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The Silent Costs of Digital Transformation in Education: Redistribution of Responsibility and Digital Inequality

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Article

Keywords: digital transformation, educational reform, policy enactment, digital inequality, technology governance, educational organisations

Posted Date: April 1st, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9055455/v1

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Additional Declarations: No competing interests reported.

Abstract

Digital transformation initiatives in education are increasingly framed as reforms intended to expand access, inclusion, and equity. Yet growing evidence suggests that such reforms can also reproduce inequality through the organisational and governance arrangements that shape their enactment in practice. Moving beyond access- and skills-based accounts of the digital divide, this study reconceptualises digital inequality as a governance-mediated and distributive process. Drawing on qualitative data from students, teachers, and school administrators, complemented by national policy document analysis in a middle-income country context, the study examines how responsibilities, risks, and adaptation demands are redistributed across actors during digital transformation. The findings show that digital reforms transfer hidden work and resource burdens to schools, educators, and disadvantaged families, producing differentiated organisational capacities and unequal educational experiences. The study introduces the concept of silent costs to theorise these unintended consequences and to explain how ostensibly inclusive digital initiatives generate new forms of technology-mediated inequality. By conceptualising digital transformation as a process of educational reform and policy enactment rather than a purely technical intervention, the article contributes to research on educational change, technology governance, and inequality, offering implications for more capacity-sensitive and equitable approaches to digital reform.

1. Introduction

Digital technologies have become central to the governance and organisation of contemporary education systems, reshaping how teaching, learning, and governance are organised across different contexts. Governments increasingly frame digital education reforms as solutions to long-standing problems of access, quality, and equity, particularly in systems facing structural constraints (OECD, 2020; UNESCO, 2021). However, a growing body of research suggests that the expansion of digital technologies in education does not automatically lead to more equitable outcomes. Instead, digitalisation may generate new forms of stratification when technological infrastructures, institutional capacities, and governance arrangements are unevenly distributed (Selwyn, 2016; Warschauer, 2004; Williamson et al., 2023).

Recent scholarship on educational technology has moved beyond early conceptions of the digital divide as a simple matter of access to devices or connectivity. Studies now emphasise second- and third-level digital divides, highlighting disparities in digital skills, patterns of technology use, and the capacity of institutions to integrate digital tools meaningfully into pedagogical and organisational practices (van Dijk, 2020; Hargittai, 2002). Within this perspective, digital technologies are increasingly understood not as neutral tools, but as socially embedded artefacts whose effects depend on the policy environments, organisational contexts, and everyday practices through which they are implemented (Selwyn, 2016; Ortegón et al., 2024; Williamson, 2016).

In education systems undergoing rapid digital transformation, these dynamics are particularly salient. Policy documents often promote ambitious visions of technology-enabled inclusion, while schools and educators are left to navigate implementation under conditions of limited resources, uneven support, and competing institutional demands (OECD, 2021; Tondeur et al., 2017). As a result, gaps frequently emerge between policy intentions and lived experiences, raising critical questions about how digital education reforms are enacted in practice, how they are mediated by school-level organisational conditions, and how they shape educational inequality and justice at the local level (Waslander et al., 2023).

Despite the expanding literature on educational technology and digital inequality, empirical research that foregrounds the perspectives of multiple educational actors, including students, teachers, and school administrators, remains limited, particularly in middle-income country contexts. Existing studies often focus either on policy discourse or on classroom-level technology use, offering less insight into how governance arrangements mediate the relationship between digital reforms and everyday educational experiences (Williamson, 2016; Selwyn & Facer, 2014). This gap is especially important given evidence that institutional capacity and governance play a decisive role in determining whether reforms mitigate or exacerbate existing inequalities (OECD, 2020; Waslander et al., 2023).

Addressing these gaps, this study moves beyond access- and skills-based explanations of the digital divide and reconceptualises digital inequality as a governance-mediated process. Rather than treating digital transformation as a purely technological development, this study conceptualises it as a form of educational reform whose outcomes depend on governance arrangements, institutional capacity, and policy enactment processes within schools. Drawing on qualitative evidence from students, teachers, and school administrators, alongside national policy documents, we show that digital reforms redistribute responsibilities, risks, and adaptation costs from central authorities to local actors with uneven institutional capacity.

To theorise these dynamics, the article advances the concept of *silent costs* to explain how digital transformation, while framed as inclusive and progressive, can silently reproduce inequality through everyday organisational practices rather than through explicit exclusion. Silent costs are defined here as the hidden and unevenly distributed burdens of digital reform, including extra labour, adaptation work, informal resource compensation, and responsibility transfer across actors with unequal institutional capacity. Rather than referring only to gaps in access or skills, the concept captures how the practical work of making digital reforms function is displaced onto schools, educators, students, and families in ways that remain under-recognised in policy discourse. In this way, the concept provides an analytical lens for examining how educational reforms can reproduce inequality through the redistribution of effort, risk, and responsibility. By theorising digitalisation as a distributive and governance-sensitive process, the study contributes to socio-technical and information systems scholarship on technology, organisations, and inequality, while offering empirically grounded insights for education systems undergoing rapid digital reform.

2. Literature Review

2.1. Digital Technologies and Educational Inequality

Digital technologies have become increasingly central to education systems, particularly in low- and middle-income countries, where they are often framed as scalable solutions to longstanding challenges of access, quality, and equity (Munoz-Najar et al., 2021; Shan Fu, 2013). International policy agendas frequently portray digitalisation as a catalyst for modernisation and systemic improvement (Tikly & Barrett, 2013). Within these narratives, technological expansion is assumed to enhance inclusion by overcoming geographical and economic barriers.

However, research in educational technology increasingly challenges the assumption that digitalisation inherently produces equitable outcomes. Rather than functioning as neutral tools, digital technologies operate within existing social and institutional structures, often reproducing inequalities shaped by socio-economic conditions and governance arrangements (Selwyn, 2016; van Dijk, 2020). Digital divide scholarship has moved beyond first-level access disparities to emphasise inequalities in skills, patterns of use, and meaningful engagement (Robinson et al., 2015; van Dijk, 2020). These perspectives highlight that connectivity alone does not guarantee equitable participation or outcomes.

From a governance perspective, digital education reforms can be understood not merely as technological interventions but as distributive processes that reallocate opportunities, responsibilities, and risks across educational actors (Tikly & Barrett, 2013; Unterhalter, 2019). Sen's capability approach offers a useful framework in this regard, shifting attention from formal provision to individuals' substantive freedoms to convert digital resources into valued educational outcomes (Sen, 2014; Unterhalter, 2019). Under this lens, equity depends not only on technological availability but on actors' capacity to benefit from digital environments.

Empirical research further indicates that digital reforms may generate new forms of stratification. Students from socio-economically advantaged backgrounds are often better positioned to capitalize on digital learning opportunities due to differences in home resources, prior digital exposure, and parental support (van Deursen & van Dijk, 2013). These patterns resonate with Bourdieu's (1986) conceptualization of social and cultural capital, suggesting that pre-existing advantages shape individuals' ability to appropriate institutional opportunities.

Digitalisation also reshapes professional roles and institutional responsibilities. Teachers frequently face expanded expectations to integrate technology without sustained training or organisational support, increasing workload and uneven implementation across schools (Asadullah & Bhattacharjee, 2022; Selwyn et al., 2020). At the system level, rapid digital expansion often exposes gaps between policy ambition and implementation capacity, particularly in resource-constrained contexts (Trucano & Dykes, 2016; Munoz-Najar et al., 2021).

Taken together, this literature suggests that digital education should be analysed as a socio-technical and governance-mediated process rather than a purely technical reform. Inequality emerges not only through differential access or skills but through the institutional arrangements that shape how digital tools are implemented and sustained. However, fewer studies explicitly conceptualise digital inequality as a redistribution of responsibility and capacity at the school level, particularly within middle-income country contexts. These patterns suggest that digital transformation in education should also be understood as a process of educational change, in which reform outcomes are mediated by school-level organisational conditions, local interpretation, and implementation capacity.

2.2. Digital Inequality at the School Level

While early research on digital inequality focused primarily on disparities in technological access, recent scholarship shows that inequalities become most visible at the school level, where digital policies are translated into everyday institutional and pedagogical practices (Hohlfeld et al., 2008; van Dijk, 2020; Adolfsson, 2024). Schools function as critical implementation sites in which national agendas intersect with organisational capacity, professional expertise, and students' socio-economic conditions, shaping how digital technologies are actually used and experienced.

Digital inequality is now widely conceptualised as a multidimensional phenomenon encompassing access, skills, patterns of use, and educational outcomes (van Deursen & van Dijk, 2013; Robinson et al., 2015). At the school level, these dimensions depend not only on connectivity but also on pedagogical guidance, institutional support, and systematic technology integration. Access alone does not ensure meaningful participation; implementation conditions determine whether digital tools expand or constrain learning opportunities.

For students, digital participation is strongly mediated by socio-economic background and differences in home learning environments. Evidence indicates that students from disadvantaged households often face structural barriers in developing advanced digital competencies, even when schools provide devices (Helsper & Eynon, 2013; OECD, 2020, 2021). Without targeted institutional support, digital practices may therefore reproduce broader social inequalities, consistent with Bourdieu's (1986) account of how educational systems can reinforce existing distributions of capital.

Digitalisation also reshapes teachers' roles and responsibilities. Teachers are frequently expected to integrate technology without sustained training, time allocation, or organisational support, intensifying workload and generating uneven implementation across schools (Selwyn et al., 2020; Tondeur et al., 2017). From a capability perspective, such conditions constrain professional agency, particularly in resource-constrained contexts.

School administrators mediate these processes but often operate within policy environments characterized by ambitious reform expectations and limited institutional capacity (Fullan, 2013; Selvaraj et al., 2021). This gap between policy ambition and school-level resources can shift adaptation burdens onto individual actors. Taken together, digital inequality at the school level emerges through the

interaction of policy design, institutional capacity, and everyday practice. A multi-actor perspective is therefore essential for understanding how digital reforms redistribute opportunities, capacities, and responsibilities within schools rather than simply expanding technological provision.

2.3. Research Gap

Despite the growing body of research on digital education and inequality, several important gaps remain in understanding how digital technologies are implemented and experienced within schools. First, much of the existing literature has examined digital inequality either at the macro policy level or through large-scale quantitative indicators, with a strong emphasis on access, connectivity, and system-level outcomes (van Dijk, 2020; Robinson et al., 2015). While these studies offer valuable insights, they provide limited understanding of how digital education policies are translated into everyday practices and technology use within schools as organisational settings. This gap is particularly significant in light of policy enactment research, which shows that reforms are not implemented in a linear manner but are interpreted, mediated, and translated by local actors within organisational contexts (Ball et al., 2012; Spillane et al., 2002; Coburn, 2001).

Second, research on digitalisation in education has largely privileged single-actor perspectives, most commonly focusing on students or teachers. As a result, the relational and multi-actor dynamics through which digital inequalities are produced, negotiated, and reproduced through daily school practices remain underexplored. There is comparatively little empirical work that simultaneously examines the experiences of students, teachers, and school administrators, despite evidence that digitalisation redistributes responsibilities, workload, and decision-making authority differently across these groups (Selwyn et al., 2020; Tondeur et al., 2017). A multi-actor perspective is therefore necessary not only to document differential experiences, but also to understand how policy enactment unfolds relationally across positions within the school organisation.

Third, although equity and inclusion are frequently articulated as goals within digital education policies, fewer studies systematically analyse whether schools possess the institutional capacity, professional expertise, and organisational support required for meaningful technology integration, particularly in middle-income country contexts. Existing research has identified persistent gaps between policy discourse and implementation (Fullan, 2013; Selvaraj et al., 2021), yet empirical analyses that explicitly connect national digital education policies with school-level realities remain limited.

Finally, digital inequality is often framed primarily as a technical or individual-level issue, emphasising deficits in access or skills. Such framings risk obscuring the role of governance arrangements, institutional decision-making, and resource allocation processes that shape how technologies are adopted and used across schools. There is therefore a need for research that conceptualises digital inequality as a governance-mediated and distributive process, in which responsibilities, resources, and capacities are unevenly allocated across educational actors and organisations (Sen, 2014; Tikly & Barrett, 2013).

In response to these gaps, the present study adopts a qualitative, multi-actor design to examine how digital technologies are implemented, interpreted, and governed at the school level in Türkiye. By integrating interviews with students, teachers, and school administrators alongside an analysis of national policy documents, the study provides an empirically grounded account of how technology integration intersects with educational inequality and justice in everyday school practice.

3. Methodology

3.1. Research Design

This study adopts a qualitative multi-actor research design combining semi-structured interviews with systematic policy document analysis to examine how digital technologies are implemented and experienced at the school level. This design enables an in-depth examination of how digital technologies are experienced, interpreted, and governed across different levels of the education system, while linking everyday school practices with broader institutional and policy frameworks. Qualitative approaches are particularly appropriate for examining complex, context-dependent processes such as technology integration, instructional change, and unequal digital learning experiences in schools (Creswell & Poth, 2018; Tisdell et al., 2025).

3.2. Participants and Sampling Strategy

The study involved a total of 62 participants, including 30 students, 20 teachers, and 12 school administrators working in public primary and secondary schools in Türkiye. Participants were selected using purposive sampling to capture variation in socio-economic background, institutional resources, and professional roles within the education system (Patton, 2015). This multi-actor sampling strategy enabled a comparative examination of how digital technologies are accessed, used, and managed at the learner, practitioner, and managerial levels. This variation was important for analysing how differences in school resources and organisational capacity shape the implementation of digital technologies across contexts.

Participants were drawn from public schools located in socio-economically diverse settings, including both relatively well-resourced and resource-constrained institutional contexts. The student group reflected variation in access to home-based digital resources and parental support, while teachers differed in terms of teaching experience, subject areas, and prior exposure to digital teaching practices. School administrators held responsibilities in schools with differing levels of digital infrastructure and institutional capacity. This diversity enabled the study to capture how digitalisation is experienced and managed under unequal conditions at the school level, strengthening the analytical depth of the findings. Interviews were conducted until thematic saturation was reached across participant groups, ensuring analytical depth and credibility of the findings (Guest et al., 2017).

3.3. Data Collection

Data were collected through semi-structured interviews, which allow participants to articulate their experiences while providing sufficient structure to address the study's research questions (Kvale & Brinkmann, 2015). Interview protocols were informed by literature on digital inequality, technology integration, educational equity, and digital governance (Selwyn, 2016; van Dijk, 2020). Interview topics included access to digital resources, digital skills and competencies, workload and pedagogical change, perceived fairness, and experiences of inclusion or exclusion in digital learning processes. All interviews were conducted voluntarily, audio-recorded with informed consent, and transcribed verbatim.

3.4. Policy Document Analysis

To contextualise interview findings within the national digital education policy environment, the study incorporated a systematic analysis of official policy documents related to digital education in Türkiye. Policy analysis is essential for understanding how equity, access, and digital transformation are framed at the governance level and how these framings shape school-level implementation and technology use (Bowen, 2009). The policy documents were analysed to identify dominant policy framings related to access, digital competence, and educational equity, and these framings were systematically compared with themes emerging from interview data.

The documents analysed included:

- *Education in Policy Documents 2026*, which consolidates education-related objectives from the Twelfth Development Plan, the Medium-Term Program, and the Ministry of National Education's Strategic Plan;
- *Artificial Intelligence in Education Policy Document and Action Plan (2025–2029)*, outlining strategic priorities for digital and AI-based transformation in education;
- *Digital Content Strategy Document* (2024), focusing on digital materials, pedagogical integration, and quality standards in digital education.

These documents were selected because they constitute the most recent and comprehensive national policy frameworks guiding digital education reform in Türkiye, with explicit relevance to digital infrastructure, competencies, equity considerations, and implementation strategies.

3.5. Data Analysis

Interview data were analysed using Reflexive Thematic Analysis following Braun and Clarke's (2006, 2021) six-phase framework. This approach was applied exclusively to interview data and allowed for the systematic identification of patterns across participants' accounts while acknowledging the interpretive role of the researcher.

Policy documents were analysed separately using a framework analysis approach (Ritchie & Spencer, 1994), which enabled the systematic mapping of policy objectives, assumptions, and framings onto analytically derived themes. To strengthen analytical rigour, a comparative thematic analysis across actor groups was conducted to systematically identify similarities and differences in how digital

technologies were implemented and experienced across schools. A theme-based cross-actor matrix was used as an analytical tool to integrate interview and policy findings (see Table 1), supporting triangulation between lived experiences and policy discourses.

Table 1
Analytical framework for cross-actor and policy comparison

Theme	Students	Teachers	Administrators
Digital access	Experience	Implementation	Policy framing
Digital competence	Perception	Workload	Institutional support
Educational justice	Exclusion	Ethical dilemmas	System-level constraints

This integrated approach enabled triangulation between lived experiences and policy discourses, strengthening the study's analytical coherence. The analysis focused on how access, digital capabilities, and institutional conditions shaped the implementation and everyday use of digital technologies within schools. Given the interpretive nature of qualitative analysis, the researcher remained attentive to their positionality as an education researcher with prior engagement in issues of digitalisation and educational inequality. Reflexive practices, including iterative coding, memo writing, and constant comparison across actor groups, were employed to minimise the influence of pre-existing assumptions and to ensure that themes were grounded in participants' accounts rather than researcher expectations.

3.6. Ethical Considerations

Ethical approval

was obtained prior to data collection. Participation was voluntary, and informed consent was secured from all participants. Confidentiality and anonymity were ensured through the use of pseudonyms and secure data storage. The study adhered to established ethical principles for educational research, including respect for participants, minimisation of harm, and transparency throughout the research process.

4. Findings

This section presents the findings of the study based on the reflexive thematic analysis of interviews with students, teachers, and school administrators, complemented by the analysis of national policy documents. The analysis focused on how digitalisation is experienced and governed at the school level and how these processes shape patterns of inequality across different actors. Four interrelated themes were identified, capturing inequalities related to digital access and infrastructure, expectations surrounding digital competence, perceptions of fairness and exclusion, and gaps between policy aspirations and everyday practices. Rather than treating these issues as isolated problems, the findings illustrate how they operate as interconnected conditions shaping participants' experiences of digital

education. Each theme is presented in turn, followed by an integrative synthesis that compares patterns across actors and policy discourses.

4.1. Infrastructure Gaps as Organisational Capacity Constraints

Rather than treating access as a purely technical issue, participants' accounts indicate that infrastructure differences functioned as organisational capacity constraints that structured who could participate consistently and who could not. Across all participant groups, unequal digital access was described as a routine and embedded feature of schooling, shaped by socio-economic conditions and institutional resources rather than by temporary disruptions or individual shortcomings. In this sense, access operated less as a gateway to learning and more as a structural filter that differentiated participation opportunities.

From the students' perspective, digital participation was frequently characterised by instability, shared device use, and fragmented engagement in online activities. While some students reported personal devices and reliable internet connections, others relied on shared household technologies or experienced recurring connectivity problems. These disparities translated directly into uneven attendance and learning continuity, particularly during synchronous lessons. As one student explained:

Sometimes I couldn't join the lesson because my sibling was using the phone. We only had one device at home, so I had to wait. When I finally joined, the class had already started and the teacher had moved on. I felt like I was always trying to catch up (Student 7).

Such experiences were described not as isolated incidents but as normalised aspects of everyday schooling, suggesting that formal platform access did not guarantee meaningful participation. Instead, participation depended on household-level resources that lay largely outside the school's control, effectively transferring the responsibility for connectivity from institutions to families.

Teachers' accounts further revealed how these infrastructure constraints reshaped pedagogical work. To accommodate students with limited access, many teachers simplified lesson plans, reduced interactive activities, or lowered expectations regarding participation. Although intended as pragmatic adjustments, these adaptations frequently reduced instructional depth for the entire class. In this way, unequal access did not only disadvantage particular students; it altered the organisation of teaching itself, generating what participants described as a narrowing of pedagogical possibilities:

You plan something interactive, you want students to participate, but then you realise that half of the students cannot connect properly… In the end, you lower your expectations and simplify what you planned (Teacher 12).

At the administrative level, access was framed as a persistent institutional constraint linked to budgets, outdated equipment, and insufficient technical support. Despite national initiatives to expand

infrastructure, school leaders reported limited capacity to address local gaps, leaving them responsible for problems they lacked the resources to solve: “On paper, access is solved. In reality, we know which students cannot connect regularly, but there is little we can do beyond reporting it” (Administrator 4).

Taken together, these accounts suggest that digital access functioned as an organisational and governance issue rather than a purely technical one. Infrastructure gaps redistributed responsibility downward to schools, teachers, and families, while limiting their capacity to ensure equitable participation. Consequently, access became a mechanism through which existing socio-economic differences were reproduced and institutionalised within everyday digital practices.

4.2. Individualisation of Digital Competence and the Shifting of Adaptation Work

Beyond issues of access, participants consistently emphasised digital competence as a key factor shaping their experiences of digital education. However, digital competence was rarely supported as an institutional or collectively organised capacity. Instead, it was framed as an individual obligation, effectively shifting the burden of adaptation from the system to students, teachers, and school leaders. In this sense, competence operated not as a resource provided by organisations, but as a responsibility that actors were expected to acquire independently.

Students’ accounts revealed marked variation in their ability to navigate digital learning environments. While some reported confidence in using platforms and managing online tasks, others struggled with basic procedural requirements such as submitting assignments or coordinating multiple applications. These differences were frequently attributed to family resources, prior exposure to technology, or parental support rather than to systematic school-based instruction: “Teachers assume we all know how to use these systems or that our parents can guide us, but some of us are learning by trial and error” (Student 14).

Rather than equalising opportunities, digital platforms therefore amplified pre-existing differences in household capacity, making digital participation contingent on resources outside the school’s direct influence. Competence became unevenly distributed social capital rather than an educationally guaranteed skill. Teachers described digital competence as a professional expectation accompanied by intensified workload and continuous self-adjustment. Many were required to adopt new platforms rapidly without sufficient training, time, or pedagogical guidance, leading them to rely on self-directed learning and informal peer support: “We were told to use digital tools, but no one showed us how to integrate them properly into our lessons” (Teacher 6).

These accounts suggest that digital transformation generated additional, often invisible forms of labour, including troubleshooting, platform management, and ongoing upskilling. Such activities expanded teachers’ responsibilities beyond pedagogical work, illustrating how adaptation costs were absorbed at the individual level rather than addressed through organisational support structures.

School administrators similarly acknowledged the importance of digital competence but highlighted limited institutional capacity to provide sustained professional development. Budget constraints, competing priorities, and policy pressures restricted their ability to organise systematic training: “We are expected to ensure digital competence, but we don’t have the budget or time to organise comprehensive training” (Administrator 9).

Consequently, responsibility for competence development was decentralised to schools without a corresponding redistribution of resources. Across actors, digital competence was therefore experienced less as empowerment and more as an obligation to cope with externally imposed technological change. Taken together, these findings indicate that competence gaps were not simply skill deficiencies but governance effects. By individualising adaptation work, digital reforms transferred the hidden labour of learning, troubleshooting, and integration to frontline actors, thereby reinforcing existing inequalities in time, expertise, and institutional capacity.

4.3. Standardisation as a Source of Institutionalised Exclusion

Participants’ accounts indicated that digitalisation did not only introduce new tools and practices but also reshaped how fairness, participation, and legitimacy were defined within everyday school routines. Across all actor groups, standardised digital procedures frequently operated in ways that overlooked differences in students’ material and social conditions. Rather than accommodating heterogeneity, digital systems embedded uniform rules and metrics that assumed equal capacity to comply. In doing so, standardisation functioned as a mechanism that translated unequal circumstances into formally equal expectations, thereby institutionalising exclusion.

Students described situations in which technical difficulties, limited home learning environments, or low digital confidence were interpreted by teachers or digital systems as disengagement or lack of effort. Because platforms recorded attendance, submission times, and participation through fixed indicators, contextual constraints became indistinguishable from individual failure: “If you can’t turn on your camera or submit things on time, it feels like you’re always the problem” (Student 19).

These accounts suggest that digital rules redefined participation in procedural terms, reducing complex learning conditions to measurable compliance. As a result, students with fewer resources were more likely to appear absent, late, or unprepared, even when the underlying barriers were infrastructural or familial rather than motivational.

Teachers’ narratives revealed parallel dilemmas. Although many recognised the unequal conditions faced by particular students, they reported limited discretion to adjust assessment or participation criteria. Administrative and reporting requirements encouraged uniform application of rules, constraining teachers’ ability to respond flexibly to students’ needs: “You know some students are disadvantaged, but the system expects you to treat everyone the same” (Teacher 15). Consequently, teachers were

positioned as enforcers of standardised procedures rather than as professionals exercising contextual judgement, reinforcing the gap between formal equality and substantive equity.

School administrators similarly described fairness challenges as shaped by policy frameworks and digital monitoring tools that prioritised comparability, accountability, and control. These systems left little room for differentiated practices, even when inequalities were recognised locally: “We are asked to ensure fairness, but the tools we are given don’t always allow for it” (Administrator 7).

Taken together, these findings indicate that exclusion was not primarily the result of individual shortcomings or isolated technical problems. Instead, it emerged from the institutional logics embedded in digital systems themselves. By enforcing uniform standards while ignoring unequal starting points, standardisation transformed structural disadvantage into apparent non-compliance, thereby reproducing inequality through routine organisational practices.

4.4. Governance Gaps and the Decentralisation of Implementation Risk

A recurring pattern across interviews and document analysis concerned the misalignment between national digital policies and the organisational realities of schools. However, rather than reflecting a simple policy-practice gap, participants’ accounts suggest a governance dynamic in which responsibility for implementation was decentralised without a corresponding redistribution of resources or authority. In this configuration, schools were held accountable for achieving digital transformation goals while lacking the institutional capacity required to realise them.

National policy documents emphasised ambitions such as equal access, digital competence, and innovation, presenting digitalisation as a technical and managerial solution to longstanding educational challenges. Yet administrators consistently described these reforms as being introduced through ambitious timelines and performance expectations, with limited guidance, funding, or infrastructural support. Consequently, implementation responsibilities were absorbed at the school level and managed through existing staff and constrained budgets: “The policy says digital transformation is a priority, but it doesn’t explain how schools with limited resources are supposed to achieve this” (Administrator 11).

Teachers reported parallel tensions between policy expectations and everyday classroom realities. Compliance-oriented requirements related to monitoring, documentation, and performance indicators limited pedagogical discretion and encouraged standardised uses of digital systems: “We are encouraged to be innovative, but at the same time we are monitored through rigid digital systems” (Teacher 18). These conditions positioned teachers as responsible for delivering reform outcomes while simultaneously constraining their ability to adapt practices to local needs, effectively transferring both accountability and risk to frontline actors.

Students’ accounts further illustrated how institutional rules embedded in digital platforms translated these governance arrangements into everyday experiences. Automated attendance and participation

metrics operated with little sensitivity to contextual barriers: “The system doesn’t care why you couldn’t log in. If you’re not there, you’re absent” (Student 23). Here, technological systems functioned as instruments of enforcement, converting policy expectations into inflexible procedural rules that left minimal room for discretion or accommodation.

Analysis of policy documents reinforced this interpretation. Although equity and inclusion were frequently articulated rhetorically, digitalisation was predominantly framed in terms of infrastructure provision, efficiency, and measurable performance outcomes, with limited attention to school-level capacity or differentiated support. As a result, responsibility for addressing inequality was implicitly devolved to local actors.

Taken together, these findings indicate that governance gaps were not merely coordination problems but mechanisms through which implementation risks and adaptation costs were shifted downward. Digital transformation was therefore experienced less as centrally supported reform and more as a decentralised responsibility borne by schools, teachers, and students with unequal resources.

4.5. Cross-Actor Synthesis of Findings

Taken together, the four themes indicate that digital inequality did not emerge from isolated deficiencies in access, skills, or policy coordination. Rather, inequality was produced through a set of interrelated organisational and governance mechanisms that collectively redistributed responsibilities, risks, and adaptation costs from central authorities to frontline actors. Across students, teachers, school administrators, and policy documents, digital transformation was experienced less as an enabling reform and more as a process that required local actors to compensate for systemic constraints with their own time, resources, and labour.

Infrastructure gaps limited schools’ organisational capacity to ensure stable participation. The individualisation of digital competence transferred learning and troubleshooting work to students and teachers. Standardised digital procedures reduced discretion and translated unequal conditions into apparent non-compliance. At the policy level, ambitious reform goals were decentralised without corresponding resource support, shifting implementation risks downward. While these dynamics appeared in different forms across actors, they operated through a common logic: institutional responsibilities were devolved while institutional support remained limited.

Considered together, these mechanisms generated what this study conceptualises as the silent costs of digital transformation-hidden forms of labour, resource expenditure, and organisational strain that were absorbed disproportionately by less-resourced schools and families. Digital inequality thus emerged not only from who had access to technology, but from how governance arrangements structured who carried the burdens of making digital systems function in practice.

Table 2
Analytical Synthesis of Governance-Related Inequality Mechanisms across Actors and Policy Discourses

Theme	Students	Teachers	School Administrators	Policy Documents
Unequal Digital Access and Infrastructure Conditions	Limited or shared devices; unstable internet; interruptions in participation	Difficulties ensuring equal participation; simplified or reduced interactive pedagogy	Infrastructure differences between schools; outdated equipment; insufficient technical support	Emphasis on expanding infrastructure and connectivity; limited attention to school-level capacity differences
Digital Competence as an Individual Responsibility	Reliance on family support or prior experience to navigate platforms; learning by trial and error	Increased workload due to rapid adaptation; self-directed upskilling; limited formal training	Responsibility for organising competence development despite time and budget constraints	Focus on individual skills, innovation, and adaptability; limited reference to institutional support mechanisms
Perceptions of Fairness and Exclusion in Digital Practices	Feelings of disadvantage or embarrassment when unable to meet uniform requirements	Ethical dilemmas in assessment and participation under standardised rules	Difficulties ensuring equitable practices within rigid digital systems	Equity framed as equal rules and participation; limited operationalisation of differentiated support
Policy-Practice Gaps in Digital Education Implementation	Perceived disconnect between system rules and everyday learning realities	Tensions between innovation expectations and compliance-oriented monitoring	Challenges translating national strategies into feasible school-level actions	Policy discourse prioritises efficiency, innovation, and performance indicators over implementation capacity and contextual differences

Table 2 summarises these governance-related mechanisms across actors and policy discourses, highlighting how responsibilities, expectations, and capacities were unevenly distributed. This cross-actor comparison underscores that digital transformation was not experienced uniformly, but stratified according to institutional resources and positional authority within the education system.

5. Discussion

Rather than approaching digital education as a primarily technical or pedagogical reform, this study conceptualises digitalisation as a governance process that redistributes responsibilities, capacities, and risks across educational actors. Framed in this way, unequal outcomes appear to stem less from

technological deficits than from the organisational and institutional arrangements through which digital reforms are enacted. Inequality therefore emerges not only through what technologies are available, but through who is expected to absorb the work of adaptation.

From a development perspective, these patterns resonate with scholarship on state capability and implementation gaps, which highlights persistent mismatches between policy ambition and institutional capacity in many middle-income contexts (Pritchett, 2015; Andrews et al., 2017). Although digital education policies in Türkiye articulate commitments to equity and innovation, their enactment at the school level is mediated by uneven resources, limited professional support, and fragmented coordination. Under such conditions, digitalisation generates what this study terms silent costs: governance-mediated redistributions of responsibility that shift the practical burdens of reform onto students, teachers, and schools. In analytical terms, silent costs refer to the unrecognised burdens of reform implementation that are redistributed across actors with unequal institutional capacity.

These costs remain largely invisible in conventional indicators centred on enrolment, connectivity, or technological provision. Instead, they surface through everyday practices: students navigating unequal home resources, teachers managing intensified workloads with limited training, and administrators implementing ambitious reforms with constrained means. Digitalisation thus reshapes inequality not only through differential access or skills, but through the relocation of coping responsibilities to actors with the least structural support.

By theorising digital education as a governance-sensitive and distributive process, this study contributes to research on education and development in two ways. First, it extends digital inequality debates beyond access- and skills-based explanations by foregrounding policy design and implementation capacity as central mechanisms of stratification. Second, it introduces the concept of silent costs as an analytical lens for examining how ostensibly equitable reforms may inadvertently reproduce inequality through the redistribution of labour and risk. Together, these insights suggest that the equity effects of digital education depend less on technological provision alone than on capacity-sensitive governance and implementation strategies.

5.1 Capacity Blindness in Digital Access

The findings suggest that unequal digital access is best understood not as a temporary technical shortfall but as a governance issue rooted in implementation capacity. A central paradox emerges: although digitalisation is promoted as a mechanism for educational equity, access-oriented reforms may reproduce inequality when they prioritise infrastructural provision while overlooking the conditions that enable meaningful use. In this sense, inequality persists less because technologies fail and more because policy designs treat provision as sufficient in itself.

This pattern aligns with research on education system reform and state capability, which highlights how ambitious policies frequently exceed institutional readiness in middle-income contexts (Bruns et al., 2011; Andrews et al., 2017; Pritchett, 2015). When digital expansion is measured primarily through

indicators such as devices or connectivity, variations in household resources, school capacity, and professional support remain obscured. As a result, formal access may coexist with unequal participation and outcomes.

Recent empirical evidence further supports the interpretation that digital inequality persists even where formal access has expanded. Drawing on large-scale data from Thailand, KC and colleagues (2025) show that the presence of devices and connectivity alone did not translate into improved learning outcomes; instead, disparities emerged through differences in pedagogical integration, institutional support, and students' socio-economic backgrounds. These findings closely mirror the patterns observed in the present study, where students with nominal access still experienced fragmented participation and teachers frequently reduced instructional depth due to uneven connectivity and competence levels. Such results also resonate with Engen and McGarr's (2025) conceptualisation of the post digital divide, which argues that contemporary inequalities are less about technological scarcity and more about how digital practices are embedded within broader social and organisational conditions. Viewed together, these studies reinforce the argument advanced here: digital technologies do not mitigate inequality by default; rather, their equity effects depend on how schools are structurally enabled, or constrained, to enact them in practice.

Conceptualising this dynamic as capacity blindness shifts attention from technical deficits to governance arrangements. Rather than asking whether schools are connected, the more consequential question concerns whether students and educators possess the material, institutional, and organisational conditions necessary to use digital resources effectively. Without such capacity-sensitive implementation, access reforms risk masking inequality while leaving its underlying drivers intact. Together, these findings extend post-digital divide scholarship by demonstrating that inequality persists not because access is absent, but because implementation capacity is unevenly distributed across institutions.

5.2 Individualisation of Responsibility

Beyond questions of access, the findings point to a systematic individualisation of responsibility for digital adaptation. Rather than being supported through collective or institutional mechanisms, the demands of digital transformation are largely displaced onto individual actors, who are expected to acquire competencies, redesign practices, and implement reforms with limited structural support. In this sense, digitalisation functions not only as a technological change but also as a reorganisation of accountability within the education system.

This pattern resonates with critical accounts of contemporary education reform, which show how structural and policy constraints are frequently reframed as individual deficits or performance issues (Ball, 2012; Apple, 2013). From a development perspective, such redistribution represents a subtle yet consequential shift: coping with inequality becomes an individual obligation rather than a systemic responsibility. As a result, differences in resources, time, and professional agency are amplified, intensifying disparities in skills, workload, and decision-making capacity (Santoro, 2009; Williamson,

2021). Taken together, these dynamics suggest that digital competence operates less as an equalising resource than as a differentiated burden. When adaptation is individualised in the absence of sustained institutional support, digital reforms risk reinforcing, rather than mitigating, existing inequalities.

5.3 Equity-through-Sameness in Digital Governance

The findings further indicate that digital education reforms often operationalise fairness through standardisation. Digital platforms, monitoring tools, and performance metrics tend to treat learners and educators as if they operate under comparable conditions, equating equal rules with equal opportunity. However, as research on automated and rule-based inequality has shown, ostensibly neutral systems frequently embed assumptions that disadvantage those working with fewer resources (Eubanks, 2018).

From a justice perspective, this equity-through-sameness logic reflects a narrow understanding of fairness grounded in formal equality rather than substantive equity. When attendance, participation, and assessment are governed through uniform digital procedures, contextual differences become less visible and less actionable at the school level. Such arrangements limit educators' ability to exercise discretion and provide differentiated support, thereby constraining the very practices through which equity is typically pursued. This tension resonates with broader critiques of education policy that distinguish between equal treatment and just outcomes (Fraser, 2008). Consequently, digital standardisation may reproduce inequality under the appearance of neutrality. By privileging comparability and compliance over contextual responsiveness, digital systems risk reinforcing existing disparities while framing outcomes as fair and objective.

5.4 Governance and Policy-Practice Misalignment

The findings further point to persistent misalignments between national digital education policies and their enactment at the school level. While policy documents articulate ambitious goals related to innovation, equity, and technological transformation, schools are often expected to realise these objectives within existing organisational and resource constraints. This gap suggests that the challenges observed in practice stem less from local resistance or inefficiency than from limitations in policy design and implementation capacity.

This pattern is consistent with research on education reform and development governance, which emphasises how centrally designed initiatives frequently exceed the institutional readiness of implementing organisations (Fullan, 2013; Pritchett, 2015; Andrews et al., 2017). From this perspective, what appears as implementation failure is better understood as a structural mismatch between policy expectations and school-level conditions. When digital reforms prioritise rapid rollout and performance indicators without sustained support mechanisms, responsibility for adaptation is displaced onto schools and educators.

Policy enactment scholarship similarly highlights that schools do not simply implement reforms but interpret and translate them within local contexts (Ball et al., 2012). However, when discretion is constrained by rigid digital systems and compliance-oriented monitoring, opportunities for contextual

adaptation become limited. As a result, digital policies may standardise procedures while overlooking the diverse capacities and needs of schools. Taken together, these dynamics suggest that digital inequality is not only produced through access or skills deficits, but also through governance arrangements that separate policy ambition from implementation support. Addressing these policy-practice misalignments is therefore central to ensuring that digital education reforms contribute to equity rather than inadvertently reproducing existing disparities.

5.5 Implications for Policy and Practice

Taken together, the findings reposition digitalisation not as a neutral or inherently progressive reform, but as a governance-mediated and distributive process that reshapes how responsibilities, risks, and resources are allocated across educational actors. Building on this perspective, the study makes three primary contributions to scholarship on digital inequality and education reform. First, it reconceptualises digital inequality beyond access- and skills-based explanations by foregrounding the role of policy design and implementation capacity. Second, it introduces the notion of silent costs to capture the hidden labour, time, and resource burdens that are absorbed by students, teachers, and schools during digital transformation. Third, it demonstrates how digital reforms may redistribute responsibilities downward while leaving institutional support structures unevenly developed, thereby producing differentiated educational experiences even under formally equal conditions.

These contributions extend existing digital divide frameworks, which have largely emphasised unequal access and differential use (van Dijk, 2020; van Deursen & van Dijk, 2019), by showing that inequality is also produced through governance arrangements and implementation practices (Ball et al., 2012; Andrews et al., 2017). In this sense, digitalisation functions not only as a technological intervention but as an organisational and political process that shapes who bears the costs of adaptation. Recognising these governance dynamics helps explain why reforms framed as equitable may nonetheless reproduce disparities in practice.

From a policy and practice perspective, the findings suggest that expanding infrastructure, while necessary, is insufficient to ensure equitable outcomes. Digital strategies should therefore incorporate systematic assessments of school-level capacity rather than relying solely on indicators of connectivity or device provision. Sustained and differentiated support mechanisms, such as ongoing professional development, technical assistance, and additional resources for disadvantaged schools, are essential if digital tools are to translate into meaningful learning opportunities. Evaluation frameworks should also move beyond participation metrics to consider pedagogical quality, meaningful use, and the distributive effects of reform.

Importantly, these conclusions should not be interpreted as an argument against digital education per se. Digitalisation retains considerable potential to enhance flexibility, inclusion, and access, particularly in contexts facing geographic or resource constraints. However, this potential is conditional rather than automatic. As prior research indicates (Selwyn, 2016; Unterhalter, 2019), equitable outcomes depend on sustained institutional capacity and governance arrangements that recognise differentiated needs.

Although grounded in the Turkish context, the patterns identified here are analytically transferable. Similar tensions between ambitious reform agendas and uneven implementation capacity have been documented across diverse education systems (Tikly & Barrett, 2013; Andrews et al., 2017). The case therefore illustrates a broader dynamic through which global digitalisation agendas interact with local governance constraints, shaping how equity is experienced in practice. Understanding these interactions is critical for designing digital education policies that reduce, rather than inadvertently reproduce, inequality.

5.6 Limitations and Directions for Future Research

Several limitations should be considered when interpreting the findings. First, the study adopts a qualitative design based on purposive sampling within a single national context. While this approach enables in-depth analysis of governance dynamics and stakeholder experiences, the findings are not statistically generalisable. Instead, they offer analytically transferable insights relevant to similar middle-income education systems.

Second, the data rely primarily on interviews and policy documents. The absence of direct classroom observations limits the ability to examine how digital practices are enacted in everyday instructional settings. Future studies could incorporate ethnographic or observational methods to capture the micro-level processes through which policy intentions are translated into practice.

Third, the document analysis focuses on nationally issued policy texts. Consequently, informal implementation practices and sub-national adaptations may remain underexplored. Longitudinal and multi-level analyses would help trace how digital education governance evolves across regional and school contexts over time.

Finally, comparative research across countries or regions with differing institutional capacities and socioeconomic conditions would further clarify the circumstances under which digitalisation promotes educational equity rather than reproducing existing inequalities. Such designs could strengthen the explanatory and policy relevance of digital education research within development contexts.

6. Conclusion

This study examined the equity implications of digital education in Türkiye through a qualitative, multi-actor analysis integrating the perspectives of students, teachers, school administrators, and national policy documents. The findings show that digitalisation does not function as an inherently equalising intervention. Although access to digital infrastructure has expanded, inequalities persist and are often reproduced through the ways reforms are governed and implemented at the school level.

Rather than stemming primarily from technological shortcomings, these disparities arise from implementation arrangements that prioritise provision, standardisation, and individual adaptation while overlooking institutional capacity and differentiated conditions of use. In this sense, digital education

operates as a governance-mediated process that redistributes responsibilities and burdens across actors, frequently shifting the costs of adaptation onto those with the least structural support.

The analysis highlights three interconnected dynamics shaping these outcomes: access without adequate capacity, the individualisation of digital responsibility, and misalignments between policy ambition and school-level realities. Together, these mechanisms help explain why equity-oriented digital reforms may fail to produce equitable educational experiences in practice.

For policymakers, the implications are clear. Expanding connectivity alone is insufficient. Equity in digital education requires capacity-sensitive implementation, sustained professional support for educators, and differentiated strategies that recognise diverse school contexts. Without such measures, digital transformation risks reinforcing existing disparities while appearing progressive and inclusive. Although grounded in the Turkish context, these insights are analytically transferable to other middle-income countries pursuing rapid digital reform, where aligning technological ambition with institutional realities remains central to inclusive educational development.

Declarations

Funding

The author received no financial support for the research, authorship, and/or publication of this article. The study was conducted as part of the author’s academic responsibilities.

Author Contribution

A.A. conceived the study, designed the research, collected and analysed the data, and wrote the manuscript.

Acknowledgement

A preliminary version of this research was presented as an abstract at the EDUCongress, 2025. No full paper was published in the conference proceedings.

Data Availability

The data supporting the findings of this study are not publicly available due to confidentiality and ethical restrictions but are available from the author upon reasonable request.

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