electrical supply, limited internet connectivity, insufficient devices with student-to-computer ratios often exceeding 100:1, and inadequate technical maintenance leading to high rates of equipment failure (Bingimlas, 2009; Trucano, 2005). Teacher-related barriers are equally significant: insufficient training, lack of confidence, limited time due to curriculum pressures, and resistance to change (Ertmer et al., 2012; Pelgrum, 2001). Ertmer and colleagues (2012) distinguish between first-order barriers (external obstacles such as infrastructure) and second-order barriers (internal obstacles such as beliefs), arguing that addressing both is essential for sustainable technology integration.

When infrastructure is inadequate, teachers may develop negative attitudes toward technology that persist even after infrastructure improves; conversely, motivated teachers may become frustrated by infrastructure limitations. Breaking this cycle requires addressing both types of barriers simultaneously (Kopcha, 2012). Policy and institutional barriers also play a significant role, including top-down approaches that fail to account for local contexts, fragmented implementation, and inadequate monitoring systems (Kozma, 2008; Voogt et al., 2013).

UNESCO's (2023) Global Education Monitoring Report provided a significant critique of technology-focused approaches in education, warning against excessive emphasis on technology at the expense of educational fundamentals. The report cautioned developing countries against uncritically adopting technology solutions promoted by commercial interests without adequate attention to pedagogical foundations and contextual appropriateness.

The National Charter for Education and Training (Charte Nationale d'Éducation et de Formation, 1999) established the first official framework for ICT integration in Moroccan education, calling for progressive introduction of ICT across all educational levels and emphasizing the need for teacher training (Kingdom of Morocco, 1999). However, the

Charter's provisions remained largely aspirational, lacking specific implementation mechanisms.

The GENIE (Généralisation des Technologies d'Information et de Communication dans l'Enseignement) Program (2006-2013) represented Morocco's first systematic attempt to implement technology integration at scale. The program equipped approximately 8,600 schools with computer labs and provided basic training to over 200,000 teachers (Ministry of National Education, 2013). However, the Supreme Audit Court's (2014) evaluation found that 40% of equipment was non-functional within three years; training was superficial and disconnected from pedagogical practice; and maintenance systems were inadequate.

The Strategic Vision 2015-2030, developed by the Higher Council for Education, Training, and Scientific Research (CSEFRS, 2015), adopted a more comprehensive approach, articulating 23 strategic levers for educational transformation. Lever 19 specifically addressed ICT integration, calling for development of pedagogical models and enhancement of teacher digital competencies. The roadmap 2022-2026 (MENPS, 2022) represents the current iteration, structured around quality, equal opportunity, and citizen promotion, emphasizing the TaalimTice platform and digital educational resources.

2.3. Policy Context in Morocco

The Emergency Program (Programme d'Urgence, 2009-2012) sought to accelerate educational reform in response to persistent challenges. The Pioneer Schools (Madaris Al-Riyada) initiative, launched during the 2023-2024 academic year with 626 primary schools nationwide, represents a promising recent development adopting a more comprehensive approach. Early evaluation results indicate improvements of 0.9 standard deviations across all subjects in participating schools (MEL, 2024).

The Supreme Audit Court's (2014) evaluation of the GENIE Program revealed significant implementation failures, concluding that the program had failed to achieve its transformational objectives due to excessive focus on equipment provision without adequate attention to teacher preparation, pedagogical integration, and sustainability mechanisms.

The Strategic Vision 2015-2030 (CSEFRS, 2015) represented a more comprehensive approach to educational reform. Lever 19 specifically addressed ICT integration, calling for development of pedagogical models, distance learning opportunities, digital resource platforms, and teacher digital competencies. The roadmap 2022-2026 (MENPS, 2022) continues this trajectory, structured around quality, equal opportunity, and citizenship objectives, while acknowledging some limitations of previous approaches.

A substantial body of empirical research has examined the relationship between technology integration and educational outcomes. Tamim and colleagues' (2011) second-order meta-analysis found a small but significant positive effect (d = 0.35) of technology use on learning outcomes, though effects varied considerably by context and implementation approach. Research specifically examining technology integration in primary education reveals that the quality of teacher-student interaction appears more predictive of learning outcomes than technology availability per se (Hattie, 2009). The relationship between teacher preparation and technology integration effectiveness has been well-documented, with studies consistently finding that teachers receiving sustained, pedagogically-focused technology training demonstrate more sophisticated integration practices (Ertmer & Ottenbreit-Leftwich, 2010; Tondeur et al., 2012).

While considerable research has examined technology integration in developing countries, limited empirical research specifically addresses the policy-practice gap in Moroccan educational digitalization. Existing studies tend to focus on either policy analysis without examining classroom realities (Driouchi & Zouag, 2019) or teacher perspectives without systematic policy analysis (Messaoudi & Talbi, 2012). This study addresses these gaps by combining rigorous content analysis of policy documents with comprehensive survey research examining teacher perceptions, enabling direct comparison of policy emphases with implementation realities.

The study contributes to the literature by providing systematic evidence on dimensions emphasized in Moroccan digitalization policy across a 25-year period (1999-2024), documenting teacher perceptions across multiple domains, examining moderating factors (geographic location, training status), contextualizing findings within Morocco's international assessment performance, and providing empirical support for theoretical frameworks (TPACK, SAMR) in a developing country context.

2.4. Empirical Evidence on Technology Integration Outcomes

Research on educational technology policy implementation highlights the importance of alignment among policy intentions, resource allocation, and classroom practices. Kozma's (2008) comparative analysis identified characteristics of effective policies, including clear vision statements, comprehensive implementation plans, and monitoring systems. Studies in developing countries frequently document disconnection among these elements (Jhurree, 2005; Unwin, 2009).

UNESCO’s (2023) Global Education Monitoring Report cautioned developing countries against uncritically adopting technology solutions without adequate attention to pedagogical foundations and contextual appropriateness. This study addresses these concerns by examining whether Moroccan policies have attended sufficiently to teacher preparation and pedagogical integration.

This study employed a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018), combining quantitative survey research with qualitative content analysis. This design allows simultaneous examination of policy discourse (through content analysis) and implementation realities (through survey research), enabling direct comparison and integration of findings.

Phase 1 (Qualitative) involved systematic content analysis of legal and regulatory texts governing digitalization in Moroccan educational policy, addressing Research Question 1. Phase 2 (Quantitative) involved a cross-sectional survey administered to primary school teachers to assess their perceptions and identify obstacles to implementation, addressing Research Questions 2, 3, and 4. Integration occurred at the interpretation stage.

2.5. Research Gap and Study Contribution

While considerable research has examined technology integration in developing countries and policy implementation challenges, limited empirical research specifically addresses the policy-practice gap in Moroccan educational digitalization. Existing studies tend to focus on either policy analysis without examining classroom realities (Driouchi & Zouag, 2019) or teacher perspectives without systematic policy analysis (Messaoudi & Talbi, 2012). International comparative studies rarely include Morocco in their samples, limiting the applicability of findings to the Moroccan context. Additionally, much existing research predates the major policy initiatives of the past decade, including the Strategic Vision 2015-2030 and Roadmap 2022-2026.

This study addresses these gaps by combining rigorous content analysis of policy documents with comprehensive survey research examining teacher perceptions, enabling direct comparison of policy emphases with implementation realities. The mixed-methods design allows triangulation of findings across data sources, strengthening the validity of conclusions about the policy-practice gap.

The study contributes to the literature in several ways. First, it provides systematic evidence on the dimensions emphasized in Moroccan digitalization policy across a 25-year period (1999-2024), enabling assessment of policy evolution and comparison with international best practices. Second, it documents teacher perceptions across multiple domains (infrastructure, practices, training, barriers), providing a comprehensive picture of implementation realities that complements policy analysis. Third, it examines moderating factors (geographic location, training status) that influence the policy-practice gap, informing targeted interventions for different teacher populations. Fourth, it contextualizes findings within Morocco's performance on international assessments (TIMSS 2023, PIRLS 2021), linking policy analysis to outcome indicators. Fifth, it provides empirical support for theoretical frameworks (TPACK, SAMR) in a developing country context, contributing to framework validation literature. These contributions advance understanding of educational technology policy implementation while providing practical guidance for Moroccan policymakers and practitioners.

3. Methods

3.1. Research Design

This study employed a convergent parallel mixed-methods design (Creswell & Plano Clark, 2018), combining quantitative survey research with qualitative content analysis. This design was selected because it allows simultaneous examination of policy discourse (through content analysis) and implementation realities (through survey research), enabling direct comparison and integration of findings. The convergent design is particularly appropriate when research questions require different types of data to address complementary aspects of a phenomenon (Tashakkori & Teddlie, 2010).

Phase 1 (Qualitative) involved systematic content analysis of legal and regulatory texts governing digitalization in Moroccan educational policy. This phase addressed Research Question 1 by examining the dimensions and emphases present in official policy discourse. Phase 2 (Quantitative) involved a cross-sectional survey administered to primary school teachers to assess their perceptions of digitalization reality and identify obstacles to implementation. This phase addressed Research Questions 2, 3, and 4. Integration occurred at the interpretation stage, where findings from both phases were compared and synthesized to address the overarching research objective of understanding the policy-practice gap.

3.2. Study Context: The Fez-Meknes Region

The Fez-Meknes region was selected as the study context for several reasons. First, it is one of Morocco's twelve administrative regions and represents the country's second-largest region by population, with approximately 4.2 million inhabitants (High Commission for Planning, 2024). Second, the region exhibits significant urban-rural diversity, encompassing the major cities of Fez and Meknes alongside extensive rural territories, enabling examination of geographic disparities. Third, the region contains five provincial education directorates, providing administrative diversity within a manageable research scope. Fourth, the region's educational indicators are broadly representative of national patterns, making findings potentially generalizable to other regions.

The region's primary education sector comprises approximately 18,500 teachers across 2,100 primary schools. The urban-rural distribution is approximately 55% urban and 45% rural, reflecting the region's demographic composition. Educational indicators for the region include a primary school enrollment rate of 99.4%, a dropout rate of 3.2%, and a student-to-teacher ratio of 26:1 (Regional Academy for Education and Training, 2024). These indicators position the region at roughly the national median on most educational metrics.

3.3. Participants and Sampling

The study population comprised primary school teachers currently employed in public schools within the Fez-Meknes region. The population was estimated at approximately 18,500 primary teachers distributed across five provincial directorates: Fez, Meknes, Sefrou, Moulay Yacoub, and El Hajeb. Stratified random sampling was employed to ensure representativeness across geographic location (urban/rural) and provincial directorate. This sampling approach was selected because it produces more precise estimates than simple random sampling when the population exhibits known stratification patterns (Cochran, 1977).

Sample size was determined using Krejcie and Morgan's (1970) widely-applied sample size formula for finite populations. For a population of 18,500 with a 95% confidence level and 5% margin of error, the minimum required sample size was 376 teachers. To account for potential non-response and incomplete questionnaires, 420 questionnaires were distributed, representing a 12% oversample.

Of the 420 distributed questionnaires, 398 were returned, yielding a response rate of 94.8%. This high response rate was achieved through several strategies: distribution through provincial directorate channels, which lent institutional legitimacy; clear communication of study purposes and confidentiality protections; follow-up reminders through school directors; and questionnaire design optimized for completion time (approximately 20 minutes). After excluding 13 questionnaires with more than 10% missing data, the final analytic sample comprised 385 teachers.

Table 1. *Sample Characteristics (N = 385)*

Variable	***Category***	***N***	***%***
Gender	Male	198	51.4
	Female	187	48.6
Location	Urban	224	58.2
	Rural	161	41.8
Teaching Experience	< 5 years	89	23.1
	5-10 years	124	32.2
	11-20 years	98	25.5
	> 20 years	74	19.2
ICT Training	Yes	160	41.6
	No	225	58.4

3.4. Instruments

3.4.1. *Content Analysis Framework*

A deductive content analysis framework was developed based on the TPACK model (Mishra & Koehler, 2006) and informed by international frameworks for educational technology policy analysis (UNESCO, 2011). The framework comprised four analytical categories representing distinct dimensions of educational digitalization: Technical Dimension (references to hardware, software, infrastructure, equipment, connectivity, and technical systems); Pedagogical Dimension (references to teaching methods, learning approaches, curriculum integration, and instructional design); Training Dimension (references to teacher preparation, professional development, capacity building, and skills development); and Managerial Dimension (references to governance, administration, monitoring, evaluation, and organizational structures).

The document corpus for content analysis comprised five key policy documents representing the evolution of Moroccan educational digitalization policy: (1) The National Charter for Education and Training (1999), (2) GENIE Program Documentation (2006-2013), (3) Emergency Program Documentation (2009-2012), (4) Strategic Vision 2015-2030 (2015), and

(5) Roadmap 2022-2026 (2022). These documents were selected based on their official status, policy significance, and comprehensive coverage of the study period.

3.4.2. *Survey Questionnaire*

A 48-item questionnaire was developed to assess teachers' perceptions across five domains, measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree): (1) Perceptions of Official Discourse (10 items), examining teachers' awareness and evaluation of policy pronouncements; (2) Digital Infrastructure Reality (8 items), assessing availability and functionality of technological resources; (3) Technology Integration Practices (12 items), measuring frequency and sophistication of technology use in teaching; (4) ICT Training and Qualification (10 items), evaluating preparation and ongoing professional development; and (5) Barriers to Technology Integration (8 items), identifying obstacles to effective implementation.

The questionnaire was developed through an iterative process. Initial items were generated based on literature review and theoretical frameworks. The instrument was reviewed by three educational technology experts and two primary education practitioners for content validity. Ambiguous or redundant items were revised or eliminated based on expert feedback. The questionnaire was then piloted with 45 teachers from schools not included in the main study sample to assess reliability and identify any remaining issues with item clarity or response scales.

Internal consistency reliability was assessed using Cronbach's alpha coefficients. As shown in Table 2, all domains exceeded the conventional threshold of α = .70 (Nunnally, 1978), with coefficients ranging from .76 to .91. The overall questionnaire demonstrated excellent reliability (α = .89), indicating that the instrument was suitable for group-level analyses.

Table 2. *Reliability Coefficients for Survey Domains (n = 45)*

Domain	Items	α
Perceptions of official discourse	10	.84
Digital infrastructure reality	8	.79
Technology integration practices	12	.91
ICT training and qualification	10	.87
Barriers to technology integration	8	.76
Overall Questionnaire	**48**	**.89**

Note. α = Cronbach's alpha coefficient.

3.5. Data Collection Procedures

Data collection occurred during the 2023-2024 academic year, spanning from September 2023 to February 2024. This timing was selected to capture a representative period of normal school operations following the disruptions of the COVID-19 pandemic, which had significantly affected educational technology implementation and teacher practices in preceding years.

For the content analysis component, policy documents were obtained from official government sources, including the Ministry of National Education website, the Official Bulletin (Bulletin Officiel), and the Higher Council for Education, Training, and Scientific Research. All documents were verified for authenticity against official publications. Documents were collected in their original Arabic and French versions to ensure accuracy in analysis. The researcher, proficient in both languages, conducted the analysis in the original language to preserve nuance and avoid translation-related distortions. When reporting findings, key terms and concepts were translated into English with careful attention to maintaining semantic equivalence.

For the survey component, questionnaires were distributed through official channels in coordination with the Regional Academy for Education and Training (AREF) Fez-Meknes. Initial authorization was obtained from the Regional Director of Education, who provided official letters facilitating access to schools through the five provincial directorates. Provincial directors were briefed on study purposes and procedures and asked to identify a random sample of schools within their jurisdictions according to the stratification criteria (urban/rural location). School directors were subsequently briefed on study purposes and procedures and asked to distribute questionnaires to randomly selected teachers within their schools.

The questionnaire was available in both Arabic and French to accommodate teacher language preferences. The instrument was initially developed in French based on established scales, then translated into Arabic using a back-translation procedure to ensure semantic equivalence across both versions. A bilingual panel of three educational researchers reviewed both versions for consistency and cultural appropriateness before pilot testing. Most respondents (78.4%) completed the Arabic version, reflecting the predominant language of instruction and professional communication in primary education. Questionnaires included a cover letter explaining the study, assuring confidentiality, providing instructions for completion, and providing contact information for questions. Informed consent was indicated by questionnaire completion and return. Completed questionnaires were collected by school directors in sealed envelopes and returned through the same administrative channels. The collection period extended over six weeks, with follow-up reminders sent at two and four weeks to maximize response rates.

3.6. Data Analysis

Content analysis followed Schreier's (2012) guidelines for qualitative content analysis. The analytical process involved: (1) familiarization with documents through repeated reading; (2) identification of meaning units (sentences or phrases addressing digitalization); (3) coding of meaning units to analytical categories; (4) verification of coding through independent review of a 20% subsample by a second researcher; and (5) calculation of frequencies and percentages. Inter-coder reliability was assessed using Cohen's kappa, yielding $\kappa = .84$, indicating substantial agreement (Landis & Koch, 1977). Chi-square goodness-of-fit tests were used to assess whether the distribution of coded units across dimensions differed significantly from equal distribution.

Quantitative data from the survey were analyzed using SPSS version 26. Analyses included: (1) descriptive statistics (means, standard deviations, frequencies) for all variables; (2) independent samples t-tests for comparison of urban versus rural teachers and trained versus untrained teachers; (3) effect sizes (Cohen's d) to assess practical significance of group differences; and (4) Pearson correlations to examine relationships among variables. Response levels were interpreted using a tri-level framework: Low (1.00-2.33), Moderate (2.34-3.67), and High (3.68-5.00). Alpha was set at .05 for all inferential tests, with Bonferroni corrections applied for multiple comparisons.

3.7. Ethical Considerations

This study was conducted in accordance with ethical principles for research involving human participants. Institutional approval was obtained from the research ethics committee of Moulay Ismail University. Official authorization was secured from the Regional Academy for Education and Training (AREF) Fez-Meknes and relevant provincial directorates. Informed consent was obtained from all survey participants through a detailed information sheet explaining study purposes, procedures, confidentiality protections, and the voluntary nature of participation. Participants were informed of their right to withdraw at any time without consequence. Data were stored securely with identifying information separated from responses. Results are reported at aggregate levels to prevent identification of individual teachers or schools.

4. Results

4.1. Content Analysis Findings (RQ1)

Analysis of the five policy document categories yielded 847 analytical units (meaning units) related to educational digitalization. These units were coded across the four analytical categories: technical, pedagogical, training, and managerial dimensions. Note that some analytical units were coded to multiple categories when they addressed more than one dimension, accounting for the total percentages exceeding 100%.

Results demonstrate clear dominance of the technical dimension (72.4%), which comprised nearly three-quarters of all digitalization discourse across the policy documents examined. Technical references primarily addressed equipment provision (computers, tablets, interactive whiteboards), infrastructure development (internet connectivity, computer labs), and technical systems (digital platforms, learning management systems). The pedagogical dimension received secondary attention (27.6%), with references focusing on digital educational resources, technology-enhanced teaching methods, and curriculum integration. Training (18.4%) and managerial (11.6%) dimensions were notably underrepresented, with limited attention to teacher preparation, professional development, governance structures, and monitoring systems.

A chi-square goodness-of-fit test was conducted to determine whether the distribution of coded units differed significantly from equal distribution across the four dimensions. The results confirmed that the distribution differed significantly from equal distribution, $\chi^2(3) = 547.82$, $p < .001$, with the technical dimension substantially overrepresented relative to other dimensions.

Analysis by individual policy document revealed important patterns in how emphases have evolved over time. The National Charter (1999) showed the most balanced distribution (62% technical, 31% pedagogical, 22% training, 18% managerial), reflecting the document's aspirational nature and comprehensive scope. The GENIE Program documentation (2006-2013) exhibited the strongest technical emphasis (82% technical), consistent with the program's implementation focus on equipment deployment. The Emergency Program (2009-2012) maintained strong technical emphasis (75%) while showing somewhat greater attention to training (24%). The Strategic Vision 2015-2030 showed the most balanced distribution among recent documents (65% technical, 34% pedagogical, 28% training, 19% managerial), reflecting its comprehensive reform agenda. The roadmap 2022-2026, despite acknowledging lessons from previous initiatives, reverted to technical emphasis (74%), focusing substantially on digital platform development and infrastructure deployment.

These temporal patterns suggest that while policy discourse has acknowledged the importance of integrated approaches, implementation-focused documents continue to prioritize technical dimensions. This may reflect the relative ease of specifying and measuring technical outputs compared to pedagogical transformation, or institutional path dependencies that perpetuate equipment-focused approaches despite recognition of their limitations.

Table 3. *Distribution of Coded Units Across Dimensions (N = 847)*

Dimension	Frequency	%	Rank	Level
Technical	613	72.4	1	Dominant
Pedagogical	234	27.6	2	Secondary
Training	156	18.4	3	Limited
Managerial	98	11.6	4	Marginal

Note. Percentages exceed 100% as some units were coded to multiple dimensions. $\chi^2(3) = 547.82, p < .001$.

To illustrate the coding logic, the following examples demonstrate how statements were classified. A technical coding was applied to statements such as “equipping schools with multimedia rooms and computer labs” (GENIE Program) or “deploying tablets and interactive whiteboards in classrooms” (Roadmap 2022-2026). In contrast, a pedagogical coding was applied to statements such as “developing innovative teaching approaches that integrate digital tools to enhance student engagement” (Strategic Vision 2015-2030). A training coding was applied to statements referencing “capacity building for teachers in digital competencies” (GENIE Program).

4.2. Survey Findings: Teacher Perceptions (RQ2 & RQ3)

Survey results revealed teachers' perceptions of the policy-practice gap and current state of digitalization across multiple domains. When asked directly about the alignment between policy rhetoric and classroom reality, 67.3% of teachers perceived a large or very large gap (38.2% very large gap, 29.1% large gap). An additional 22.1% perceived a moderate gap, while only 10.6% perceived a small or no gap. These results indicate substantial skepticism among teachers regarding the implementation of digitalization policies.

Table 4 presents descriptive statistics for the five survey domains. The barriers to integration domain scored highest (M = 3.92, SD = 0.68); note that for this domain, higher scores indicate greater perceived obstacles, so a high mean represents a negative situation, indicating teachers perceive substantial obstacles to effective technology integration. Perceptions of official discourse scored at a moderate level (M = 2.84, SD = 0.72), suggesting teachers have some awareness of policy pronouncements but limited confidence in their implementation. Technology integration practices also scored at moderate levels (M = 2.47, SD = 0.81), indicating occasional but not routine technology use in teaching.

Notably, infrastructure (M = 2.31, SD = 0.89) and training (M = 2.19, SD = 0.94) domains scored at low levels, indicating significant deficiencies in these areas as perceived by teachers. The infrastructure domain items addressed availability of computers, internet connectivity, technical functionality of equipment, and adequacy of digital resources. The training domain items addressed pre-service technology preparation, in-service professional development, pedagogical integration training, and ongoing support. The low scores in these domains suggest fundamental prerequisites for effective technology integration remain unmet.

Table 4. *Descriptive Statistics for Survey Domains (N = 385)*

Domain	M	SD	Rank	Level
Perceptions of official discourse	2.84	0.72	2	Moderate
Digital infrastructure	2.31	0.89	4	Low
Technology integration practices	2.47	0.81	3	Moderate
ICT training	2.19	0.94	5	Low
Barriers to integration	3.92	0.68	1	High
Overall Mean	**2.75**	**0.64**	**—**	**Moderate**

Note. Interpretation: Low = 1.00-2.33; Moderate = 2.34-3.67; High = 3.68-5.00. M = Mean; SD = Standard Deviation.

Analysis of specific barriers revealed that inadequate training ranked as the primary obstacle (M = 4.21, SD = 0.79), followed closely by equipment insufficiency (M = 4.18, SD = 0.82) and curriculum/time constraints (M = 4.02, SD = 0.85). Technical problems (M = 3.89, SD = 0.91), lack of technical support (M = 3.76, SD = 0.88), and administrative obstacles (M = 3.64, SD = 0.94) also scored at moderate to high levels. These results suggest that barriers to integration are multidimensional, encompassing teacher preparation, infrastructure, curriculum design, and institutional support.

Further analysis of training-related barriers revealed specific dimensions of concern. Among teachers who reported receiving no ICT training (58.4% of sample), 82.3% indicated they would be interested in receiving such training if available—suggesting the issue is access rather than willingness. Among those who had received training, 64.2% rated their training as inadequate in terms of duration, 71.8% rated it inadequate in terms of practical application, and 58.9% indicated the training focused on technical skills without addressing pedagogical integration. These findings suggest that both the quantity and quality of teacher training are problematic.

Analysis of infrastructure-related barriers revealed significant variation by school location. Rural teachers reported that 43.2% of their schools lacked functional computer equipment, compared to 18.7% for urban teachers. Internet connectivity was absent or unreliable in 67.8% of rural schools compared to 31.4% of urban schools. Even where equipment was available, 52.1% of rural teachers reported lacking technical support for maintenance and troubleshooting, compared to 29.8% of urban teachers. These findings quantify the extent of infrastructure disparities underlying the urban-rural differences in integration practices.

4.3. Group Comparisons: Urban-Rural and Training Differences (RQ4)

Independent samples t-tests were conducted to examine differences between urban and rural teachers across the four perception domains (excluding barriers, which were analyzed separately). Results revealed statistically significant differences across all domains, with urban teachers reporting more favorable conditions than rural teachers.

As shown in Table 5, the largest difference appeared in the infrastructure domain, where urban teachers reported significantly higher availability and functionality of technology resources ($M = 2.67$) compared to rural teachers ($M = 1.81$), $t(383) = 7.42$, $p < .001$, $d = 0.89$. This effect size is classified as large according to Cohen's (1988) guidelines, indicating a substantial practical difference in infrastructure availability between urban and rural schools.

Urban teachers also reported significantly more frequent technology integration practices ($M = 2.71$) compared to rural teachers ($M = 2.14$), $t(383) = 5.18$, $p < .001$, $d = 0.62$, a medium effect size. The training domain showed a smaller but still significant difference ($d = 0.38$). Conversely, rural teachers reported significantly higher barriers to integration ($M = 4.21$)

compared to urban teachers (M = 3.72), t(383) = -4.56, $p < .001$, d = 0.52. These results indicate that rural teachers face systematically more challenging conditions for technology integration.

Table 5. *Comparison of Urban and Rural Teachers*

Domain	Urban M	Rural M	t	p	d
Infrastructure	2.67	1.81	7.42	< .001	0.89
Integration	2.71	2.14	5.18	< .001	0.62
Training	2.34	1.98	3.21	.002	0.38
Barriers	3.72	4.21	-4.56	< .001	0.52

Note. df = 383. Effect size interpretation: small = 0.20, medium = 0.50, large = 0.80 (Cohen, 1988). M = Mean; d = Cohen's d.

Additional analyses examined differences between teachers who had received ICT training (n = 160) and those who had not (n = 225). Results revealed that trained teachers demonstrated significantly higher technology integration practices (M = 2.89) compared to untrained teachers (M = 2.17), t(383) = 8.74, $p < .001$, d = 0.91. This large effect size underscores the critical importance of teacher training for technology integration. Notably, 58.4% of the sample reported receiving no ICT training, indicating a substantial gap in professional development provision.

Correlation analyses examined relationships among the study variables. Infrastructure availability was positively correlated with integration practices (r = .52, $p < .001$) and negatively correlated with perceived barriers (r = -.41, $p < .001$). Training was positively correlated with integration practices (r = .48, $p < .001$) and with confidence in technology use (r = .56, $p < .001$). These correlational patterns, while not establishing causality, suggest that infrastructure and training work together to enable integration practices while reducing perceived barriers.

Further analysis examined the interaction between location and training status on integration practices. A two-way ANOVA revealed significant main effects for both location, $F(1, 381) = 26.73$, $p < .001$, $\eta^2 = .07$, and training status, $F(1, 381) = 76.42$, $p < .001$, $\eta^2 = .17$. The interaction effect was not significant, $F(1, 381) = 1.84$, $p = .18$, $\eta^2 = .005$, suggesting that the benefit of training is similar for urban and rural teachers. This finding has important policy implications: investing in teacher training may help reduce (though not eliminate) urban-rural disparities in technology integration.

5. Discussion

5.1. Technical Dominance in Policy Discourse

The content analysis results demonstrated clear dominance of technical dimensions in Moroccan educational digitalization policy (72.4% of coded units), confirming the first research hypothesis and addressing RQ1. This technical emphasis was evident across all five policy documents analyzed, though with some variation in intensity. The GENIE Program documentation exhibited the strongest technical emphasis (82% technical references), while the Strategic Vision 2015-2030 showed somewhat more balance (65% technical references).

This technical dominance can be attributed to several interrelated factors. First, technical approaches are more easily quantified, measured, and communicated politically. The number of computers deployed, schools connected, or platforms created provides concrete metrics for demonstrating policy implementation, whereas pedagogical transformation is more difficult to measure and demonstrate (Cuban, 2001). Second, early international approaches to educational technology emphasized access-focused strategies based on the assumption that providing equipment would naturally lead to improved outcomes—what Warschauer (2003) termed the "device fetishism" of early ICT4D (ICT for Development) initiatives. Morocco's policy trajectory reflects the influence of these international discourses.

Third, a comprehensive pedagogical vision for technology integration has been largely absent from Moroccan educational policy. While documents reference the potential for technology to improve teaching and learning, they rarely articulate specific pedagogical models, instructional approaches, or learning theories that should guide technology use. This absence is particularly notable given the availability of frameworks such as TPACK (Mishra & Koehler, 2006) and SAMR (Puentedura, 2006) that could inform more pedagogically-grounded approaches.

These findings align with UNESCO's (2023) Global Education Monitoring Report, which warned against excessive technology focus at the expense of educational fundamentals. The report noted that many countries have invested heavily in educational technology without adequate evidence of effectiveness, often responding to commercial pressures rather than educational needs. Morocco's policy trajectory appears consistent with this international pattern, though the consequences—as evidenced by international assessment results—are particularly stark.

5.2. The Policy-Practice Gap: Infrastructure and Training Deficits

Survey results confirmed a substantial gap between policy discourse and classroom practice, with 67.3% of teachers perceiving significant disconnection. The low scores on infrastructure (M = 2.31) and training (M = 2.19) domains provide empirical evidence for this gap and address RQ2. These findings indicate that despite two decades of policy initiatives and substantial financial investments, fundamental prerequisites for effective technology integration remain unmet in many Moroccan primary schools.

From a TPACK perspective (Mishra & Koehler, 2006), these findings suggest that policies have primarily emphasized Technological Knowledge (TK) at the expense of the integrated competencies—particularly Technological Pedagogical Content Knowledge (TPACK)—that research identifies as essential for effective technology integration. The low training scores indicate teachers lack the pedagogical integration knowledge needed to use technology in ways that enhance content learning. Without this integration, technology use is likely to remain superficial and disconnected from learning objectives.

From a SAMR perspective (Puentedura, 2006), the moderate integration scores (M = 2.47) and teacher self-reports on integration items suggest that technology use, where it occurs, likely remains primarily at the Substitution level—technology serving as a direct substitute for traditional tools without functional change or pedagogical transformation. This pattern is consistent with international research showing that without adequate preparation and support, teachers default to using technology in familiar, non-transformative ways (Hamilton et al., 2016; Romrell et al., 2014).

The identification of inadequate training as the primary barrier (M = 4.21) directly addresses RQ3 and underscores the fundamental misalignment between policy emphasis (technical dimensions) and implementation needs (training and pedagogical support). This finding is particularly significant given that 58.4% of sampled teachers reported receiving no ICT training at all. The barriers identified—training deficits, equipment insufficiency, curriculum constraints, and lack of support—are interrelated and require coordinated policy responses rather than isolated interventions.

5.3. Urban-Rural Disparities and Equity Implications

The substantial urban-rural disparities documented in this study (effect sizes ranging from d = 0.52 to d = 0.89) address RQ4 and raise important equity considerations. These disparities parallel broader patterns of educational inequality in Morocco and suggest that current digitalization policies may inadvertently exacerbate rather than address existing inequities. The large infrastructure gap (d = 0.89) indicates that rural schools are significantly disadvantaged in access to technology resources, while the barrier gap (d = 0.52) indicates that rural teachers face systematically more challenging conditions.

These findings highlight a fundamental limitation of “one-size-fits-all” national policies. The policy documents analyzed assume a baseline of infrastructure availability that simply does not exist in many rural schools. When policies mandate technology integration without accounting for the reality that 43.2% of rural schools lack functional computer equipment and 67.8% lack reliable internet connectivity, they place rural teachers in an impossible position. This creates a systematic disadvantage whereby rural schools cannot comply with national directives regardless of teacher motivation or effort. Future policies must adopt differentiated implementation strategies that either ensure rural schools receive enhanced infrastructure support before integration mandates take effect, or establish alternative pathways to educational modernization that do not presuppose the infrastructure that rural areas lack.

These findings are consistent with the broader pattern of urban-rural educational disparities in Morocco. The dropout rate differential (5.7% in rural areas versus 1.1% in urban areas at the primary level) reflects structural inequities in educational provision that technology policies have not effectively addressed (Ibourk et al., 2024). Without targeted interventions to ensure equitable access to infrastructure, training, and support, digitalization policies risk creating a "digital divide" that mirrors and reinforces existing socioeconomic inequalities.

The significant differences between trained and untrained teachers (d = 0.91) provide more optimistic evidence, demonstrating that professional development can substantially improve integration practices. This finding underscores the pivotal role of teacher training and suggests that investment in comprehensive professional development could yield significant returns. However, the finding that 58.4% of sampled teachers have received no ICT training indicates that current professional development systems are inadequate to meet this need.

5.4. Theoretical Implications

The findings of this study have important implications for theoretical frameworks guiding educational technology integration. The TPACK framework (Mishra & Koehler, 2006) proved valuable for analyzing the multidimensional nature of effective technology integration and identifying the limitations of technically-focused approaches. The dominance of technical dimensions in policy discourse (72.4%) contrasts sharply with TPACK's emphasis on the integration of technological, pedagogical, and content knowledge. This misalignment helps explain why substantial technology investments have not translated into improved learning outcomes—policies have addressed only one dimension of what research identifies as a multidimensional competency.

The SAMR model (Puentedura, 2006) provided a useful lens for understanding the level of technology integration achieved in classrooms. The moderate integration scores (M = 2.47) suggest that most technology use remains at the Substitution and Augmentation levels, consistent with international research patterns. However, the SAMR model's hierarchical assumption—that higher levels are inherently better—should be applied cautiously. In resource-constrained contexts, lower-level integration that is pedagogically sound may be more valuable than ambitious but poorly supported attempts at transformation. Future research should examine what levels of SAMR integration are achievable and beneficial given specific resource and capacity constraints.

The study also contributes to understanding of policy implementation in developing country contexts. The substantial gap between policy rhetoric and classroom reality documented here reflects broader patterns of implementation failure observed internationally (Jhurree, 2005; Tondeur et al., 2017). Several theoretical propositions emerge from this analysis. First, policies that prioritize easily-measured technical outputs over harder-to-measure pedagogical transformation tend to produce superficial implementation. Second, implementation success requires alignment among policy emphases, resource allocation, and capacity building—misalignment at any level undermines overall effectiveness. Third, urban-rural disparities in implementation outcomes suggest that uniform policies produce unequal results when applied to unequal contexts, supporting calls for differentiated implementation strategies.

5.5. Contextualizing International Assessment Results

The findings of this study provide important context for understanding Morocco's disappointing performance on international assessments. The TIMSS 2023 results (mathematics rank: 56/58; score: 393) and PIRLS 2021 results (reading rank: 56/57; score: 372) represent concerning indicators of educational quality that cannot be attributed solely to technology-related factors. However, the policy-practice gap documented in this study suggests that digitalization investments have not contributed effectively to learning outcomes—and may have diverted attention and resources from more fundamental educational needs.

The Pioneer Schools (Madaris Al-Riyada) initiative provides an instructive counterpoint. The substantial improvements documented in participating schools (0.9 standard deviations across subjects) demonstrate that meaningful educational improvement is achievable when comprehensive approaches are employed (MEL, 2024). The Pioneer Schools model combines infrastructure provision with intensive teacher training, pedagogical support, curriculum alignment, and community engagement—precisely the integrated approach that the policy analysis suggests has been absent from Morocco's broader digitalization strategy.

5.6. Limitations

Several limitations warrant consideration when interpreting these findings. First, the study was conducted in a single region (Fez-Meknes), and while this region is broadly representative of national patterns, findings may not fully generalize to regions with different characteristics, particularly the southern and eastern regions with lower population densities and different resource allocations. Second, the cross-sectional design precludes causal inferences about relationships among variables. Longitudinal research is needed to establish how policy changes affect implementation outcomes over time.

Third, self-reported survey data may be subject to social desirability bias, with teachers potentially underreporting problems or overreporting positive practices. Future research should include direct classroom observation to validate self-reported integration practices. Fourth, the content analysis examined official policy documents without assessing how these documents are interpreted and implemented at lower administrative levels (regional academies, provincial directorates, individual schools). The policy-practice gap may be compounded by interpretation gaps at each administrative level.

Fifth, the study focused exclusively on primary education and may not capture dynamics specific to secondary or higher education contexts. Finally, the study did not directly measure student learning outcomes, relying instead on international assessment results as contextual indicators. Future research should examine direct relationships between implementation factors and student learning.

6. Conclusions

This study documented a significant and multidimensional gap between official discourse on educational digitalization and classroom practice in Moroccan primary education. Content analysis of five key policy documents spanning 25 years (1999-2024) revealed predominance of technical dimensions (72.4%), with pedagogical (27.6%), training (18.4%), and managerial (11.6%) dimensions substantially underrepresented. This pattern persisted across all policy documents analyzed, though with some variation in intensity, suggesting a structural tendency toward technical emphasis rather than an isolated characteristic of particular initiatives.

Survey research with 385 primary teachers confirmed this gap, with 67.3% perceiving significant disconnection between policy rhetoric and classroom reality. The empirical data revealed a consistent pattern: policy documents emphasize equipment and infrastructure while teachers report deficiencies in precisely those areas (infrastructure M = 2.31, training M = 2.19), alongside high barriers to implementation (M = 3.92). This pattern suggests not merely that implementation has failed to match policy aspirations, but that the nature of those aspirations—focused primarily on technical dimensions—may be fundamentally misaligned with implementation needs.

The low teacher ratings on infrastructure and training indicate that fundamental prerequisites for effective technology integration remain unmet despite substantial policy attention and financial investment over two decades. The finding that 58.4% of teachers have received no ICT training is particularly striking given that the GENIE program alone claimed to have trained over 200,000 teachers—suggesting either that training coverage was more limited than reported or that training was so superficial as to be unrecognized by recipients. The identification of inadequate training as the primary barrier (M = 4.21) suggests fundamental misalignment between policy emphasis (equipment provision) and implementation needs (teacher preparation and support).

Substantial urban-rural disparities (effect sizes d = 0.52-0.89) indicate that current policies may exacerbate rather than address existing educational inequities. Rural teachers face systematically more challenging conditions across all dimensions examined—less infrastructure availability, fewer training opportunities, higher barriers, and lower integration practices. These disparities mirror and potentially reinforce broader patterns of educational inequality in Morocco, where rural dropout rates substantially exceed urban rates. Without explicit attention to equity considerations, digitalization policies risk creating a "digital divide" that compounds existing socioeconomic inequalities.

These findings contextualize Morocco's concerning performance on international assessments—TIMSS 2023 (mathematics rank: 56/58; score: 393) and PIRLS 2021 (reading rank: 56/57; score: 372)—while suggesting pathways for improvement. The success of the Pioneer Schools initiative, with documented improvements of 0.9 standard deviations across all subjects, demonstrates that meaningful improvement is achievable when comprehensive approaches replace equipment-focused strategies. The key differentiator appears to be the integration of infrastructure provision with intensive teacher training, pedagogical support, and ongoing monitoring—precisely the elements that content analysis revealed to be underemphasized in broader policy documents.

Successful educational digitalization requires rebalancing policy focus from equipment provision toward integrated approaches that encompass: systematic teacher preparation grounded in TPACK frameworks that develop technological, pedagogical, and content knowledge in integrated ways; pedagogical transformation moving beyond substitution to modification and redefinition levels of the SAMR model, enabling technology to transform rather than merely replicate traditional practices; equity-focused strategies that explicitly prioritize underserved rural areas and ensure that digitalization reduces rather than exacerbates existing inequalities; and robust monitoring and evaluation systems that enable evidence-based policy adjustment based on implementation realities rather than technical deployment metrics alone.

Recommendations

The findings of this study support detailed recommendations for multiple stakeholder groups, each of which plays a critical role in addressing the documented policy-practice gap.

6.1. Recommendations for Policy Makers

First, policies should rebalance emphasis from technical to integrated approaches, ensuring that infrastructure investments are accompanied by commensurate investments in teacher preparation, pedagogical support, and monitoring systems. The current ratio of technical to pedagogical emphasis (approximately 3:1 based on content analysis) should be reversed, with greater attention to the conditions that enable effective technology use. Second, policies should establish clear implementation mechanisms with specific targets, timelines, and accountability structures. Broad aspirational statements about technology's transformative potential should be replaced with measurable objectives and indicators that capture pedagogical transformation rather than merely technical deployment.

Third, policies should explicitly prioritize rural areas and underserved populations to prevent digitalization from exacerbating existing inequities. This might include differentiated resource allocation formulas that provide additional support to schools with greater infrastructure gaps, targeted recruitment and retention incentives for teachers in rural areas, and mobile or shared resource models where fixed infrastructure is not feasible. Fourth, policymakers should continue evaluating the Pioneer Schools model and consider potential scaling based on accumulating evidence. While preliminary results from the 2023-2024 academic year are promising (MEL, 2024), the initiative remains in its early stages and requires sustained evaluation before national scaling can be confidently recommended. The key elements of this model—integration of infrastructure, intensive training, pedagogical support, and community engagement—should be systematically documented and rigorously evaluated across diverse contexts before broader implementation.

Fifth, policy development processes should incorporate teacher voice and classroom perspective more systematically. The substantial gap between policy rhetoric and teacher perceptions documented in this study suggests that policies are developed without adequate input from those responsible for implementation. Mechanisms for teacher consultation, pilot testing, and feedback should be institutionalized in the policy development process.

6.2. Recommendations for Future Research

Longitudinal studies are needed to track the implementation of current policy initiatives (particularly the roadmap 2022-2026 and Pioneer Schools expansion) and their effects on teacher practices and student outcomes over time. Cross-sectional studies like the present one can document associations but cannot establish how changes in policy translate into changes in practice. Comparative research across multiple regions would enhance understanding of contextual factors affecting implementation and enable identification of successful local adaptations.

Direct classroom observation studies would validate self-reported practices and provide richer understanding of technology integration in action. The moderate integration scores reported in this study ($M = 2.47$) may reflect actual practice levels, social desirability bias, or differing interpretations of integration—observation research could disambiguate these possibilities. Finally, research examining the Pioneer Schools initiative in greater depth could identify specific elements contributing to its success, informing broader policy development. The substantial effect sizes documented (0.9 standard deviations) warrant careful analysis of what combination of elements produces such results.

Acknowledgement

Artificial Intelligence Statement: *AI and AI-assisted technologies were not used in the data collection and analysis of this study.*

Ethics Approval Statement: *This study was conducted in accordance with ethical principles for research involving human participants. Institutional approval was obtained from the research ethics committee of Moulay Ismail University. Informed consent was 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

Anas El Berkouki is a doctoral candidate in Educational Sciences at the Higher School of Teachers (École Normale Supérieure), Moulay Ismail University, Meknès, Morocco. His research focuses on educational technology integration, ICT policy implementation, teacher professional development, and educational policy analysis in primary education contexts.

a.elberkouki@edu.umi.ac.ma

ORCID

Anas El Berkouki *https://orcid.org/0009-0000-7093-5934*

References

Bingimlas, K. A. (2009). Barriers to the successful integration of ICT in teaching and learning environments: A review of the literature. Eurasia Journal of Mathematics, Science and Technology Education, 5(3), 235-245. https://doi.org/10.12973/ejmste/75275

Castells, M. (2010). The rise of the network society (2nd ed.). Wiley-Blackwell.

Chai, C. S., Koh, J. H. L., & Tsai, C. C. (2013). A review of technological pedagogical content knowledge. Educational Technology & Society, 16(2), 31-51.

Cheung, A. C. K., & Slavin, R. E. (2013). The effectiveness of educational technology applications for enhancing mathematics achievement in K-12 classrooms: A meta-analysis. Educational Research Review, 9, 88-113. https://doi.org/10.1016/j.edurev.2013.01.001

Cochran, W. G. (1977). Sampling techniques (3rd ed.). John Wiley & Sons.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Creswell, J. W., & Plano Clark, V. L. (2018). Designing and conducting mixed methods research (3rd ed.). Sage.

Cuban, L. (2001). Oversold and underused: Computers in the classroom. Harvard University Press.

Driouchi, A., & Zouag, N. (2019). ICT in education in Morocco: Progress and challenges. International Journal of Education and Development using ICT, 15(2), 45-62.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. Journal of Research on Technology in Education, 42(3), 255-284. https://doi.org/10.1080/15391523.2010.10782551

Ertmer, P. A., Ottenbreit-Leftwich, A. T., Sadik, O., Sendurur, E., & Sendurur, P. (2012). Teacher beliefs and technology integration practices: A critical relationship. Computers & Education, 59(2), 423-435. https://doi.org/10.1016/j.compedu.2012.02.001

Government of Morocco. (2024). Ministerial commission report on education sector budget. Author.

Hamilton, E. R., Rosenberg, J. M., & Akcaoglu, M. (2016). The substitution augmentation modification redefinition (SAMR) model: A critical review and suggestions for its use. TechTrends, 60(5), 433-441. https://doi.org/10.1007/s11528-016-0091-y

Hattie, J. A. C. (2009). Visible learning: A synthesis of over 800 meta-analyses relating to achievement. Routledge.

Hennessy, S., Harrison, D., & Wamakote, L. (2010). Teacher factors influencing classroom use of ICT in sub-Saharan Africa. Itupale Online Journal of African Studies, 2(1), 39-54.

Hew, K. F., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: Current knowledge gaps and recommendations for future research. Educational Technology Research and Development, 55(3), 223-252. https://doi.org/10.1007/s11423-006-9022-5

High Commission for Planning. (2024). Regional population statistics: Fez-Meknes region. Author.

Higher Council for Education, Training, and Scientific Research. (2015). Strategic vision 2015-2030: For a school of equity, quality and promotion. Author.

Ibourk, A., Amaghouss, J., & El Ghak, T. (2024). Territorial obstacles causing early school dropout in Morocco: A multidimensional analysis. Heliyon, 10(24), e41386. https://doi.org/10.1016/j.heliyon.2024.e41386

Jhurree, V. (2005). Technology integration in education in developing countries: Guidelines to policy makers. International Education Journal, 6(4), 467-483.

Khan, M. S. H., Hasan, M., & Clement, C. K. (2012). Barriers to the introduction of ICT into education in developing countries: The example of Bangladesh. International Journal of Instruction, 5(2), 61-80.

Kingdom of Morocco. (1999). National charter for education and training. Author.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? Contemporary Issues in Technology and Teacher Education, 9(1), 60-70.

Kopcha, T. J. (2012). Teachers' perceptions of the barriers to technology integration and practices with technology under situated professional development. Computers & Education, 59(4), 1109-1121. https://doi.org/10.1016/j.compedu.2012.05.014

Kozma, R. B. (2008). Comparative analysis of policies for ICT in education. In J. Voogt & G. Knezek (Eds.), International handbook of information technology in primary and secondary education (pp. 1083-1096). Springer.

Kozma, R. B. (2011). ICT, education transformation, and economic development: An analysis of the US National Educational Technology Plan. E-Learning and Digital Media, 8(2), 106-120.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. Educational and Psychological Measurement, 30(3), 607-610. https://doi.org/10.1177/001316447003000308

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. Biometrics, 33(1), 159-174.

Messaoudi, F., & Talbi, M. (2012). ICT integration in Moroccan schools: Perceptions and practices. Journal of Educational Technology Systems, 41(2), 123-142.

Ministry of National Education. (2009). GENIE program: Strategic framework and implementation plan. Author.

Ministry of National Education. (2013). GENIE program: Final evaluation report 2006-2013. Author.

Ministry of National Education, Preschool, and Sports. (2022). Roadmap 2022-2026: For a quality public school for all. Author.

Ministry of National Education, Preschool, and Sports. (2025). School dropout statistics report: 2024-2025 academic year. Author.

Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. Teachers College Record, 108(6), 1017-1054. https://doi.org/10.1111/j.1467-9620.2006.00684.x

Morocco Innovation and Evaluation Lab. (2024). Pioneer Schools (Madaris Al-Riyada) evaluation report: First year findings. Mohammed VI Polytechnic University.

Mullis, I. V. S., Martin, M. O., Foy, P., Kelly, D. L., & Fishbein, B. (2020). TIMSS 2019 international results in mathematics and science. Boston College, TIMSS & PIRLS International Study Center.

Mullis, I. V. S., von Davier, M., Foy, P., Fishbein, B., Reynolds, K. A., & Wry, E. (2023). PIRLS 2021 international results in reading. Boston College, TIMSS & PIRLS International Study Center.

Nunnally, J. C. (1978). Psychometric theory (2nd ed.). McGraw-Hill.

OECD. (2023). PISA 2022 results: Learning in the digital world. OECD Publishing. https://doi.org/10.1787/a97db61c-en

Pelgrum, W. J. (2001). Obstacles to the integration of ICT in education: Results from a worldwide educational assessment. Computers & Education, 37(2), 163-178. https://doi.org/10.1016/S0360-1315(01)00045-8

Prensky, M. (2010). Teaching digital natives: Partnering for real learning. Corwin Press.

Puentedura, R. R. (2006). Transformation, technology, and education [Conference presentation]. Maine Learning Technologies Initiative, Portland, ME, United States.

Regional Academy for Education and Training. (2024). Annual statistical report: Fez-Meknes region 2023-2024. Author.

Romrell, D., Kidder, L. C., & Wood, E. (2014). The SAMR model as a framework for evaluating mLearning. Online Learning, 18(2), 1-15.

Schreier, M. (2012). Qualitative content analysis in practice. Sage.

Selwyn, N. (2016). Education and technology: Key issues and debates (2nd ed.). Bloomsbury Academic.

Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. Educational Researcher, 15(2), 4-14.

Supreme Audit Court. (2014). Evaluation report on the GENIE program. Author.

Tamim, R. M., Bernard, R. M., Borokhovski, E., Abrami, P. C., & Schmid, R. F. (2011). What forty years of research says about the impact of technology on learning: A second-order meta-analysis and validation study. Review of Educational Research, 81(1), 4-28. https://doi.org/10.3102/0034654310393361

Tashakkori, A., & Teddlie, C. (2010). SAGE handbook of mixed methods in social and behavioral research (2nd ed.). Sage.

Tondeur, J., van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. Educational Technology Research and Development, 65(3), 555-575. https://doi.org/10.1007/s11423-016-9481-2

Tondeur, J., van Braak, J., Sang, G., Voogt, J., Fisser, P., & Ottenbreit-Leftwich, A. (2012). Preparing pre-service teachers to integrate technology in education: A synthesis of qualitative evidence. Computers & Education, 59(1), 134-144. https://doi.org/10.1016/j.compedu.2011.10.009

Trucano, M. (2005). Knowledge maps: ICT in education. infoDev/World Bank.

UNESCO. (2011). UNESCO ICT competency framework for teachers. UNESCO Publishing.

UNESCO. (2020). Education in a post-COVID world: Nine ideas for public action. UNESCO Publishing.

UNESCO. (2023). Global education monitoring report 2023: Technology in education—A tool on whose terms? UNESCO Publishing.

Unwin, T. (Ed.). (2009). ICT4D: Information and communication technology for development. Cambridge University Press.

von Davier, M., Mullis, I. V. S., Fishbein, B., & Foy, P. (2024). TIMSS 2023 international results in mathematics and science. Boston College, TIMSS & PIRLS International Study Center.

Voogt, J., Fisser, P., Pareja Roblin, N., Tondeur, J., & van Braak, J. (2013). Technological pedagogical content knowledge—A review of the literature. Journal of Computer Assisted Learning, 29(2), 109-121. https://doi.org/10.1111/j.1365-2729.2012.00487.x

Warschauer, M. (2003). Technology and social inclusion: Rethinking the digital divide. MIT Press.

Williamson, B. (2017). Big data in education: The digital future of learning, policy and practice. Sage.

World Bank. (2018). Morocco: Education and training sector strategy. World Bank Group.

World Bank. (2021). Remote learning during COVID-19: Lessons from today, principles for tomorrow. World Bank Group.

World Bank. (2023). Morocco education support program: Program information document. World Bank Group.