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Reconstructing Educational Philosophy as a Metatheoretical Framework for AI-Driven Educational Science

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Abstract

The development of educational science in the contemporary era has been increasingly influenced by empirical research, technological innovation, data-driven decision-making, and artificial intelligence. While these advancements have enhanced the effectiveness of educational practices, they have also raised concerns regarding the diminishing role of philosophical reflection in determining the meaning, purpose, and values of education. This study aims to examine the position of educational philosophy within the structure of knowledge by analyzing its ontological, epistemological, and axiological foundations and exploring its relevance to contemporary educational science. Employing a qualitative library research approach, this study analyzes classical and contemporary philosophical literature related to educational theory, scientific inquiry, and the philosophy of education. The findings reveal that educational philosophy serves as the foundational framework of educational science by defining the nature of educational reality, guiding the construction and validation of educational knowledge, and providing ethical and normative orientations for educational practice. Furthermore, the study argues that the growing dominance of technocratic and data-driven approaches in education necessitates a reconstruction of the role of educational philosophy. Rather than functioning merely as a historical or introductory discipline, educational philosophy should be repositioned as a metatheoretical foundation that integrates ontological understanding, epistemological rigor, and axiological reflection. Such a reconstruction enables educational science to maintain its scientific credibility while preserving its commitment to human development, ethical responsibility, and social transformation. The study concludes that educational philosophy remains indispensable for ensuring that educational progress is directed not only toward technological advancement but also toward the cultivation of meaningful, humane, and value-oriented educational practices.

Keywords: Educational Philosophy; Educational Science; Ontology; Epistemology; Axiology; Structure of Knowledge.

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INTRODUCTION

The rapid integration of artificial intelligence (AI), learning analytics, adaptive educational systems, and data-driven decision-making has fundamentally reshaped contemporary educational science (Paiva et al., 2025). These technological developments have

expanded opportunities for personalized learning, predictive assessment, automated feedback, and evidence-informed educational policymaking, enabling educational institutions to improve instructional effectiveness and organizational efficiency (Ayeni et al., n.d.). At the same time, the increasing reliance on algorithmic systems, educational data mining, and learning analytics has accelerated the transformation of education into a highly measurable and data-intensive enterprise, in which educational quality is increasingly evaluated through performance indicators, predictive models, and standardized metrics (Ettlinger, 2024). While these innovations have strengthened the scientific and technological capacities of educational research, they have also intensified concerns regarding the growing dominance of technocratic rationality over philosophical reflection within educational discourse (Horvath et al., 2026).

This transformation reflects a broader process of educational datafication, in which complex educational phenomena are translated into quantifiable datasets that can be monitored, compared, and optimized through digital technologies (Szcyrek et al., 2024). Consequently, educational decision-making is increasingly legitimized by algorithmic predictions and measurable outcomes, whereas fundamental questions concerning the nature of human beings, the purposes of education, and the ethical justification of educational practice receive comparatively less attention (G. Biesta, 2020). Recent debates on digital humanism further argue that technological innovation should not merely improve educational efficiency but must also preserve human dignity, democratic participation, ethical responsibility, and the broader purposes of education in digitally mediated societies (Selwyn et al., 2023). These developments demonstrate that contemporary educational science faces not only technological challenges but also profound philosophical challenges concerning how educational knowledge should be conceptualized, evaluated, and directed in the age of AI.

The philosophical challenges generated by AI-driven educational science cannot be adequately addressed through technological innovation alone because education is fundamentally concerned with human beings, knowledge, and values rather than merely with technical efficiency. Long before education emerged as an autonomous scientific discipline, philosophy had already provided the conceptual foundations from which educational theories, methods, and purposes were derived. As (Russell, 2004) argued, philosophy is the intellectual origin of the sciences, while (Dewey, 1997) regarded philosophy as the general theory of education because it offers the critical framework through which educational aims and practices acquire meaning. From this perspective, educational science is not simply a collection of empirical methods or instructional techniques but a field of inquiry whose scientific legitimacy depends upon explicit assumptions about reality, knowledge, and human flourishing.

These assumptions are traditionally articulated through the interrelated philosophical dimensions of ontology, epistemology, and axiology. Ontology concerns the nature of educational reality and the human person; epistemology addresses the nature, sources, and justification of knowledge; and axiology examines the values and ethical purposes that orient educational aims and practices (Kneller, 1971; Ozmon & Craver, 2008). Together, these dimensions have historically enabled educational philosophy to shape curriculum, pedagogy, assessment, and educational policy. However, as contemporary educational research increasingly prioritizes

algorithmic optimization, predictive analytics, and evidence-based accountability, philosophical reflection is frequently relegated to a peripheral role (Gurr et al., 2025). Consequently, educational science risks becoming methodologically sophisticated yet philosophically impoverished, raising a fundamental question of whether its accelerating technological development remains aligned with the broader human purposes that education is intended to serve.

Recent scholarship has increasingly acknowledged that the rapid digital transformation of education requires renewed philosophical reflection. Studies on artificial intelligence in education have primarily focused on improving instructional personalization, predictive learning analytics, intelligent tutoring systems, automated assessment, and institutional decision-making (Ifenthaler et al., 2024). Parallel discussions have addressed emerging ethical concerns, including algorithmic bias, data privacy, transparency, and responsible AI governance in educational settings (Ovtšarenko, 2026). These studies have significantly advanced contemporary educational science by demonstrating both the transformative potential and the societal risks associated with AI-driven educational technologies.

At the same time, another body of literature has revisited the philosophical foundations of education by examining ontological questions concerning the nature of learners in digital environments, epistemological debates regarding the legitimacy of data-driven knowledge, or axiological discussions on educational values and social justice (MacKenzie et al., 2022). While these contributions have enriched philosophical discourse, they generally investigate ontology, epistemology, and axiology as separate analytical domains or relate them only to particular educational issues. Consequently, philosophical reflection remains fragmented across specialized debates, providing limited guidance for evaluating the increasingly interconnected technological, methodological, and normative challenges characterizing contemporary educational science.

This fragmentation reveals a significant conceptual gap. Existing studies rarely integrate the three philosophical dimensions into a coherent framework capable of critically evaluating AI-driven educational science as a unified intellectual enterprise. More importantly, educational philosophy is still predominantly positioned as a historical foundation, an introductory theoretical perspective, or a complementary discipline accompanying empirical research, rather than as an active framework for governing the conceptual assumptions, methodological choices, and ethical implications of educational inquiry (Siegel & Matthes, 2022). As a result, contemporary educational research often possesses sophisticated methodological capabilities while lacking an explicit philosophical architecture through which technological innovation, empirical evidence, and normative responsibility can be critically integrated.

Addressing this gap requires moving beyond traditional descriptions of educational philosophy toward its systematic reconstruction as an integrative metatheoretical framework. Such a reconstruction is expected not merely to reaffirm the relevance of ontology, epistemology, and axiology, but to reconnect these philosophical dimensions into a unified structure capable of guiding the development, evaluation, and governance of AI-driven educational science in ways

that remain scientifically rigorous, ethically responsible, and fundamentally human-centered.

METHOD

Research Design

This study employed an Integrative Literature Review (ILR) informed by Critical Philosophical Inquiry and Conceptual Analysis to reconstruct educational philosophy as an integrative metatheoretical framework for AI-driven educational science. This design was selected because the study aims to develop a conceptual framework rather than synthesize empirical evidence or evaluate the effectiveness of educational interventions.

The Integrative Literature Review provided a systematic approach for identifying, selecting, and synthesizing classical philosophical works alongside contemporary peer-reviewed literature relevant to educational philosophy, artificial intelligence, datafication, and digital transformation. This approach enables the integration of diverse theoretical perspectives into a coherent conceptual understanding and is widely recommended for theory-building research (Snyder, 2019; Torraco, 2005).

The review was further guided by Critical Philosophical Inquiry, which critically examined the underlying ontological, epistemological, and axiological assumptions embedded in contemporary educational science. To support this process, Conceptual Analysis was employed to clarify, compare, and synthesize key philosophical concepts across the selected literature. Through these complementary approaches, the study reconstructed educational philosophy as an integrative metatheoretical framework capable of critically evaluating AI-driven educational science, learning analytics, datafication, and other technology-mediated educational practices.

Literature Search Strategy and Eligibility Criteria

A systematic literature search was conducted between June and July 2026 using Google Scholar as the primary search platform, complemented by Crossref and the Directory of Open Access Journals (DOAJ) to verify bibliographic information and identify peer-reviewed publications. Multiple keyword combinations representing the main conceptual domains of the study were employed (Table 2). Retrieved records were subsequently screened according to predefined eligibility criteria concerning publication period, document type, language, research focus, and conceptual relevance. Contemporary studies published between 2021 and 2026 were prioritized, whereas seminal philosophical works were included regardless of publication year because they constitute the theoretical foundations of educational philosophy.

Table 1. Literature Search Strategy and Eligibility Criteria

Component	Description
Primary search platform	Google Scholar
Supporting sources	Crossref; Directory of Open Access Journals (DOAJ)
Search period	June–July 2026

Component	Description
Search strings	Multiple keyword combinations (see Table 2)
Publication period	2021–2026 (except seminal philosophical works)
Language	English
Document types	Peer-reviewed journal articles, review articles, and seminal philosophical works
Inclusion criteria	Studies addressing educational philosophy, AI-driven education, learning analytics, AI ethics, datafication, digital humanism, philosophy of technology, or algorithmic governance
Exclusion criteria	Duplicate records, conference papers, theses, dissertations, editorials, book reviews, inaccessible full texts, and conceptually irrelevant studies

Table 2. Representative Search Strings Used in the Literature Search

Search Domain	Representative Search String
Educational Philosophy and AI	("educational philosophy" OR "philosophy of education") AND ("artificial intelligence" OR AI OR "AI-driven education")
Learning Analytics and Datafication	("learning analytics" OR "data-driven education" OR datafication) AND education
AI Ethics in Education	("AI ethics" OR "ethical AI" OR "algorithmic bias") AND education
Philosophy of Technology	("philosophy of technology" OR technology) AND education
Digital Humanism and Postdigital Education	("digital humanism" OR postdigital OR "post-digital education") AND education
Algorithmic Governance	("algorithmic governance" OR "algorithmic assessment") AND education
Metatheoretical Framework	(metatheory OR metatheoretical OR "metatheoretical framework") AND education
Philosophical Dimensions	(ontology OR epistemology OR axiology) AND ("educational philosophy" OR education) AND ("artificial intelligence" OR AI)

Literature Screening Process (PRISMA-adapted)

Following the literature search, retrieved records were screened using a PRISMA-adapted procedure to ensure transparency and consistency in corpus selection. Duplicate records were removed before title and abstract screening, followed by full-text assessment against the predefined inclusion and exclusion criteria. The screening process focused on contemporary literature relevant to AI-driven education, educational philosophy, datafication, algorithmic governance, digital education, and related ethical and epistemological debates. The resulting analytical corpus comprised 35 sources organized into three classes: 11 foundational philosophical works, 23 contemporary analytical sources, and one strategic philosophical bridge, namely Winner's account of the political character of technological artifacts. The foundational works were retained as philosophical anchors, while the contemporary sources and strategic bridge were used to examine how emerging technological transformations generate ontological, epistemological, and axiological tensions requiring conceptual reconstruction.

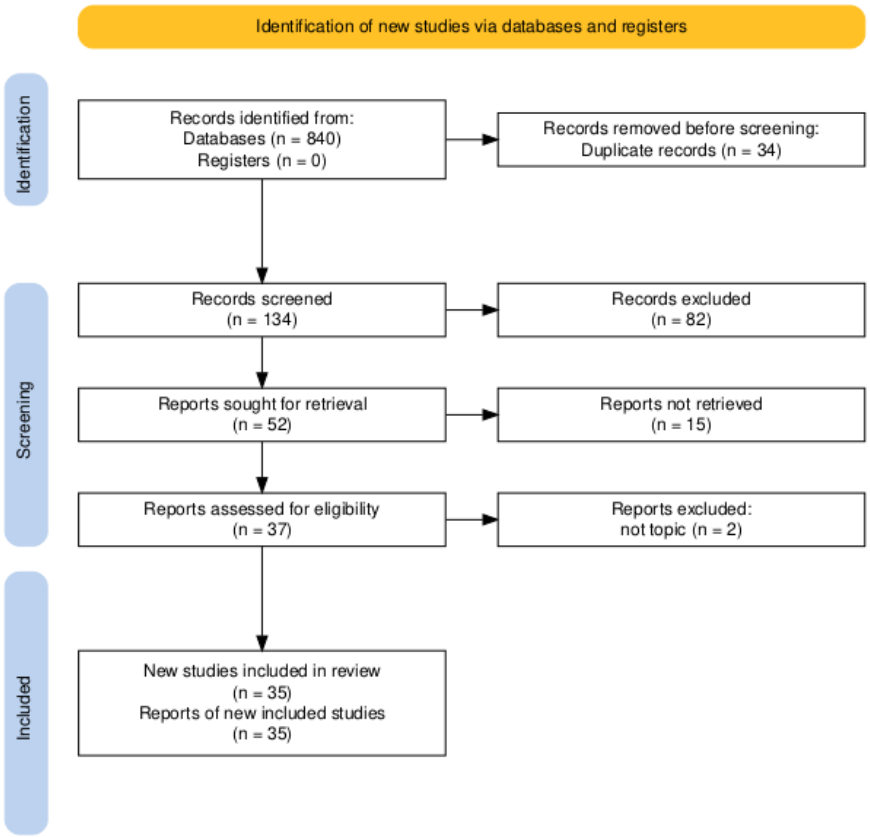


Figure 1. PRISMA-Adapted Literature Screening Process

Analytical Procedure

The analysis proceeded through six sequential stages. First, the selected sources were identified and organized according to their publication status, philosophical orientation, and relevance to AI-driven educational science. Second, the sources were categorized into foundational philosophical works and contemporary analytical literature addressing artificial intelligence, datafication, algorithmic governance, digital education, and related technological developments. Third, conceptual coding was conducted using ontology, epistemology, and axiology as the primary analytical lenses. Fourth, coded concepts were compared across sources to identify convergences, tensions, and fragmented treatments of philosophical dimensions. Fifth, cross-source synthesis was undertaken to examine relationships between philosophical assumptions and contemporary educational transformations. Finally, the synthesized findings were reconstructed into an integrative metatheoretical framework that positions educational philosophy as a critical filter for evaluating AI-driven educational science.

Trustworthiness and Reflexivity

Trustworthiness was strengthened through systematic documentation of the search, screening, coding, and synthesis procedures. Conceptual interpretations were repeatedly checked against the original arguments of the selected sources to minimize decontextualization and overinterpretation. Contradictory philosophical positions were retained during analysis and resolved through comparative interpretation rather

than forced consensus. Reflexivity was maintained by distinguishing foundational philosophical claims from the researchers' reconstruction and by explicitly documenting the analytical transition from individual concepts to the proposed metatheoretical framework. The framework was therefore treated as a reasoned synthesis rather than an objectively discovered structure.

RESULTS AND DISCUSSION

Corpus Profile and Conceptual Coding

The analytical corpus comprised 35 sources organized into three classes: 11 foundational philosophical works, 23 contemporary analytical sources, and one strategic philosophical bridge, namely Winner's account of the political character of technological artifacts. The foundational works provided philosophical anchors for examining reality, knowledge, values, human agency, and educational purposes, while the contemporary sources contextualized these questions within AI-driven education, datafication, algorithmic governance, digital pedagogy, and postdigital conditions. The corpus was analyzed through interpretive conceptual coding rather than frequency-based content analysis. Each source was examined against three analytical lenses ontology (O), epistemology (E), and axiology (A), and was additionally coded according to its relevance to AI, datafication, algorithmic governance, and digital or postdigital transformation. Coding focused on the substantive conceptual contribution of each source rather than the number of occurrences of particular terms. Sources could therefore contribute to multiple dimensions. Cross-source comparison was subsequently used to identify recurring philosophical tensions and fragmented treatments, which informed the reconstruction of an integrative metatheoretical framework for AI-driven educational science.

Table 3. Conceptual Coding Matrix of the Analytical Corpus

Code	Source	Class	O	E	A	Contemporary context	Principal conceptual contribution
F01	(Plato & Reeve, 1992)	Foundational	✓	✓	–	–	Reality and knowledge
F02	(Aristotle, 2009)	Foundational	✓	–	✓	–	Educational ends and flourishing
F03	(Locke, 1894)	Foundational	–	✓	–	–	Experience and evidence
F04	(Kant, 1998)	Foundational	–	✓	✓	–	Knowledge and moral autonomy
F05	(Dewey, 1997)	Foundational	✓	✓	✓	–	Inquiry, experience, and democracy
F06	(Peters, 2015)	Foundational	✓	✓	✓	–	Normative concept of education
F07	(Freire, 1970)a	Foundational	✓	✓	✓	–	Power, dialogue, and emancipation

Code	Source	Class	O	E	A	Contemporary context	Principal conceptual contribution
F08	(Russell, 2004)	Foundational	–	✓	–	–	Scientific reasoning
F09	(Habermas, 1971)	Foundational	–	✓	✓	–	Rationality and legitimacy
F10	(G. J. J. Biesta, 2015)	Foundational	✓	✓	✓	Measurement	Critique of measurement-driven education
F11	(An & Oliver, 2021)	Foundational	✓	–	✓	–	Human–technology–education relations
C01	(Baruwa, 2024)	Contemporary	✓	✓	✓	AI	Human judgment and AI
C02	(Marques-Cobeta, 2024)	Contemporary	✓	✓	✓	AI	Educational transformation
C03	(Tanchuk et al., 2026)	Contemporary	✓	✓	✓	AI	Philosophical foundations of AI
C04	(Аллах'ярова, 2022)	Contemporary	✓	✓	✓	AI/digital	Paradigm transformation
C05	(ΜΕΤΑΞΟΥΔΗΣ, 2025)	Contemporary	✓	✓	✓	AI	Philosophy and computation
C06	(Rudenko et al., 2025)	Contemporary	✓	✓	✓	Digital	Philosophical transformation
C07	(Wieczorek et al., 2025)	Contemporary	–	✓	✓	AI	AI ethics
C08	(Diao et al., 2026)	Contemporary	✓	✓	✓	AI	Human agency
C09	(Pangrazio et al., 2024)	Contemporary	✓	✓	✓	Datafication	Data justice
C10	(Khurana et al., 2026)	Contemporary	✓	✓	✓	AI	Human-centred learning
C11	(Zaky, 2026)	Contemporary	–	✓	✓	AI/data	Quality assurance
C12	(Fuente, 2025)	Contemporary	✓	✓	✓	Digital	Digital pedagogy
C13	(Wickramasinghe et al., 2026)	Contemporary	–	✓	✓	AI	Normative AI principles
C14	(Kotikalapudi & Gayatri, 2026)	Contemporary	✓	✓	✓	AI/data	Equity and ethics
C15	(Vučković et al., 2026)	Contemporary	✓	✓	✓	AI	Ethical–epistemic issues
C16	(Nguyen, 2025)	Contemporary	–	✓	✓	GenAI	Human–AI interaction

Code	Source	Class	O	E	A	Contemporary context	Principal conceptual contribution
C17	(Usher & Barak, 2024)	Strategic	–	✓	✓	AI	Ethics in online education
C18	(Katzenbach & Ulbricht, 2019)	Strategic	–	✓	✓	Algorithms	Algorithmic governance
C19	(Jarke & Breiter, 2019)	Strategic	–	✓	✓	Datafication	Data-driven transformation
C20	(Brey, 2010)	Strategic	✓	✓	✓	Technology	Human–technology relations
C21	(Jandrić et al., 2018)	Strategic	✓	✓	✓	Postdigital	Postdigital condition
C22	(Bayne & Jandrić, 2017)	Strategic	✓	✓	✓	Digital	Critical posthumanism
C23	(Floridi, 2023)	Strategic	✓	✓	✓	AI/LLMs	AI agency and human judgment
C24	(Winner, 1980)	Philosophical bridge	✓	–	✓	Technology	Technology as value-laden

Fragmentation of Contemporary Educational Discourse

The synthesis indicates that contemporary educational discourse addresses the philosophical consequences of technological transformation, but largely through separate debates. AI ethics emphasizes fairness, responsibility, and human oversight (Wieczorek et al., 2025; Usher & Barak, 2024), while datafication research examines how educational practices increasingly depend on quantification and data infrastructures (Jarke & Breiter, 2019; Pangrazio et al., 2024). Algorithmic governance further highlights how computational systems can influence educational decision-making (Katzenbach & Ulbricht, 2019), whereas postdigital scholarship questions changing relations between humans, technologies, and educational practices (Jandrić et al., 2018; Bayne & Jandrić, 2017). These strands demonstrate that philosophical concerns remain present but are distributed across technological, epistemic, ethical, and governance-oriented discussions.

The implication is not that contemporary scholarship lacks philosophical reflection, but that its philosophical dimensions remain insufficiently integrated. The literature tends to examine particular problems—ethical AI, data justice, algorithmic governance, or postdigital subjectivity—without establishing how assumptions about the human person, educational knowledge, and educational values are mutually related. Our synthesis therefore identifies fragmentation as a metatheoretical problem: contemporary debates provide important philosophical insights, but lack an integrative structure for connecting them. This finding provides the basis for reconstructing ontology, epistemology, and axiology as interconnected dimensions of a single metatheoretical framework for evaluating AI-driven educational science.

Ontological Reconstruction

The coding indicates a recurring ontological tension in AI-driven educational science: learners are increasingly represented through data, predictions, and

measurable behavioural patterns, while education fundamentally concerns persons with agency, relationships, and purposes. (An & Oliver, 2021), from a philosophy-of-technology perspective, emphasize the importance of examining educational technology through the changing relationships among humans, education, and technology rather than treating technology merely as a neutral instrument. Contemporary literature on AI, learning analytics, and postdigital education highlights changing relations between learners, teachers, algorithms, and educational environments (Baruwa, 2024; Bayne & Jandrić, 2017; Jandrić et al., 2018; Khurana et al., 2026). (Floridi, 2023) analysis further problematizes attributing human-like agency or intelligence to generative AI, while (Winner, 1980) emphasizes that technological artefacts embody social and normative arrangements. Read through classical perspectives from Dewey, Peters, and Freire, these developments suggest that technological mediation should not redefine the learner merely according to what can be computationally represented.

The reconstruction therefore positions the human learner as an autonomous, relational, and purposive subject rather than a data-generating object. AI systems may mediate learning, generate recommendations, and support prediction, but they should remain subordinate to human educational purposes and judgment. Ontology consequently functions as the first metatheoretical filter: before asking whether an AI system is accurate or efficient, educational researchers should ask what conception of the learner and human agency the system presupposes. This shifts evaluation from technological capability alone toward the preservation of human subjectivity, agency, and educational purpose.

Epistemological Reconstruction

The corpus indicates that AI-driven educational science is increasingly shaped by datafication, learning analytics, algorithmic assessment, and evidence-based decision-making. These developments expand the capacity to collect and process educational data, but they also risk narrowing educational knowledge to what can be measured and computationally represented. Jarke and Breiter's analysis of educational datafication, together with studies on algorithmic governance and AI-based assessment, illustrates how data increasingly mediates educational judgment (Jarke & Breiter, 2019; Katzenbach & Ulbricht, 2019). The foundational literature complicates this tendency. Locke emphasizes experience as a source of knowledge, Dewey positions inquiry as contextual and reflective, while Russell highlights the importance of rational justification. Biesta's critique of the "Age of Measurement" further demonstrates that measurable outcomes cannot exhaust the meaning of educational knowledge (G. Biesta, 2020; Dewey, 1997; Locke, 1894; Russell, 2004).

The synthesis therefore suggests that educational data should be treated as epistemic resources rather than self-sufficient educational truths. The reconstructed epistemological position follows a sequence of data to evidence to interpretation to educational judgment, rather than data to algorithm to truth. AI-generated outputs and predictive analytics may inform educational decisions, but their validity remains dependent on contextual interpretation, human judgment, and philosophical scrutiny. This provides a metatheoretical filter for evaluating whether data-driven educational research recognizes the limits of measurement and the plurality of ways through which educational knowledge is produced. Consequently, epistemological

reconstruction does not reject empirical evidence; it situates empirical evidence within a broader architecture of interpretive, rational, and normative inquiry.

Axiological Reconstruction

The axiological synthesis indicates that AI-driven educational science cannot be evaluated solely through accuracy, efficiency, personalization, or measurable learning outcomes. Across the corpus, ethical concerns increasingly involve autonomy, equity, privacy, accountability, bias, and the distribution of educational opportunities (Pangrazio et al., 2024; Wickramasinghe et al., 2026; Wieczorek et al., 2025). These concerns resonate with (Aristotle, 2009) conception of human flourishing, (Kant, 1998) account of moral autonomy, (Freire, 1970) emphasis on emancipation and justice, and (G. J. J. Biesta, 2015) critique of measurement-driven education. (Winner, 1980) argument that technological artifacts embody social and political arrangements further indicates that educational technologies are never purely neutral instruments. Accordingly, the axiological dimension must reconstruct educational evaluation around the question of what educational technologies ought to serve, rather than only what they can achieve.

This reconstruction positions values as an active evaluative criterion within AI-driven educational science. An AI system should therefore be considered educationally legitimate only when its efficiency and predictive performance remain compatible with autonomy, fairness, human responsibility, and human flourishing. This extends existing AI-ethics discussions by connecting ethical principles to the broader purposes of education. The resulting metatheoretical filter requires educational researchers and institutions to ask three questions alongside technical evaluation: Whose interests are served? What educational values are promoted or compromised? And does the technology enhance or constrain human flourishing? Thus, axiology functions not as an additional ethical layer after technological adoption, but as a criterion for determining whether technological innovation is educationally justified.

Integrative Metatheoretical Framework

The preceding analysis indicates that ontology, epistemology, and axiology should not be treated as isolated philosophical dimensions but as interconnected filters for evaluating AI-driven educational science. The reconstructed framework begins with contemporary transformations—AI integration, datafication, algorithmic governance, and postdigital educational environments—which generate tensions concerning human agency, knowledge production, and educational values. These tensions are examined through three interconnected dimensions: ontology, addressing the nature and agency of human participants; epistemology, addressing the status of data, evidence, interpretation, and algorithmic knowledge; and **axiology**, addressing justice, autonomy, responsibility, and human flourishing. Their integration produces a metatheoretical framework through which AI systems, learning analytics, algorithmic assessment, and data-driven educational policies can be philosophically evaluated (Figure 2).

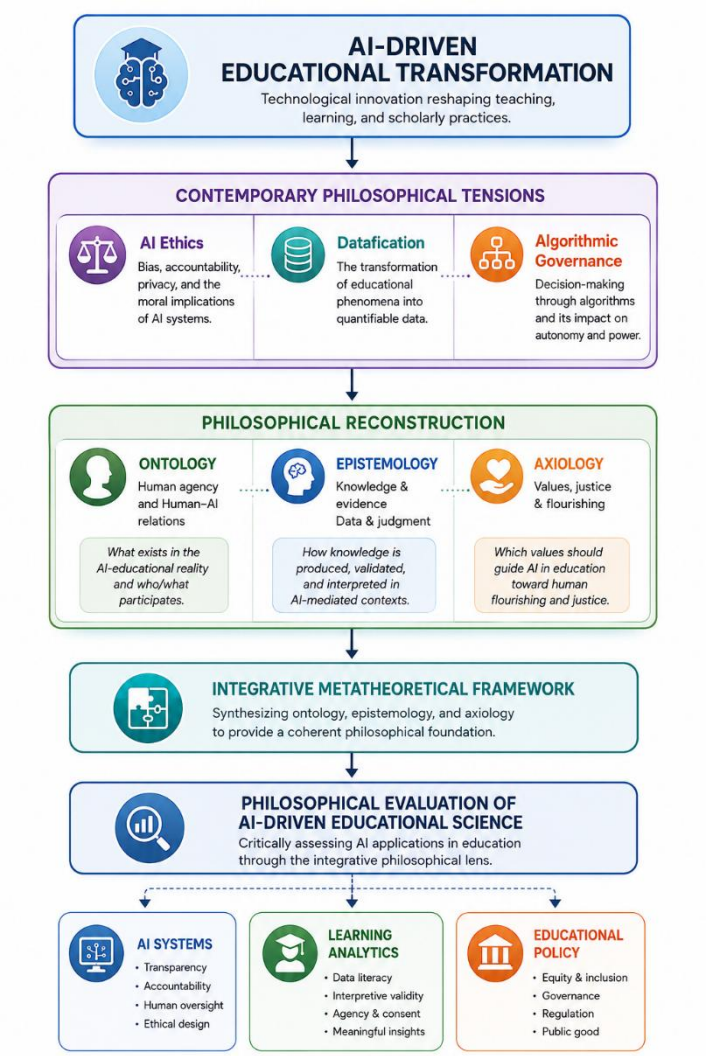


Figure 2. Reconstructed Metatheoretical Framework for AI-Driven Educational Science

Implications

The reconstructed framework has three practical implications. First, it provides a philosophical basis for evaluating AI systems beyond accuracy and efficiency by considering human agency, epistemic validity, and ethical consequences. Second, it can inform curriculum and teacher education by strengthening critical engagement with AI, data, and algorithmic systems. Third, it offers educational researchers and policymakers a metatheoretical lens for assessing technological innovation in relation to justice, autonomy, responsibility, and human flourishing.

CONCLUSION

This study finds that educational philosophy can no longer be positioned merely as a foundational or reflective discipline within educational science. The conceptual reconstruction demonstrates that ontology, epistemology, and axiology can be integrated into a metatheoretical framework that critically examines the assumptions, knowledge claims, and value commitments underlying AI-driven educational science. The resulting framework positions educational philosophy as an

integrative metatheoretical filter operating prior to the adoption of particular technologies, methods, or educational policies.

The findings further show that the three philosophical dimensions perform complementary functions. The ontological dimension protects the conception of learners and educators as human subjects whose educational experiences cannot be adequately represented through data alone. The epistemological dimension establishes that algorithmic outputs, learning analytics, and measurable indicators constitute sources of educational evidence but cannot independently determine the meaning or validity of educational knowledge. The axiological dimension establishes normative criteria through which technological effectiveness must be assessed alongside human dignity, justice, responsibility, equity, and educational purpose. Taken together, these dimensions provide a coherent philosophical mechanism for connecting technological innovation with the broader purposes of education.

The principal contribution of the study is therefore not the reaffirmation of ontology, epistemology, and axiology as traditional branches of educational philosophy, but their reconstruction into an integrated metatheoretical filter for contemporary educational science. This framework provides a conceptual basis for evaluating AI-based educational technologies, data-driven pedagogies, curriculum decisions, educational research, and policy without reducing educational quality to technical efficiency or measurable performance alone.

The study is limited by its conceptual nature and reliance on selected philosophical and contemporary literature; the proposed framework has not yet been empirically validated across specific AI systems, institutions, or educational contexts. Its categories also require further operationalization before they can function as an empirical evaluation instrument. These limitations do not diminish the conceptual contribution but indicate the need for subsequent empirical examination of the framework's applicability.

RECOMMENDATION

Future research should operationalize the proposed framework into measurable or systematically applicable criteria for evaluating AI-driven educational technologies, particularly generative AI, learning analytics, and algorithmic assessment. Empirical and comparative studies across different educational institutions and sociocultural contexts are also recommended to examine how the ontological, epistemological, and axiological principles function in practice and whether they can effectively identify tensions between technological efficiency and human-centered educational purpose

Author Contributions

First Author: Conceptualization, methodology, literature collection, conceptual analysis, original draft writing, visualization, and manuscript editing. Second Author: Concept validation, academic supervision, literature review, theoretical framework development, substantive manuscript revision, and critical review. Third Author: Academic supervision, literature review, critical evaluation of the analysis, substantive manuscript revision, and final manuscript review.

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Conflict of interests
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