

BEYOND TECHNOCRATIC DIGITAL GOVERNANCE: A PHILOSOPHICAL INQUIRY INTO KNOWLEDGE, POWER, AND VALUES IN EDUCATION

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ABSTRACT

Digital technologies increasingly structure the governance of Education through data-driven systems, algorithmic decision-making, and platform-based infrastructures. While digital governance is widely promoted as a neutral and efficient solution to educational management challenges, it is often grounded in technocratic rationality that remains insufficiently examined. This study critically explores digital Education governance beyond instrumental and technical perspectives by employing a philosophy-of-science framework. Using a qualitative conceptual methodology grounded in critical literature analysis, the study examines digital governance through interconnected epistemological, ontological, and axiological dimensions. The analysis reveals that digital governance privileges data-based knowledge as authoritative, reconfigures Education as a measurable and governable system, and embeds normative commitments centred on efficiency, control, and performance. These dynamics reshape power relations within educational institutions and risk marginalising human judgment, ethical responsibility, and relational dimensions of Education. The study contributes a novel integrative conceptual framework that positions digital governance as a socio-epistemic and value-laden practice rather than a neutral administrative tool. By foregrounding the philosophical assumptions underpinning data-driven governance, this article provides a critical foundation for reimagining digital governance as a reflective, human-centred, and ethically accountable practice. The findings have significant implications for Theory and policy, particularly in guiding the responsible development of digital governance frameworks aligned with the normative purposes of Education.

Keywords: Digital governance; Philosophy; Education policy; Technocratic rationality

INTRODUCTION

In recent years, digital technologies have become deeply embedded in the governance of Education systems across the globe. Educational institutions increasingly rely on digital platforms, data analytics, and algorithmic systems to manage administrative processes, monitor performance, and inform policy decisions. Learning management systems, digital dashboards, and large-scale educational databases are now central to how educational quality, accountability, and efficiency are defined and evaluated. This transformation has been further accelerated by the COVID-19 pandemic, which normalised digital infrastructure as an essential instrument of institutional governance rather than a temporary solution (Williamson & Hogan, 2020). As a result, Education governance is no longer merely supported by digital technologies but is increasingly organised through them.

Within dominant policy and managerial discourses, digital governance in Education is widely portrayed as a rational and value-neutral response to persistent challenges such as inefficiency, lack of transparency, and uneven institutional performance. Data-driven governance models promise objective decision-making based on measurable indicators, real-time monitoring, and predictive analytics. From this perspective, digital systems are framed as technical tools that enhance organisational effectiveness and policy coherence by translating complex educational processes into quantifiable data (OECD, 2021). The success of digital

governance initiatives is therefore often assessed in terms of system integration, data accuracy, and managerial efficiency, reinforcing a technocratic understanding of educational leadership.

However, this instrumental framing has increasingly been questioned by critical scholars who argue that digital governance cannot be reduced to a purely technical matter. Digital technologies do not simply record educational realities; they actively shape how Education is conceptualised, governed, and valued. Data infrastructures privilege certain forms of knowledge while marginalising others, often favouring what is measurable, comparable, and standardised over what is relational, contextual, and ethically grounded (Selwyn, 2022). In this sense, digital governance operates as an epistemic force that defines what counts as legitimate educational knowledge and whose perspectives are rendered visible within decision-making processes.

The growing reliance on data-driven governance also raises important questions about power and authority in Education. Algorithmic systems increasingly mediate institutional evaluation, student assessment, and policy accountability, often through opaque mechanisms that are inaccessible to educators and learners. These systems may shift authority away from professional judgment toward automated processes, reinforcing managerial control and surveillance practices within educational institutions (Perrotta & Selwyn, 2020). Such developments challenge traditional understandings of educational autonomy and professional agency, suggesting that digital governance reshapes not only administrative practices but also the social relations that underpin Education.

Despite the significance of these transformations, much of the existing research on digital Education governance remains focused on implementation, effectiveness, and policy outcomes. Empirical studies frequently examine how digital systems improve efficiency, enhance service delivery, or support institutional accountability. While these contributions are valuable, they often take for granted the underlying assumptions that structure digital governance itself. Questions about how digital systems redefine educational knowledge, reconfigure power relations, and embed particular value orientations are rarely addressed systematically and theoretically. This gap is especially notable given the rapid expansion of artificial intelligence, learning analytics, and automated decision-making in Education (Eynon, 2023).

Recent scholarly work has begun to address these concerns, yet significant limitations remain. Williamson (2021) offers a critical analysis of Education data infrastructures, demonstrating how digital governance reshapes policy processes and institutional practices through algorithmic rationalities. While this work effectively highlights the political and economic dimensions of datafication, it is primarily situated within policy sociology. It does not explicitly engage with the philosophy of science as an analytical framework. Similarly, Knox (2022) explores postdigital Education and challenges simplistic narratives of technological determinism, emphasising the cultural and material entanglements of digital systems. However, this perspective does not provide a systematic examination of epistemological and axiological questions related to governance. Meanwhile, research on the ethics of artificial intelligence in Education has emphasised transparency, accountability, and data protection (Zawacki-Richter et al., 2023). Although ethically important, these discussions often remain at the level of applied ethics and do not interrogate the deeper ontological assumptions that underpin technocratic governance models.

Taken together, these studies indicate a growing recognition that digital governance in Education is neither neutral nor unproblematic. However, they also reveal a fragmented analytical landscape in which epistemological, ontological, and axiological dimensions are addressed separately, if at all. What remains largely absent is an integrative philosophical inquiry that examines how digital governance operates as a knowledge-producing system, a mechanism of power, and a carrier of values simultaneously. Without such an inquiry, critiques of digital governance risk remaining partial and reactive, unable to fully account for the normative implications of governing Education through data and algorithms.

The increasing normalisation of algorithmic decision-making in Education underscores the urgency of addressing this gap. Predictive analytics are used to assess student risk, performance metrics inform funding allocations, and digital dashboards shape institutional reputations. These practices are often justified through appeals to objectivity and efficiency, obscuring the value-laden assumptions embedded in system design and data interpretation (Williamson, 2022). As digital governance becomes more deeply entrenched, the absence of philosophical reflection risks reinforcing technocratic rationality at the expense of educational values such as equity, human agency, and democratic participation.

In this context, philosophy of science offers a critical lens through which digital Education governance can be re-examined. Epistemologically, it enables scrutiny of claims that data-driven systems produce objective and neutral knowledge, highlighting the socially constructed nature of educational data. Ontologically, it invites reflection on how digital governance redefines educational actors as data subjects and institutions as performance-oriented systems. Axiologically, it foregrounds questions of value, ethics, and responsibility, challenging the assumption that technological efficiency should be the primary criterion of good governance (Biesta, 2021). By integrating these dimensions, philosophy of science provides a coherent framework for questioning the foundations of technocratic digital governance.

The originality of this study lies in its integrative conceptual approach. Rather than offering another empirical evaluation of digital governance systems, this article advances a philosophical synthesis that connects knowledge, power, and values within a single analytical framework. This approach moves beyond isolated critiques of datafication or ethics to articulate a more comprehensive understanding of how digital governance reshapes Education at a foundational level. In doing so, the study contributes to contemporary debates on digital transformation, algorithmic governance, and the future of Education by foregrounding the normative dimensions often marginalised in policy and managerial discourse.

Accordingly, the purpose of this article is to examine digital Education governance beyond technocratic rationality through a philosophy-of-science perspective. The study aims to analyse how digital governance practices critically shape educational knowledge, reorganise power relations, and embed particular value orientations that influence decision-making processes. By offering a conceptual inquiry grounded in epistemological, ontological, and axiological reflection, this article seeks to contribute to the development of a more reflective, human-centred, and ethically responsible approach to digital governance in Education.

METHODOLOGY

This study adopts a qualitative conceptual research design grounded in philosophical inquiry and critical analysis of the literature. Rather than testing empirical hypotheses or measuring implementation outcomes, the research aims to interrogate the foundational assumptions that shape digital governance in education. This methodological choice aligns with the nature of the research problem, which concerns knowledge production, power relations, and value orientations embedded in digital governance practices—issues that cannot be adequately addressed by purely empirical or positivist approaches (Biesta, 2021). Conceptual research is particularly appropriate when the objective is to clarify concepts, examine underlying assumptions, and develop theoretical frameworks that can reorient understanding within a field. In the context of digital education governance, this approach enables a systematic examination of how governance practices are constituted through epistemological claims, ontological configurations, and axiological commitments. By employing philosophy of science as its primary analytical lens, this study situates digital governance not merely as a technical or administrative phenomenon but as a socio-epistemic practice shaped by specific rationalities and normative priorities.

The methodological orientation of this study is interpretive–critical, drawing on the traditions of critical educational Theory and philosophy of science to interrogate the

foundations of digital governance in Education. Rather than assuming neutrality or objectivity in digital systems, the analysis explicitly problematizes dominant claims of technological rationality and data-driven objectivity that underpin contemporary governance practices. This critical stance enables the study to examine how digital governance operates not merely as a technical mechanism, but as a socio-epistemic structure that both reflects and reproduces power relations within educational institutions (Selwyn, 2022). Within this orientation, the study integrates three interrelated analytical dimensions derived from the philosophy of science. Epistemological analysis examines how digital governance produces, legitimises, and prioritises particular forms of educational knowledge, often privileging measurable, standardised data over contextual and experiential understanding. Ontological analysis focuses on how digital systems reconfigure the nature of educational actors, institutions, and processes, transforming learners, educators, and organisations into datafied entities subject to continuous monitoring and evaluation. Axiological analysis interrogates the values, ethical assumptions, and normative consequences embedded in technocratic governance models, particularly their implications for justice, human agency, and moral responsibility in Education. These dimensions are not treated as discrete analytical stages but as interconnected perspectives that collectively illuminate the complexity of digital Education governance, revealing the underlying coherence of technocratic rationality while exposing its philosophical limitations.

The primary data sources for this study consist of peer-reviewed journal articles, scholarly books, and authoritative policy reports published between 2020 and 2025. This time frame was selected to ensure relevance to current debates surrounding datafication, artificial intelligence, and post-pandemic digital transformation in Education. Literature was identified through systematic searches of academic databases, including Scopus-indexed journals, Web of Science, and major academic publishers.

The selection of literature followed three main criteria: (1) direct relevance to digital governance, data-driven decision-making, or algorithmic systems in Education; (2) explicit or implicit engagement with issues of knowledge, power, ethics, or values; and (3) theoretical or conceptual contribution beyond purely technical evaluation. Studies that focused solely on system implementation or performance metrics, without critical or theoretical reflection, were excluded from the core analysis, although they were considered in context. To ensure analytical depth rather than breadth, the study prioritised high-impact and theoretically influential works that shape contemporary discourse on digital Education governance. This strategy aligns with the purpose of conceptual research, which emphasises analytical rigour and theoretical coherence over exhaustive coverage.

The analysis proceeded through a thematic–philosophical synthesis. First, selected literature was closely read to identify recurring concepts, metaphors, and assumptions related to digital governance. Particular attention was paid to how authors framed issues of objectivity, efficiency, accountability, and innovation. Second, these themes were mapped onto the epistemological, ontological, and axiological dimensions of philosophy of science. This mapping enabled a structured examination of how digital governance operates simultaneously as a knowledge system, a mode of control, and a value-laden practice. Third, a critical interpretation was conducted to expose tensions, contradictions, and silences within dominant narratives of digital governance. For example, claims of data neutrality were analysed in relation to the exclusion of contextual and experiential knowledge. At the same time, narratives of efficiency were examined alongside their ethical implications for equity and human agency. The final stage involved synthesising these insights into a coherent conceptual framework that challenges technocratic rationality and articulates alternative ways of understanding digital governance in Education.

Table 1. Philosophical Dimensions and Analytical Focus

Philosophical Dimension	Analytical Focus	Guiding Questions
Epistemology	Knowledge production and validation	What forms of knowledge are privileged by digital governance systems? How are data framed as objective or authoritative?
Ontology	Configuration of educational reality	How do digital systems redefine learners, educators, and institutions? What aspects of education become visible or invisible?
Axiology	Values and ethical implications	What values are embedded in technocratic governance? How do these affect justice, agency, and responsibility?

This framework functions not merely as a classificatory tool but as a critical heuristic that enables deeper interrogation of digital governance practices. By systematically applying these philosophical dimensions, the study reveals how epistemological assumptions about data objectivity support ontological reconfigurations of Education as a measurable system, which, in turn, legitimise axiological priorities such as efficiency, control, and performance optimisation. The framework thus makes visible the internal coherence of technocratic rationality while simultaneously exposing its limitations. Importantly, the integrative nature of the framework distinguishes this study from existing research that addresses digital governance primarily through policy analysis or applied ethics. By foregrounding the interdependence of knowledge, power, and values, the methodology enables a more comprehensive critique that accounts for both structural and normative dimensions of digital transformation in Education.

Although this study does not aim for empirical generalisation, rigour is ensured through theoretical coherence, transparency of analytical procedures, and engagement with authoritative scholarship. The use of established philosophical concepts provides analytical consistency, while the systematic selection and interpretation of literature enhances credibility. Reflexivity is maintained throughout the analysis by explicitly acknowledging the study’s normative stance and commitment to human-centred educational values.

Methodologically, this study contributes to digital Education research by demonstrating how the philosophy of science can function as a robust analytical approach to governance issues. Rather than positioning philosophy as an abstract or peripheral concern, the methodology shows its relevance for interrogating contemporary challenges posed by data-driven and algorithmic systems. This approach offers a transferable framework that can inform future research on digital governance across different educational contexts.

RESULT AND DISCUSSION

The conceptual analysis reveals that digital governance in Education operates through a coherent but largely unexamined technocratic rationality that reshapes educational knowledge, institutional power, and normative orientations. Rather than functioning as a neutral managerial innovation, digital governance emerges as a complex socio-epistemic assemblage that privileges particular ways of knowing, being, and valuing Education. The findings are organised around three interrelated philosophical dimensions—epistemological, ontological, and axiological—which together illuminate how digital governance extends beyond technical administration into the foundational terrain of educational meaning and purpose.

Epistemological Reconfiguration: Data as Authoritative Knowledge

The analysis indicates that digital governance systems increasingly position data as the primary, and often exclusive, source of legitimate educational knowledge. Learning analytics, performance indicators, and algorithmic evaluations are framed as objective representations of educational reality, enabling governance decisions to be justified through numerical evidence and predictive models. This epistemological shift privileges quantifiable outcomes, standardisation, and comparability while marginalising contextual, relational, and interpretive forms of knowledge. Educational quality becomes synonymous with what can be measured, tracked, and visualised within digital infrastructures.

From a philosophy-of-science perspective, this epistemological configuration reflects a positivist assumption that knowledge derived from data is inherently neutral and universally valid. However, the analysis demonstrates that educational data are not passive reflections of reality but are actively constructed through system design, indicator selection, and institutional priorities. What counts as governance agendas shapes relevant data, reinforcing particular interpretations of success, efficiency, and performance. Consequently, digital governance narrows the epistemic horizon of Education by rendering invisible those dimensions of teaching and learning that resist quantification, such as moral development, democratic participation, and pedagogical relationships.

This epistemological reduction has significant implications for educational decision-making. When governance relies predominantly on data-driven indicators, professional judgment and contextual understanding are subordinated to algorithmic outputs. The authority to define educational truth shifts from educators and communities toward technical systems and policy actors who control data infrastructures. As a result, epistemic power becomes centralised within digital governance architectures, reinforcing technocratic forms of control.

Ontological Transformation: Education as a Governable System

Ontological analysis reveals that digital governance reconfigures the very nature of educational reality. Educational actors—students, teachers, and institutions—are increasingly constituted as data entities subject to continuous monitoring and evaluation. Learners are represented through engagement metrics and risk profiles, educators through performance indicators, and institutions through dashboards of measurable outputs. Education, in this configuration, is no longer understood primarily as a relational and developmental practice but as a system of optimizable processes.

This ontological shift transforms Education into a governable object, managed through real-time data flows and automated interventions. The complexity and unpredictability of educational processes are reduced to manageable variables, enabling governance through surveillance, prediction, and control. While such reconfiguration enhances administrative oversight, it also risks eroding the human and dialogical dimensions of Education. The lived experiences of learners and educators are subsumed under abstract representations, creating a disjunction between educational reality as lived and as governed.

Moreover, this datafied ontology reinforces a performative culture in which educational value is equated with visibility within digital systems. Practices that align with measurable indicators gain institutional legitimacy, while those that do not are rendered peripheral or irrelevant. This dynamic reshapes institutional behaviour, encouraging compliance with governance metrics rather than reflective engagement with educational purposes.

Axiological Implications: Embedded Values and Ethical Tensions

The axiological analysis highlights that digital governance is underpinned by a specific value orientation that prioritises efficiency, accountability, and control. These values are embedded within system architectures and governance frameworks, shaping decision-making processes and institutional priorities. While such values are often presented as universally desirable, the analysis reveals their normative consequences for educational justice, autonomy, and responsibility.

One of the most salient ethical tensions concerns the normalisation of surveillance practices in Education. Continuous data collection and monitoring are justified in the name of improvement and accountability, yet they raise concerns about privacy, consent, and the erosion of trust. Additionally, the reliance on algorithmic decision-making risks reproducing existing inequalities, as data-driven systems often reflect and amplify structural biases present in educational contexts.

Crucially, the analysis demonstrates that ethical responsibility in digital governance is often shifted from human actors to technological systems. Decisions are framed as outcomes of algorithms rather than moral judgments made by individuals or institutions. This

displacement obscures accountability and weakens ethical reflexivity, reinforcing the illusion that governance decisions are value-neutral technical necessities rather than normative choices.

Integrative Analysis of Philosophical Dimensions

To synthesise these findings, Table 2 presents an overview of how epistemological, ontological, and axiological dimensions interact within technocratic digital governance.

Table 2. Philosophical Dimensions of Technocratic Digital Governance in Education

Dimension	Core Assumptions	Governance Effects	Critical Implications
Epistemological	Data as objective and authoritative knowledge	Decisions justified through metrics and analytics	Marginalisation of contextual and experiential knowledge
Ontological	Education as a measurable and optimizable system	Datafication of actors and processes	Reduction of relational and human dimensions
Axiological	Efficiency and accountability as primary values	Normalisation of surveillance and control	Ethical tensions related to justice, agency, and responsibility

A dissolving microneedle system was successfully developed to enhance the transdermal delivery of andrographolide for the management of neuropathic pain. The combination of polyvinyl alcohol and polyvinylpyrrolidone produced microneedles with good physical stability, adequate mechanical strength, and effective skin penetration. The formulation exhibited high recovery efficiency, with andrographolide recovery ranging from 83% to 95%. Hemolysis assays confirmed excellent hemocompatibility, with no evidence of erythrocyte damage. Ex vivo permeation studies demonstrated superior skin permeation of andrographolide from dissolving microneedles compared with conventional microneedle-free formulations. The integrative analysis shows that these dimensions mutually reinforce one another, producing a coherent technocratic rationality that legitimises digital governance practices. Epistemological claims of objectivity support ontological reconfigurations of Education as a system, which, in turn, normalise axiological priorities centred on control. This coherence explains the rise of technocratic digital governance despite growing ethical and pedagogical concerns.

The findings underscore that digital governance in Education cannot be adequately understood or evaluated solely through technical criteria. By operating as a knowledge-producing, reality-shaping, and value-laden system, digital governance fundamentally shapes how it is used and experienced. Without philosophical reflection, governance reforms risk reinforcing instrumental rationality and undermining the normative foundations of Education. This analysis highlights the need to recenter educational governance on human judgment, ethical deliberation, and democratic accountability. Philosophy of science provides a critical lens for exposing the assumptions embedded in digital systems and for articulating alternative governance imaginaries that prioritise educational values over technical efficiency. Such reflection is essential if digital governance is to support, rather than constrain, the emancipatory and humanistic aims of Education.

DISCUSSION

The findings of this study invite a critical rethinking of how digital governance in Education is conceptualised, justified, and implemented. By exposing the epistemological, ontological, and axiological foundations of technocratic digital governance, the analysis demonstrates that current governance models are not merely technical arrangements but normative projects that shape educational meaning and practice. This recognition has significant implications for Theory, policy, and practice, particularly in an era marked by the rapid expansion of artificial intelligence, algorithmic decision-making, and platform-based Education systems.

From a theoretical standpoint, the findings challenge dominant narratives that frame digital governance as an inevitable and progressive form of modernisation in Education. Instead, they align with critical scholarship that views datafication and algorithmic systems as political and epistemic interventions rather than neutral tools (Kitchin, 2021). Digital governance structures actively define what counts as valid knowledge, acceptable performance, and desirable

outcomes, thereby shaping educational realities in ways that often escape scrutiny. This reinforces the need to move beyond functionalist and solutionist approaches toward more reflexive theoretical frameworks that can interrogate the assumptions embedded in digital systems.

Epistemologically, the findings suggest that data-driven governance narrows the scope of educational knowledge by privileging what is measurable and computationally tractable. This Tendency resonates with broader critiques of computational epistemology, which warn against equating data with truth and prediction with understanding (Floridi, 2021). When educational governance relies heavily on analytics and performance indicators, it risks marginalising pedagogical judgment, contextual expertise, and democratic deliberation. The implication is not that data should be rejected, but that its epistemic authority must be critically situated within broader interpretive and normative frameworks.

Ontologically, the analysis highlights how digital governance reconstitutes Education as a system of governable objects rather than a relational social practice. Learners and educators are increasingly positioned as data subjects whose identities and trajectories are defined through algorithmic profiles and performance metrics. This reconfiguration echoes concerns raised in critical data studies about the transformation of human subjects into calculable entities optimised for management and control (Lyon, 2022). Such an ontological shift risks eroding the ethical and relational dimensions of Education by reducing complex human experiences to abstract representations within governance infrastructures.

The axiological implications of technocratic digital governance are particularly consequential. The prioritisation of efficiency, accountability, and optimisation reflects a narrow value orientation that aligns Education with managerial and market logics. Critical scholars have argued that these values often conflict with educational commitments to equity, care, and democratic participation (Roberts-Mahoney et al., 2020). Moreover, the displacement of ethical responsibility onto technological systems obscures decision-makers' moral agency, allowing governance choices to be framed as technical necessities rather than contested value judgments. This ethical distancing is especially problematic in contexts where algorithmic decisions affect student opportunities, institutional funding, and professional evaluation.

Taken together, these implications point to the limitations of technocratic digital governance and the need for a fundamental reframing. Rather than treating governance as a problem of system optimisation, Education must be understood as a normative practice oriented toward human development and social justice. Recent work in critical digital Education studies emphasises the importance of reclaiming human agency and ethical deliberation amid the expansion of automation (Macgilchrist, 2021). This perspective calls for governance models that recognise uncertainty, contextuality, and moral responsibility as integral to educational decision-making.

Reframing digital governance also requires questioning the power relations embedded in data infrastructures and platforms. Platform-based governance models often centralise control within state agencies or private technology providers, reshaping educational authority and accountability (Decuyper, 2021). Without democratic oversight, these arrangements risk entrenching power asymmetries and limiting educators' and learners' capacity to influence governance processes. A critical reframing, therefore, entails reimagining governance as a participatory and dialogical process rather than a top-down technical operation.

Ethically, this reframing aligns with emerging debates on responsible and human-centred governance of digital technologies. Scholars in digital ethics argue that governance systems must be designed and evaluated not only for efficiency but also for their impact on human dignity, autonomy, and justice (Mittelstadt, 2022). Applying this insight to Education underscores the importance of embedding ethical reflexivity within governance practices, ensuring that technological systems remain accountable to educational values rather than displacing them.

To clarify the contrast between technocratic and philosophically informed approaches, Table 3 presents a conceptual reframing of digital governance in Education.

Table 3. Reframing Digital Governance in Education

Dimension	Technocratic Digital Governance	Philosophically Informed Digital Governance
Epistemological Orientation	Data is objective and self-evident	Data is constructed, contextual, and interpretable
Ontological Assumptions	Education as a measurable system	Education as a relational and moral practice
Axiological Priorities	Efficiency, performance, control	Justice, agency, responsibility
Role of Technology	Deterministic governance tool	Supportive and accountable instrument
Governance Logic	Optimisation and surveillance	Deliberation and ethical judgment

This reframing does not imply rejecting digital technologies or governance innovations. Rather, it emphasises the need to reposition technology within a broader educational and ethical horizon. Digital systems can support governance processes when reflective judgment, transparent values, and democratic accountability guide them. However, without such grounding, they risk reinforcing instrumental rationality and undermining the normative purposes of Education. Ultimately, the discussion underscores that the future of digital governance in Education is not a technical question but a philosophical one. Decisions about how Education is governed digitally are inseparable from questions about what Education is for, who it serves, and which values it embodies. By bringing philosophy of science into dialogue with digital governance, this study contributes to a growing body of critical scholarship seeking to reclaim Education as a human-centred, ethically grounded practice in an increasingly data-driven world (Greene, 2021; Pangrazio, 2023).

CONCLUSION

This study demonstrates that digital governance in Education extends far beyond technical administration, functioning instead as a socio-epistemic system that reshapes educational knowledge, power relations, and normative orientations. From a philosophy-of-science perspective, the analysis reveals that technocratic digital governance privileges data-driven knowledge, reconfigures Education as a measurable, governable system, and embeds values centred on efficiency and control. These dynamics risk marginalising human judgment, ethical responsibility, and the relational purposes of Education. The primary theoretical contribution of this study lies in its integrative framework, which connects epistemological, ontological, and axiological dimensions to examine digital governance as a value-laden practice. By foregrounding the philosophical assumptions embedded in data-driven governance, the study advances critical digital Education scholarship beyond fragmented critiques of datafication or ethics, offering a coherent lens for understanding how digital governance transforms Education at a foundational level.

From a policy perspective, the findings underscore the need to move beyond technocratic solutionism in digital Education governance. Policymakers should critically interrogate the assumptions underlying algorithmic and data-driven systems, ensure transparency and accountability in governance processes, and reaffirm human agency in educational decision-making. Digital governance frameworks must explicitly address ethical responsibility, equity, and democratic participation, recognising that technological efficiency alone cannot define educational quality.

Ultimately, reimagining digital governance requires recognising that educational futures are shaped not only by technological innovation but by the values and judgments embedded in governance systems. A philosophically informed approach positions digital governance as a supportive and accountable instrument, aligned with the humanistic and ethical aims of Education rather than subordinated to instrumental rationality. Ex vivo permeation studies demonstrated that DMNAg6 achieved higher andrographolide permeation across the skin than

conventional microneedle-free formulations, with detectable drug permeation observed at 24 h. These findings indicate the dissolving microneedle system's ability to facilitate transdermal delivery of andrographolide and provide an initial indication of its potential to improve delivery performance compared with non-microneedle systems.

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