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PERSPECTIVE RESEARCH

BRAZILIAN EDUCATION, DISCIPLINE, AND ALGORITHMS: TENSIONS BETWEEN CONTROL AND AUTONOMY IN THE DIGITAL ERA

Educação, Disciplina e Algoritmos no Brasil: Tensões entre Controle e Autonomia na Era Digital

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ABSTRACT | Objective: This study presents the *Algorithmic Discipline Recalibration Model* (ADRM), a theoretically integrated framework that articulates the critical tradition of discipline with the contemporary literature on algorithmic governance to examine how artificial intelligence systems reconfigure institutional dynamics within Brazilian education. It investigates whether the incorporation of AI represents a rupture, an intensification, or a recalibration of historically sedimented disciplinary mechanisms, as well as how this process generates structural tensions between institutional governance and pedagogical autonomy. **Method:** A structured integrative conceptual review combined with comparative conceptual analysis was employed. Foundational works in genealogical theory, sociology of reproduction, critical data studies, and AI-in-education research were systematically mapped and analyzed to identify convergences and theoretical tensions. Concepts were organized into analytical categories, allowing cross-traditional comparison and synthesis into a unified interpretative model. **Findings**: The analysis indicates that AI integration does not displace disciplinary rationality but digitally recalibrates it through datafication, predictive analytics, continuous visibility, and performance metrics. Algorithmic mediation translates normalization and classification into statistically mediated governance mechanisms. This transformation produces a structural tension between professional autonomy and institutional oversight, with outcomes contingent upon regulatory design, institutional architecture, and ethical safeguards. **Value:** This study contributes an original conceptual framework (ADRM) that reframes AI in education as a process of digitally mediated disciplinary recalibration. By integrating classical critical theory with contemporary AI governance debates, it advances a context-sensitive interpretation of algorithmic integration in Brazilian education. **Practical Implications:** The ADRM offers policymakers, administrators, and educators a theoretically grounded lens to design participatory governance structures, safeguard professional discretion, and implement ethically responsible AI strategies within educational systems.

Keywords | Artificial Intelligence; Algorithmic Governance; Discipline; Digital Governance; Brazilian Education; Educational Autonomy; Datafication; AI Policy.

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RESUMO | Objetivo: Este estudo apresenta o Modelo de Recalibração Disciplinar Algorítmica (Algorithmic Discipline Recalibration Model – ADRM), um framework teoricamente integrado que articula a tradição crítica da disciplina com a literatura contemporânea sobre governança algorítmica para analisar como sistemas de inteligência artificial reconfiguram dinâmicas institucionais na educação brasileira. Investiga-se se a incorporação da IA representa uma ruptura, intensificação ou recalibração de mecanismos disciplinares historicamente sedimentados, bem como de que forma esse processo produz tensões estruturais entre governança institucional e autonomia pedagógica. **Método:** Adotou-se uma revisão integrativa conceitual estruturada combinada à análise conceitual comparativa. Obras fundamentais da teoria genealógica, da sociologia da reprodução, dos estudos críticos de dados e da pesquisa em IA na educação foram sistematicamente mapeadas para identificar convergências e tensões teóricas. Os conceitos foram organizados em categorias analíticas que permitiram síntese interpretativa e a formulação do modelo conceitual proposto. **Resultados:** A análise indica que a integração da IA não substitui a racionalidade disciplinar, mas a recalibra digitalmente por meio da datificação das condutas, da visibilidade contínua, da análise preditiva e de métricas de desempenho. A mediação algorítmica traduz processos de normalização e classificação em mecanismos estatisticamente mediados de governança, produzindo uma tensão estrutural entre autonomia profissional e controle institucional. Os desfechos dessa tensão dependem do desenho regulatório, da arquitetura institucional e das salvaguardas éticas adotadas. **Valor:** O estudo contribui com um modelo conceitual original (ADRM) que reconceitualiza a IA na educação como processo de recalibração disciplinar digitalmente mediada, integrando teoria crítica clássica e debates contemporâneos sobre governança algorítmica no contexto brasileiro. **Implicações** Práticas: O ADRM oferece a formuladores de políticas, gestores e educadores um referencial teórico para estruturar estratégias regulatórias participativas, preservar a autonomia docente e orientar a implementação ética e responsável da IA nos sistemas educacionais.

Palavras-chave | Inteligência Artificial; Governança Algorítmica; Disciplina; Governança Digital; Educação Brasileira; Autonomia Docente; Datificação; Políticas de IA.

INTRODUCTION

The rapid incorporation of artificial intelligence into educational systems has intensified debates concerning the reconfiguration of institutional practices and regulatory frameworks. In the context of Brazilian education, these developments occur alongside expanding processes of digital governance, datafication and platform integration that reshape administrative and pedagogical routines. International policy documents emphasize the transformative potential of AI to personalize learning and improve system efficiency, while simultaneously warning about ethical, legal and democratic implications (OECD, 2023; UNESCO, 2023). Critical scholarship further suggests that algorithmic systems embed normative assumptions that may reorganize forms of control within schooling environments (Williamson, 2017a; Selwyn, 2019). Such transformations do not unfold in a vacuum. Rather, they intersect with historically sedimented structures of authority and professional practice. In this scenario, the question of autonomy acquires renewed urgency, particularly in educational systems marked by structural inequality and institutional diversity, as is the case in Brazil.

A conceptual entry point into this discussion lies in the historical formation of discipline as a constitutive feature of the modern school. Analyses of power, vigilance and normalization have described schooling as a space in which subjectivities are shaped through regulated routines, classificatory mechanisms and evaluative hierarchies (Foucault, 1977, 1980). Complementary perspectives highlight how educational institutionality participates in the reproduction of social distinctions and symbolic orders (Bourdieu & Passeron, 1977). From this critical tradition, the

school can be interpreted as an apparatus that organizes conduct and distributes legitimacy. These interpretations do not reduce education to domination, yet they underscore the structured character of pedagogical relations. The theoretical problem, therefore, concerns how emerging digital infrastructures intersect with pre-existing disciplinary formations and whether they intensify, displace or subtly recalibrate them.

Although research on AI applications in education has expanded significantly, a theoretical gap remains regarding the integrated examination of school discipline and algorithmic mediation in the Brazilian context. Reviews have mapped technological implementations and documented trends in intelligent systems and analytics (Zawacki-Richter et al., 2019), while relational approaches have analyzed the sociotechnical entanglements of AI within classroom settings (Perrotta & Selwyn, 2020). However, these strands of literature rarely engage systematically with the critical educational tradition that interrogates disciplinary structures and institutional reproduction. As a result, discussions of innovation and efficiency often proceed separately from analyses grounded in critical educational theory. This fragmentation is particularly visible in studies addressing Brazil, where the articulation between algorithmic governance and historically constituted schooling norms remains underexplored. The absence of such an integrated framework constitutes the central lacuna that motivates the present study.

The general objective of this article is to analyze how AI-based systems introduced into Brazilian schooling interact with established disciplinary arrangements, thereby generating a structural tension between governance mechanisms and pedagogical autonomy. The specific objectives are threefold: first, to examine how digital governance frameworks structure regulatory practices within educational institutions; second, to investigate how algorithmic mediation may influence processes of evaluation and subject formation; third, to assess whether these dynamics intensify or reconfigure established patterns of control. Guided by these aims, the study addresses the following research questions: How do AI systems participate in the production of regulatory norms in schools? In what ways might they shape processes of subjectivation? To what extent does their implementation deepen a central structural tension between institutional governance and educator autonomy? These questions approach the relationship between governance and autonomy as historically situated and analytically open rather than predetermined.

For analytical clarity, several key concepts require preliminary definition. The term algorithm refers to computational procedures embedded in digital platforms that process data and generate outputs capable of influencing educational decisions (Pasquale, 2015; O'Neil, 2016). The notion of digital governance designates the assemblage of policies, regulatory instruments and infrastructural arrangements through which data-driven systems are coordinated and legitimized within public institutions (Williamson, 2017a). Pedagogical autonomy denotes the professional and epistemic capacity of educators to deliberate and act according to pedagogical judgment within institutional constraints. These conceptual delimitations frame the scope of the inquiry and establish its analytical boundaries. The article proceeds in four parts. The first section elaborates the theoretical articulation between discipline and algorithmic governance. The second details the methodological procedures. The third presents the analytical discussion. The final section reflects on the broader implications of the findings, ensuring conceptual articulation and methodological coherence throughout the manuscript.

LITERATURE REVIEW

The historical constitution of school discipline has long been interpreted as foundational to the consolidation of modern educational systems. Genealogical analyses describe schooling as embedded within a broader modern rationality that organizes time, space and conduct through surveillance, examination and hierarchical observation (Foucault, 1977, 1980). From this perspective, normalization is structurally woven into pedagogical routines rather than operating as an external imposition. Complementary sociological accounts emphasize how institutional arrangements stabilize symbolic hierarchies and reproduce social distinctions (Bourdieu & Passeron, 1977). Earlier critical traditions also frame schooling as an ideological apparatus implicated in broader relations of domination (Althusser, 1970). Taken together, these approaches suggest that the architecture of schooling historically intertwines knowledge transmission with mechanisms of control, while remaining internally contested.

This disciplinary formation cannot be detached from broader transformations in knowledge and society. Analyses of post-industrial and networked societies argue that informational logics increasingly shape institutional coordination (Castells, 1996; Lyotard, 1984). Within education, debates about democracy and participation have simultaneously emphasized the emancipatory promise of schooling (Dewey, 1916; Freire, 1970) and the risk of technocratic rationalization (Illich, 1971; Giroux, 1983). Selwyn (2011) underscores that educational technology debates have always oscillated between utopian and critical narratives. Thus, the emergence of digital infrastructures must be interpreted against a longer trajectory in which schooling mediates tensions between emancipation and regulation.

Building on this institutional genealogy, contemporary scholarship highlights the rise of algorithmic governance in education. Data-driven infrastructures increasingly inform assessment, accountability and resource allocation (Williamson, 2017a, 2017b; OECD, 2023). In these arrangements, algorithms translate complex pedagogical processes into measurable indicators of performance. Learning analytics research conceptualizes data extraction and visualization as central to institutional decision-making (Buckingham Shum & Ferguson, 2012; Knight et al., 2014). The promise of optimization coexists with intensified monitoring. Governance becomes operationalized through dashboards and predictive models that render student activity continuously visible.

Critical analyses question the neutrality of such infrastructures. Pasquale (2015) and O'Neil (2016) argue that opaque algorithmic systems may embed biases and reproduce inequality, while Zuboff (2019) situates data extraction within broader logics of surveillance capitalism. In educational contexts, Williamson et al. (2020) demonstrate how digital platforms reorganized pedagogical practices during crises, consolidating new dependencies. These perspectives converge in suggesting that algorithmic systems operate not merely as technical tools but as regulatory dispositifs. The literature thus presents a divided landscape in which data governance is framed alternately as rational enhancement and as an extension of institutional surveillance.

At the same time, a substantial body of research emphasizes the pedagogical potential of artificial intelligence. Luckin et al. (2016) and Holmes et al. (2019) argue that AI can augment teaching and support adaptive learning pathways. Systematic reviews identify diverse applications ranging

from intelligent tutoring systems to automated feedback mechanisms (Zawacki-Richter et al., 2019). Baker, Smith and Anissa (2019) envision AI as capable of reshaping educational ecosystems, provided ethical safeguards are established. These contributions foreground innovation and efficiency, positioning AI as a transformative resource.

More recent scholarship has further expanded the debate by examining the institutional and governance implications of generative artificial intelligence in educational systems. Emerging studies highlight how large language models and automated content generation tools introduce new challenges related to academic integrity, assessment practices, epistemic authority, and institutional regulation (Kasneci et al., 2023; Miao & Holmes, 2023; Mollick, 2024; Dwivedi et al., 2024). These discussions increasingly emphasize the need for governance frameworks capable of balancing innovation with accountability, transparency, and pedagogical responsibility (Kasneci et al., 2023; Miao & Holmes, 2023). Recent policy-oriented analyses also stress the importance of regulatory architectures capable of addressing algorithmic opacity, data governance, and the ethical deployment of generative AI within educational ecosystems (UNESCO, 2024; Williamson et al., 2024). In this sense, contemporary debates increasingly frame AI integration not only as a technological development but also as a transformation in institutional governance and knowledge mediation.

Recent research published after the emergence of large-scale generative models has further expanded the debate on artificial intelligence in education. These studies emphasize the transformative implications of generative AI for knowledge production, assessment practices, and institutional governance, highlighting the need for regulatory frameworks capable of ensuring transparency, accountability, and ethical oversight in educational systems (Mollick, 2024; Dwivedi et al., 2024; UNESCO, 2024).

The literature on personalization provides another crucial dimension. Perrotta and Selwyn (2020) argue for a relational understanding of AI that accounts for sociotechnical entanglements rather than deterministic narratives. Personalized systems promise differentiation and performance optimization, yet they also intensify quantification. Meritocratic logics become embedded within algorithmic infrastructures, shaping evaluative cultures. Here, the production of subjectivity intersects with data-driven profiling. The learner is increasingly constituted through metrics.

Simultaneously, proponents of innovation highlight the possibility of expanding pedagogical autonomy through responsible design. Holmes et al. (2019) suggest that AI can support reflective practice when educators remain central decision-makers. OECD (2023) emphasizes ecosystem coordination and governance coherence, while UNESCO (2023) advocates participatory regulation. These positions present AI as a mediating resource rather than an autonomous authority. However, Selwyn (2019) cautions that optimistic projections may obscure structural asymmetries. The debate remains unsettled.

When these strands are synthesized, a persistent structural tension becomes visible. On one side stand traditions of critical theory emphasizing discipline, ideology and reproduction (Foucault, 1977; Bourdieu & Passeron, 1977; Althusser, 1970). On the other stand innovation-oriented frameworks that foreground optimization and systemic redesign (Luckin et al., 2016; Baker, Smith, Anissa, 2019). Between them lies a contested terrain shaped by data governance, surveillance concerns and

democratic aspirations (Zuboff, 2019; Holmes et al., 2022). The coexistence of these perspectives signals conceptual fragmentation.

This framework therefore positions algorithmic governance as both extension and recalibration of disciplinary rationality. It draws upon genealogical theory, sociological reproduction, critical data studies and AI-in-education scholarship to construct an integrated analytical lens. Rather than privileging either technophilic or technoskeptic narratives, the framework conceptualizes AI as embedded within historically constituted power relations. In doing so, it establishes the conceptual conditions for examining how digital infrastructures intersect with institutional traditions, shaping contemporary configurations of control, autonomy and governance in education.

To synthesize the theoretical articulation developed in this study, Figure 1 presents the Algorithmic Discipline Recalibration Model (ADRM). The model conceptualizes AI integration in schooling not as a rupture with disciplinary rationality, but as its digital recalibration through data-mediated infrastructures. It illustrates how historically sedimented mechanisms of normalization are translated into algorithmic systems, generating a structural tension between professional autonomy and institutional governance.

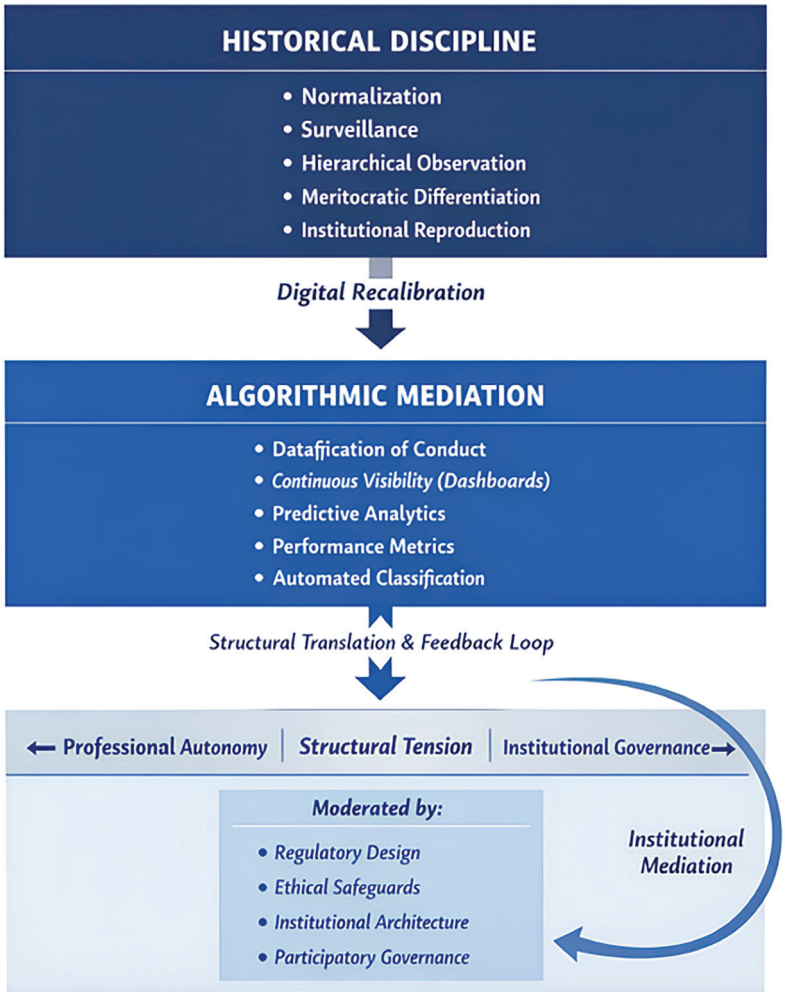


Figure 1. Algorithmic Discipline Recalibration Model (ADRM).

The ADRM conceptualizes the interaction between historically sedimented disciplinary mechanisms and emerging algorithmic governance infrastructures in educational institutions. The model is structured around three analytical dimensions identified in the literature review: (1) disciplinary rationality, which includes mechanisms of surveillance, normalization, and hierarchical differentiation historically embedded in schooling; (2) algorithmic mediation, referring to datafication processes, predictive analytics, and automated evaluative systems that translate institutional practices into computational metrics; and (3) governance outcomes, which emerge from the interaction between institutional regulation and professional autonomy. Within this framework, artificial intelligence does not operate as an external technological layer but as a mediating infrastructure that recalibrates existing disciplinary logics through data-driven visibility and probabilistic decision-making. The model therefore illustrates how algorithmic systems transform the operational grammar of discipline by shifting regulatory processes from spatial observation toward continuous data-based monitoring, generating structural tensions between institutional oversight and pedagogical autonomy.

Building on the literature discussed above, a broader conceptual fragmentation becomes visible in the field of artificial intelligence in education. More specifically, the present study identifies a triple conceptual gap that limits the analytical coherence of current debates on artificial intelligence in education.

First, there remains a persistent separation between critical educational theory and contemporary AI-in-education scholarship. Genealogical and sociological analyses of discipline have long examined how schooling organizes visibility, normalization and hierarchical differentiation. In contrast, much of the AI literature focuses on personalization, optimization and digital governance without systematically engaging the critical tradition that interrogates institutional power. This divide results in parallel discourses that rarely intersect: one centered on technological innovation, the other on structural regulation. The absence of sustained dialogue between these traditions prevents a comprehensive understanding of how algorithmic systems operate within historically constituted educational apparatuses.

Second, there is a scarcity of theoretically integrated analyses situated in the Brazilian context. While global research increasingly addresses AI governance and ethical regulation, comparatively fewer studies examine how these processes unfold within educational systems marked by structural inequality, institutional heterogeneity and ongoing policy reform, as in Brazil. The majority of existing work either adopts a global governance perspective or remains descriptively focused on technological implementation. Consequently, there is limited analytical exploration of how digital infrastructures interact with nationally specific institutional configurations and regulatory traditions.

Third, and more fundamentally, current literature lacks an articulated framework connecting discipline and algorithmic governance as co-constitutive dynamics. Discussions of algorithmic mediation frequently treat digital systems as novel layers of administration, while critical analyses of discipline often remain anchored in architectural, spatial or bureaucratic forms of control. What remains underdeveloped is a conceptual synthesis capable of examining how algorithmic infrastructures recalibrate disciplinary rationalities through datafication, predictive analytics and continuous visibility.

By explicitly addressing this triple conceptual gap, the present study advances a theoretically integrated approach that situates AI within the historical grammar of institutional regulation while remaining attentive to contemporary governance dynamics. This articulation establishes the analytical foundation for examining the structural tension between control and autonomy within digitally mediated educational institutions.

METHODOLOGY

This study adopts a structured integrative conceptual review combined with comparative conceptual analysis as its research design. The methodological strategy was selected to ensure systematic articulation between classical critical educational theory and contemporary scholarship on algorithmic governance and artificial intelligence in education. The structured integrative conceptual review approach allows the synthesis of heterogeneous yet conceptually related bodies of literature, enabling the identification of recurrent patterns, theoretical convergences, and analytical tensions across traditions. At the same time, the comparative dimension strengthens methodological rigor by situating arguments relationally rather than treating them as isolated claims, thereby enhancing transparency and interpretative traceability.

The construction of the theoretical corpus followed explicit and replicable criteria. A systematic search was conducted in major academic databases, including Scopus, Web of Science, ERIC, and Google Scholar, using combinations of descriptors such as “artificial intelligence in education,” “algorithmic governance,” “digital governance,” “discipline,” “educational autonomy,” “datafication,” and “subject formation.” The temporal scope ranged from 1970 to 2023, allowing the inclusion of foundational works in critical theory alongside contemporary research on digital governance and artificial intelligence in education. The temporal delimitation of the corpus until 2023 reflects the period in which the systematic literature search and corpus construction were conducted. The primary database searches were completed in late 2023, prior to the final stages of manuscript preparation. Given the rapid expansion of research on generative artificial intelligence in education between 2024 and 2025, additional recent publications were considered during the interpretative phase of the study to ensure conceptual alignment with emerging debates. However, the structured corpus used for systematic coding remained anchored in the 1970–2023 window in order to preserve methodological consistency and analytical comparability across the reviewed literature. Inclusion criteria required peer-reviewed publications, academically recognized books or book chapters, and demonstrable conceptual engagement with at least one of the study’s analytical axes: discipline, governance, autonomy, meritocracy, or subject formation. Works that were exclusively technical, descriptive of software implementation without theoretical reflection, or lacking methodological transparency were excluded. After abstract screening and full-text assessment, a final corpus was selected and organized according to its theoretical centrality and analytical contribution.

Sources were included only if they met all of the following conditions: (i) Education as primary domain—the text centrally addressed schooling (K–12 or higher education), teaching/learning, assessment, or education policy (not merely citing education as an example); (ii) Algorithmic/AI mediation as an analytical object—the text substantively examined AI, algorithms, datafication,

learning analytics, automated classification/prediction, large language models, or metric-based platform governance as mechanisms shaping educational practices or policy (not "technology in education" in general); (iii) Contribution to at least one ADRM analytical axis—the text provided conceptual or empirical material relevant to at least one of the model's axes: discipline/normalization and institutional control, datafication/algorithmic power and opacity, or AI-in-education governance/practices (e.g., integrity, accountability, rights, equity, oversight); (iv) Eligible document type—peer-reviewed journal articles, scholarly books/chapters published by recognized academic presses, or institutional reports/guidelines issued by authoritative organizations (e.g., UNESCO, OECD, Council of Europe, Nesta); and (v) Full-text accessibility for coding and matrix-based synthesis. The default temporal window for non-foundational sources was 2010–present, with a stricter focus on 2019–present for generative AI/LLM integrity and governance. Foundational works published prior to this window were included only when they were primary sources of constructs operationalized in the ADRM (e.g., discipline/normalization, reproduction, ideology, critical pedagogy), were explicitly coded in the analytical matrix, and were bridged by contemporary scholarship applying those constructs to datafied education. Sources were excluded if education was peripheral, if algorithmic/AI mechanisms were absent or merely mentioned, if the text was purely technical (model performance/architecture) without governance/autonomy implications, if it was non-scholarly commentary or promotional material, if full text was unavailable, or if the work functioned only as "ornamental theory" without being codified into the ADRM synthesis.

For analytical purposes, the corpus was structured into three interrelated reference groups. The first comprised foundational works addressing discipline, institutional regulation, and educational reproduction within critical theory. The second included contemporary scholarship on digital governance, datafication, and algorithmic regulation. The third encompassed AI-in-education research examining learning analytics, personalization, generative AI, and system-level transformation. This grouping was not hierarchical but heuristic, facilitating relational comparison across conceptual traditions while preserving theoretical specificity.

The analytical procedure followed an abductive strategy grounded in iterative reading and cross-textual comparison. Central conceptual categories were identified through systematic coding and organized into a structured analytical matrix. This matrix mapped definitional variations, normative orientations, and interpretative positions regarding governance mechanisms, regulatory infrastructures, autonomy, and processes of subject formation. Particular attention was given to how authors conceptualize the relationship between visibility, normalization, datafication, and institutional authority. This process enabled the identification of both convergences and divergences, generating a structured field of analytical tension.

Subsequently, a comparative conceptual analysis was conducted to examine relational patterns among authors and theoretical traditions. Positions were categorized according to their interpretation of AI's impact on institutional power dynamics, ranging from emancipatory to regulatory or ambivalent perspectives. Through thematic clustering and relational synthesis, the analysis sought to clarify whether algorithmic systems operate as rupture, intensification, or recalibration of disciplinary rationality. The final stage consisted of integrative theoretical synthesis, articulating the mapped tensions into a cohesive interpretative framework. This synthesis informed the development of the

Algorithmic Discipline Recalibration Model (ADRM), which conceptualizes AI integration as a digitally mediated recalibration of historically sedimented disciplinary structures.

The methodological design does not aim at statistical generalization but at conceptual integration and analytical coherence. Its validity rests on transparency in corpus construction, systematic categorization of theoretical positions, and logical consistency between research questions, analytical procedures, and interpretative conclusions. By explicitly articulating disciplinary genealogy with contemporary algorithmic governance literature, the method ensures alignment between the study's general objective and its analytical outcomes.

RESULTS AND DISCUSSION

Disciplinary Continuity and Algorithmic Visibility

The findings can be interpreted through the critical tradition that conceptualizes schooling as structured by a specific disciplinary rationality. Classical analyses describe discipline as operating through surveillance, normalization and hierarchical differentiation (Foucault, 1977, 1980), while sociological accounts emphasize institutional reproduction and symbolic power (Bourdieu & Passeron, 1977). When confronted with these frameworks, the results suggest not a rupture but a patterned continuity. Algorithmic systems appear to translate established modalities of observation and classification into data-driven formats. At the same time, subtle processes of transformation become evident. Visibility shifts from episodic inspection to continuous monitoring, and evaluative criteria become increasingly automated. The grammar of power persists, yet its operational medium moves from architectural arrangements to computational infrastructures.

This reinterpretation supports the first and second objectives by demonstrating that algorithmic governance does not simply overlay schooling from outside. Rather, it resonates with historically sedimented mechanisms of regulation. The mapping of conceptual correspondences between disciplinary dispositifs and digital dashboards reinforces this claim. However, the transformation is not merely technical. The relocation of authority into data-processing systems modifies the locus of decision-making, intensifying abstraction in institutional oversight. Discipline becomes statistically mediated, probabilistic and anticipatory. In this sense, AI incorporation reconfigures rather than replaces disciplinary structures, recalibrating how norms are produced, stabilized and enacted within educational institutions.

Datafication and Subject Formation

A second analytical axis concerns processes of subjectivation under digital governance. The findings indicate that performance analytics contribute to shaping learner identity through quantified indicators aligned with meritocratic logics. Continuous feedback systems orient conduct toward measurable outcomes (Williamson, 2017a; Perrotta & Selwyn, 2020), encouraging individuals to interpret themselves through dashboards, rankings and predictive scores. Subject formation increasingly unfolds within data environments that promise objectivity but rely on selective inputs

and embedded normative assumptions. Educational selves are thus constituted in interaction with metrics of differentiation and performance visibility.

The literature does not converge on a singular interpretation of these dynamics. Some accounts frame data-driven identity formation as empowering, emphasizing enhanced self-regulation and reflexive awareness. Others underscore risks of reductionism, informational asymmetries and stratification. The present findings align with this ambivalent landscape. They reveal patterned tensions rather than deterministic outcomes. The hypothesis that algorithmic governance intensifies visibility finds partial support; however, its normative implications depend on institutional design, interpretative practices and regulatory safeguards. Algorithmic mediation participates in identity production without unilaterally determining it.

Algorithmic Governance and Institutional Authority

A third thematic strand addresses the structural ambivalence embedded in AI integration. The comparative analysis reveals that discourses of expanded autonomy coexist with mechanisms of intensified control. Algorithmic systems introduce adaptive feedback, optimization strategies and potential pedagogical innovation, yet they simultaneously enlarge infrastructures of monitoring and performance comparison. This duality substantiates the hypothesis of a persistent structural tension between emancipatory aspirations and regulatory consolidation. Rather than validating a linear narrative of technological emancipation or technocratic domination, the evidence suggests that algorithmic mediation operates as a contested terrain shaped by governance arrangements and institutional mediation.

Importantly, the findings neither invalidate emancipatory perspectives nor endorse technological determinism. Instead, they indicate that autonomy is relational and institutionally conditioned. Conditions of participatory governance, ethical oversight and professional discretion appear central to determining whether AI tools enhance or delimit agency (UNESCO, 2023; Holmes et al., 2022). Where such safeguards are absent, intensified regulation may prevail. The ambivalence identified therefore operates at a structural level, reflecting the coexistence of divergent trajectories within the same technological assemblage.

Structural Tensions Between Autonomy and Control

From a theoretical standpoint, these insights extend critical educational theory by articulating disciplinary genealogy with contemporary algorithmic governance. The results suggest the need to reconceptualize discipline as digitally mediated rather than exclusively spatial or hierarchical. Concepts such as normalization and surveillance require recalibration to account for predictive analytics and probabilistic scoring. This theoretical refinement integrates classical analyses with contemporary technological conditions, expanding the analytical vocabulary available for examining institutional transformation.

Practical implications also emerge. For educational policy, the findings highlight the importance of transparent regulation and participatory institutional design in AI adoption (Baker; Smith; Anissa, 2019). Policymakers should consider not only efficiency gains but also how algorithmic systems redistribute authority and reshape professional discretion. Institutional arrangements that safeguard pedagogical judgment may mitigate excessive centralization, while reflexive evaluation mechanisms can prevent uncritical reliance on performance metrics. Future research may further examine how different policy configurations mediate the balance between autonomy and oversight, refining the analytical articulation between discipline and algorithmic governance within digitally mediated schooling.

CONCLUSION

This study set out to examine how algorithmic systems incorporated into Brazilian schooling interact with established disciplinary structures, guided by a central question concerning the relationship between control and autonomy. The final synthesis indicates that AI does not displace disciplinary rationality; rather, it reconfigures it through data-mediated mechanisms of visibility and evaluation. The general objective was therefore addressed by demonstrating patterned continuities alongside operational shifts. The proposed hypotheses find conditional support: algorithmic governance tends to intensify monitoring and comparability, while claims of expanded autonomy remain institutionally mediated. The central tension persists. Control becomes more abstract and predictive, whereas autonomy depends on regulatory design and professional agency. In this sense, the study underscores a structurally ambivalent configuration rather than a unidirectional transformation.

From a theoretical standpoint, the research offers a theoretical contribution by articulating critical analyses of discipline with contemporary debates on digital governance. By situating AI within the historical grammar of institutional regulation, the study refines conceptual tools for examining technologically mediated schooling. This articulation is particularly relevant to Brazilian education, where processes of digital expansion intersect with structural inequalities and policy experimentation. The analysis reinforces the critical relevance of interrogating how algorithmic infrastructures redistribute authority and redefine evaluative norms. In doing so, it expands the field's analytical vocabulary and highlights the broader relevance of examining AI not only as innovation but also as institutional transformation.

At the same time, the conclusions must be interpreted in light of several methodological and analytical limitations inherent to a structured integrative conceptual review. Because the study relies primarily on theoretical and secondary sources, its findings do not provide empirical validation of the proposed Algorithmic Discipline Recalibration Model (ADRM). The model should therefore be interpreted as a conceptual framework rather than as an empirically tested explanatory structure. Additionally, the interpretative synthesis employed in this study necessarily involves analytical selection and theoretical abstraction, which may privilege particular conceptual traditions while overlooking alternative perspectives. Another limitation concerns contextual variability across educational systems. Although the analysis is situated in the Brazilian educational context, algorithmic

governance may operate differently in institutional environments characterized by distinct regulatory frameworks, technological infrastructures, and policy traditions. Consequently, the conclusions offered here should be understood as analytically indicative rather than universally generalizable. A future research agenda may include qualitative and quantitative empirical studies examining how AI governance frameworks are implemented within Brazilian educational institutions. Case studies conducted in schools, universities, or educational administrative systems could provide insight into how algorithmic systems reshape professional practices, evaluation mechanisms, and institutional decision-making. Comparative research across different national educational systems may further illuminate how regulatory traditions, policy frameworks, and technological infrastructures influence the relationship between algorithmic governance and pedagogical autonomy. Additionally, qualitative investigations exploring educators' perceptions of algorithmic oversight could contribute to understanding how these systems are experienced in everyday pedagogical practice. Finally, mixed-method studies evaluating the institutional impacts of AI adoption would provide valuable empirical evidence capable of testing, refining, and expanding the analytical propositions advanced by the Algorithmic Discipline Recalibration Model (ADRM).

ARTIFICIAL INTELLIGENCE (AI)

The authors declare that artificial intelligence (AI) tools were used during the preparation of this manuscript exclusively to support textual analysis, language refinement, and the generation of suggestions for structural and argumentative improvements. These tools were employed as auxiliary instruments to enhance clarity and coherence, without replacing the authors' intellectual contribution, theoretical interpretation, or critical reasoning. All ideas, conceptual articulations, analytical arguments, and final decisions regarding the content remain the sole responsibility of the authors. The authors reaffirm their commitment to transparency, authorship responsibility, academic integrity, ethics, and compliance with the journal's editorial and ethical guidelines. All AI-assisted outputs were carefully reviewed, verified, and critically evaluated to ensure originality, accuracy, and proper citation of sources. No AI tool was listed as a co-author, and its use did not involve the unauthorized reproduction, paraphrasing, or summarization of copyrighted material.

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