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Artificial Intelligence and the Didactic Transposition of Knowledge: Implications for Curriculum Development and Knowledge Gatekeeping

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Abstract: This article explores how artificial intelligence (AI) is reshaping the transformation of scientific knowledge into school knowledge, a process traditionally conceptualized through the lens of didactic transposition theory. Drawing from curriculum theory, philosophy and sociology of education, and educational technology, the study examines two key dimensions: the use of AI in curriculum development and textbook authorship, and the role of algorithmic systems in selecting and structuring pedagogically relevant content. A conceptual model, "ReKnow-AI", is proposed to illustrate how AI can be integrated into all stages of knowledge mediation, from scientific production to classroom practice. The study employs a theoretical and conceptual methodology, grounded in interdisciplinary content analysis. It proceeds through a systematic literature review and comparative synthesis of over 60 international sources published between 2020 and 2025, covering educational research, digital pedagogy, and AI-driven instructional design. No empirical data or statistical tools were employed; instead, conceptual modelling was used to identify epistemic shifts in curriculum-making under AI mediation. Findings highlight pedagogical opportunities such as content personalization, dynamic updating, and real-time instructional support. However, they also underline risks associated with algorithmic bias, lack of transparency, and diminished teaching agency. The proposed "ReKnow-AI" model identifies the critical junctures where AI systems influence educational content and advocates for ethical, human-centered oversight. This research contributes a novel perspective by framing AI not merely as a technological aid but as an epistemic actor in curriculum construction. Its practical

significance lies in informing curriculum designers, policymakers, and teacher educators about the structural and normative implications of AI-based content mediation in contemporary education.

Keywords: artificial intelligence (AI), didactic transposition, curriculum development, 'ReKnow-AI' model

Introduction

The rapid advancements in artificial intelligence (AI) are bringing about profound transformations across various domains, including education. The process by which academic or scientific knowledge is transformed into knowledge suitable for school use—namely, into teachable curricula and instructional content—constitutes a critical area of inquiry within Didactics. Traditionally, the selection and transformation of the knowledge taught in schools have been undertaken by human agents (such as universities, curriculum committees, textbook authors, and educators), operating within specific sociocultural contexts and influences (Mligo, 2025; Priestley et al., 2021; Vlasov et al., 2022; Yang et al., 2022). However, the emergence of AI introduces new variables into this process. Increasingly, algorithmic systems are capable of processing vast amounts of scientific data, supporting, and in some cases even automating, aspects of curriculum development and content design (Kasztelnik, 2024). Simultaneously, AI systems—including search engines, content recommendation tools, and more recently, large language models—are functioning as gateways to knowledge, shaping the flow of information that ultimately reaches teachers and learners (Abedi et al., 2022; Alqahtani et al., 2023; Kasneci et al., 2023).

This issue is gaining increasing global attention, as education systems worldwide struggle to integrate AI into their curriculum processes. International organizations such as the OECD and UNESCO have issued frameworks and policy guidelines on the responsible use of AI in education, emphasizing the need for ethical standards, transparency, and teacher empowerment. At the national level, countries such as Finland, Singapore, and China have initiated AI-based curriculum reforms or launched pilot projects that integrate algorithmic systems into educational content delivery. Simultaneously, the European Union's Digital Education Action Plan (2021–2027) highlights the transformation of teaching and learning through data-driven technologies, explicitly referencing AI in curriculum innovation. These developments signal that the impact of AI on knowledge transformation is not merely a theoretical question but an urgent and transnational educational challenge.

The central research question that arises is: How do AI technologies and algorithms influence the transformation of scientific knowledge into school knowledge? This study aims to address this question by investigating two key dimensions. First, it examines the use of AI in structuring curricula and developing school textbooks, where AI can offer opportunities for content personalization and automation (Hashim et al., 2022). Second, it explores the role of AI algorithms as filters or mediators that select and hierarchize scientific information for educational integration, with significant implications for what is considered valid and teachable knowledge (Karan & Angadi, 2023; Ouyang et al., 2022).

The significance of this study lies in its timely contribution to ongoing efforts within the educational community to understand and harness AI, while simultaneously safeguarding the pedagogical integrity and societal role of education (Vázquez-Cano, 2021). The paper is structured as follows: It begins with a theoretical framework that incorporates concepts from the didactic transposition of knowledge, sociological and philosophical perspectives on curriculum, and the integration of emerging technologies into educational contexts. This is followed by two main analytical

sections, each addressing one of the dimensions, based on recent empirical findings. Subsequently, a conceptual model is proposed, illustrating how AI can be integrated into the process of converting knowledge from scientific production to classroom instruction. The paper concludes with a summary of key findings and a set of proposals for future research and practice.

The novelty of this study lies in its development of the ReKnow-AI model, a conceptual framework that integrates AI technologies across all stages of the didactic transposition process, external and internal. While earlier literature has addressed the use of AI in isolated educational functions (e.g., personalized learning, automated assessment), few studies have examined the systemic role of AI in shaping the entire knowledge flow from scientific production to classroom implementation. This paper fills that gap by bringing together theoretical perspectives from curriculum theory, didactics, and AI ethics into a unified analytical model, offering both explanatory power and a practical roadmap for educational policy and teacher development.

Research Problem

The emergence of AI in educational contexts has accelerated dramatically in recent years; yet, its role in transforming scientific knowledge into pedagogically meaningful school knowledge remains under-examined. Analyzing this issue now is imperative, as AI tools are already being implemented in curriculum design, textbook creation, and instructional planning. Understanding their impact ensures that the epistemic integrity of education is preserved. This study addresses a gap in the literature by integrating theories of didactic transposition with current developments in educational technology. The findings aim to support both theoretical discourse and practical implementation, offering insights that benefit curriculum theorists, educators, and policymakers. The novelty of this research lies in its proposal of a conceptual model (ReKnow-AI) that redefines the human–AI collaboration in curriculum processes, while also contributing to broader debates around knowledge selection, legitimacy, and equity.

Research Focus

This study focuses on the intersection of curriculum theory, didactic transposition, and artificial intelligence. It offers a critical perspective on how AI influences both the external and internal processes of transforming scientific knowledge into school knowledge. The authors adopt a reflective stance, not merely advocating AI integration, but evaluating its epistemological and pedagogical implications. The focus is on proposing a normative, ethically sound, and pedagogically guided framework for AI-mediated curriculum design.

Research Aim and Questions

This research aims to conceptualize the integration of artificial intelligence into the process of didactic transposition and curriculum development in a way that maintains pedagogical integrity, epistemic justice, and teacher agency.

The following research questions guide the study:

- How does AI intervene in the selection, structuring, and validation of scientific knowledge for educational purposes?
- What are the opportunities and challenges of AI-assisted curriculum development and textbook design?
- How can algorithmic systems be embedded into curriculum processes without compromising educational equity and professional judgment?

- What conceptual framework can support responsible human–AI collaboration in transforming knowledge from scientific production to classroom practice?

Research Hypotheses

Based on the existing literature and theoretical orientation of this study, three guiding hypotheses are proposed:

- **H1:** The integration of AI into curriculum design processes is not a neutral enhancement but actively reshapes the epistemic structures and pedagogical priorities of school knowledge.
- **H2:** AI systems increasingly assume roles traditionally reserved for human agents—such as content selection and sequencing—thereby altering the dynamics of didactic transposition.
- **H3:** Without critical frameworks, the application of AI risks reinforcing epistemic biases and diminishing teacher agency in curriculum decisions.

Materials and Methods

This study employs a theoretical and conceptual methodology grounded in interdisciplinary content analysis. The research proceeded through the following stages: (1) critical review of literature on didactic transposition theory, curriculum studies, and AI in education; (2) analysis of empirical studies on AI applications in curriculum design, textbook development, and knowledge filtering; (3) synthesis of findings into a conceptual model ("ReKnow-AI").

Sources were selected based on relevance, recency (2020–2025), peer-reviewed status, and representation of multiple disciplines (education, technology, philosophy). The method of analysis included comparative conceptual analysis and theory synthesis, aiming to bridge traditional educational theory with emerging AI applications. The study is limited to theoretical and conceptual analysis, as no statistical processing or datasets were employed. A detailed account of the study's limitations and justification of its design is provided in the section "Limitations and Justification of Research Design".

Sample and Participants

This study is theoretical and does not involve human participants or the collection of empirical data. Instead, the analysis is based on a purposive selection of academic literature published between 2020 and 2025. Sources were chosen based on the following criteria: (a) relevance to the intersection of artificial intelligence and education, (b) focus on curriculum development, didactic theory, or educational technology, and (c) publication in peer-reviewed journals or academic conferences. Particular emphasis was placed on works that addressed both opportunities and risks of AI integration in pedagogical contexts. A total of over 60 academic sources were reviewed, representing interdisciplinary perspectives from educational research, philosophy, and computer science.

Instrument and Procedure

The research followed a multi-step theoretical inquiry process. First, relevant literature was identified through academic databases such as Scopus, ERIC, and Google Scholar, using keywords including "artificial intelligence in education", "didactic transposition", "curriculum development", and "algorithmic bias in learning systems". The sources were then categorized according to thematic focus (e.g., AI-assisted curriculum design, algorithmic gatekeeping, human–AI collaboration). The conceptual model (ReKnow-AI) was iteratively developed by synthesizing findings from these categories, emphasizing the continuity between knowledge transformation stages and AI-supported interventions.

Data Analysis

The study employed qualitative theoretical analysis grounded in content analysis and comparative conceptual synthesis. First, selected studies were examined to identify key constructs, definitions, and models regarding the role of AI in education. Content analysis was employed to identify recurring themes related to curriculum transformation and AI mediation. Comparative analysis was then applied to align these insights with the stages of didactic transposition theory. Based on this process, a four-stage conceptual framework was developed, integrating AI as a supportive actor across educational phases. The model was refined to ensure internal coherence, pedagogical relevance, and responsiveness to ethical and epistemological concerns.

Limitations and justification of research design

As a theoretical and conceptual study, this paper does not include quantitative data or statistical analysis. Its primary aim is to develop a conceptual framework (ReKnow-AI) by synthesizing insights from an interdisciplinary body of literature. Consequently, no numerical datasets or empirical instruments were employed, and no tables or graphic materials were generated. While the absence of quantitative evidence may limit generalizability, the theoretical model is substantiated through rigorous content and comparative analysis of over 60 international sources. The study's contribution lies in the integration of didactic transposition theory with emerging AI applications, offering a novel perspective for future empirical validation and curriculum design. The ReKnow-AI model itself functions as an analytical tool that may be graphically represented in future studies to guide teacher education, policy-making, and technological development in education.

A Multidisciplinary Theoretical Framework for the Transformation of Scientific Knowledge into School Knowledge

The transformation of scientific knowledge into teachable knowledge within the school context can be understood through the lens of didactic transposition theory. This theoretical approach identifies distinct levels of knowledge: (1) scholarly/scientific knowledge as produced by the academic community, (2) knowledge designated for teaching as defined by official curricula, (3) the knowledge taught in classrooms by educators, and (4) the knowledge ultimately acquired by students (Atalar & Ergun, 2018; Strømskag & Chevallard, 2024; Suryadi & Priatna, 2020). Throughout the progression from the first to the final level, knowledge undergoes significant transformations and adaptations. More specifically, external didactic transposition refers to the changes made to convert scientific knowledge into knowledge for teaching purposes (e.g., the selection and simplification of concepts within curriculum frameworks). In contrast, internal didactic transposition concerns the modifications that occur as educators adapt the official curriculum to their specific classroom practices (Do, 2020). This theoretical model underscores a fundamental principle: knowledge is not transmitted unchanged from the laboratory to the classroom. Rather, it is filtered, reformulated, and situated within new learning contexts.

From the perspective of Philosophy and Sociology of Education, the selection of knowledge for instruction is not a neutral or purely technical process; rather, it inherently reflects values and power dynamics. As Apple (2004) argues, curricula are the outcomes of political negotiation, embodying social and ideological priorities. In other words, the selection of educational content is intrinsically political. Certain forms of knowledge are prioritized, while others are marginalized, depending on which social groups possess the influence to shape the content of education (Wu, 2024). Furthermore, various institutional actors—such as universities, professionals, and state authorities—participate in what may be seen as a "politics of truth", determining which forms of knowledge are deemed legitimate and worthy of inclusion (Horsthemke, 2022; Talbot, 2023). These perspectives emphasize the importance

of transparency, plurality, and critical reflection in the processes through which curricular knowledge is defined. The introduction of AI into the selection and organization of curricular content raises a fundamental question: According to which values and criteria will algorithms choose knowledge? An algorithmic process that is biased or opaque may inadvertently reinforce existing inequalities or epistemic exclusions. Conversely, well-designed AI systems can incorporate multicultural perspectives and promote critical thinking and epistemic justice (Gorski & Dalton, 2020).

From the standpoint of Educational Technology, the integration of any new technological tool—AI included—must be considered about both the pedagogical goals and the subject matter. Frameworks such as TPACK (Technological Pedagogical Content Knowledge) stress the need for teachers to possess integrated knowledge that combines technological expertise, pedagogical insight, and disciplinary understanding to effectively utilize tools like AI (Dewi et al., 2021; Kasztelnik, 2024). While AI offers novel possibilities—such as personalized learning pathways and automated assessment—its pedagogical value emerges only when it is embedded within a well-structured instructional design. Contemporary theoretical models, including smart learning environments and learning analytics, treat AI as part of an interconnected system that collects, analyzes, and applies learning data to improve instructional strategies (Cukurova et al., 2020; Ullah et al., 2021). Educational technology reminds us that AI integration should empower rather than replace the human dimension of teaching and must occur within professional development frameworks that address not only technical but also ethical considerations surrounding the use of AI in education (Aljemely, 2024; Borenstein & Howard, 2021; Kasztelnik, 2024).

In summary, this theoretical framework brings together three interconnected dimensions:

- Didactic theory of knowledge transposition, which offers a conceptual model of the flow of knowledge from science to school.
- Philosophical and sociological perspectives, which stress that this flow is selective, value-laden, and politically situated; and
- Educational technology, which provides the tools (e.g., algorithms and data systems) but also requires a comprehensive pedagogical and ethical infrastructure for meaningful application.

The analysis of the two core dimensions of this study will be situated within this interdisciplinary framework.

AI-Supported Curriculum Development: From Content Personalization to Compilation of Dynamic Textbooks

The first dimension concerns the application of artificial intelligence in curriculum design and the development of educational materials, particularly school textbooks. This stage corresponds to the external phase of knowledge transformation, during which decisions are made about what will be taught and in what form it will be presented. At this level, AI technologies promise significant innovations across three core areas: the personalization and adaptability of instructional content, the automation and structuring of content development, and the updating of scientific information to ensure alignment with current knowledge.

Personalization and Adaptability of the Curriculum: One of the most frequently highlighted benefits of artificial intelligence in education is its potential to enable personalized learning. By applying machine learning techniques and big data analytics, AI can contribute to the design of curricula that adapt to the needs of diverse student populations (Song et al., 2024). Research has already demonstrated that modern intelligent educational systems are capable of dynamically adjusting content

in response to learners' progress and preferences, thereby promoting more individualized learning experiences (Akyuz, 2020; Kaswan et al., 2024; Phillips et al., 2020; Rizvi, 2023). For instance, machine learning algorithms have been utilized to create adaptive learning environments that analyze student interactions and performance data to dynamically modify content in real-time (Essa et al., 2023). In this way, curriculum content is no longer static. Still, it can be continuously restructured based on emerging insights from the learning process, such as the identification of learners' needs and the immediate adjustment of instructional content to address them. Within the framework of curriculum design, this may signify a shift away from one-size-fits-all approaches toward flexible, differentiated learning pathways aligned with shared learning goals, effectively constituting a dynamic curriculum. A relevant example involves AI-driven systems that recommend alternative learning trajectories and resources to educators, based on analyses of both the curriculum content and student data (Tapalova & Zhiyenbayeva, 2022).

Automation and Support in Content Creation: Beyond curriculum adaptation, artificial intelligence can serve as a powerful tool for instructional designers and curriculum developers. Recent advancements in natural language processing (NLP) and generative AI have enabled the (semi-)automated production of educational content on an unprecedented scale (Manju, 2024). One prominent application is the AI-assisted authoring of school textbooks and other instructional materials. Traditionally, textbooks are written by subject matter experts who reinterpret scientific knowledge into age-appropriate and pedagogically sound formats. However, the first steps toward AI-supported textbook generation have already been taken. According to recent reviews, the latest generation of 'intelligent textbooks' explores the use of generative AI systems not only to enhance interactivity but also to autonomously produce educational content (Sosnovsky et al., 2025). These systems can generate explanatory texts, define concepts, and compose instructional materials from scratch, drawing on extensive knowledge databases.

At the same time, more pragmatic yet impactful applications are already in use. AI tools now enable the automated generation of exercises and assessment questions derived from existing textbooks, facilitating the large-scale production of high-quality practice materials (Van Campenhout et al., 2024). In such cases, a digital textbook can be accompanied by a virtually limitless number of personalized exercises, tailored to different student profiles. Moreover, text mining and knowledge extraction techniques enable the automatic creation of study aids such as summaries, concept maps, and other pedagogical resources that support learner comprehension (Sosnovsky et al., 2025).

Together, these developments signify a paradigm shift: educators and content authors can increasingly rely on AI as a supportive partner in content design, automating time-intensive tasks—such as drafting explanatory text or retrieving scientific data—while redirecting their focus toward pedagogical planning, narrative construction, and quality assurance. Indeed, studies have highlighted that AI can streamline curriculum development, affording teachers more time to engage in meaningful instructional design rather than administrative duties (Hashem et al., 2024).

Updating and Expanding Curriculum Content: A third advantage offered by artificial intelligence is its capacity to accelerate and expand the updating of curricular content. Scientific knowledge evolves rapidly, with new findings, theories, and technologies emerging at an unprecedented pace. Traditionally, there has been a significant time lag between the generation of new knowledge and its integration into school curricula, often spanning several decades. AI has the potential to narrow this gap. Data-driven and search algorithms can scan vast volumes of scientific literature to identify emerging topics and developments relevant to education (Ejjami, 2024). For instance, an AI system could analyze thousands of publications and references to recommend specific concepts or content updates to curriculum development committees. Such approaches are already being applied in higher education, where

learning analytics tools are used to detect content gaps and identify outdated segments within syllabi (Kasztelnik, 2024). An AI-enhanced curriculum could therefore remain dynamically aligned with contemporary scientific advancements, incorporating up-to-date examples and real-world applications, thereby making learning more responsive to societal and technological change. Moreover, AI also enables cultural contextualization and personalization of content. It enables the adaptation of instructional materials to incorporate diverse cultural perspectives and examples relevant to learners' backgrounds. For example, a lesson in the history of science could be enriched—with the support of AI—by incorporating the contributions of scientists from underrepresented regions or communities that are often omitted from standard narratives. Such uses resonate with ongoing calls for culturally responsive curricula, especially within frameworks that integrate AI with equity and inclusion goals (Wu, 2024).

Challenges and Quality Parameters: Despite the opportunities, integrating artificial intelligence into curriculum development and textbook authoring presents significant challenges. A central concern is ensuring the quality and accuracy of AI-generated content. Particularly in the case of generative AI systems, such as large language models, there is a risk of producing text that contains inaccuracies or fabricated information—a phenomenon known as hallucination—especially when such systems are not subject to adequate human oversight (Elsayed, 2024). Consequently, human validation of AI-generated curricula and instructional texts remains essential to ensure that the material is scientifically sound, pedagogically appropriate, and aligned with the core values of education.

Additionally, issues related to intellectual property and ethics arise. Since AI models are trained on vast corpora of text—many of which are protected under copyright—there is a risk that automatically generated content may reproduce excerpts without proper attribution (Zahariev, 2024). It is therefore imperative to establish clear guidelines for the ethical use of AI in educational content creation, to prevent copyright infringement and ensure originality and academic integrity.

Another key concern involves algorithmic bias. Suppose the training data or the criteria used by AI systems to select content are biased, whether due to structural limitations or dominant perspectives—such bias may become embedded in the curriculum. This could result in overrepresentation of certain geographic, cultural, or disciplinary perspectives, while marginalizing others. As Holmes et al. (2019) emphasize, the integration of AI into education must be guided by a commitment to equity and inclusion, so that technology does not amplify existing digital divides. This necessitates the transparent and accountable design of content-generation algorithms, with clear mechanisms for auditing the decisions AI systems make regarding which knowledge to include or omit.

More broadly, there is a growing need to develop normative frameworks and ethical standards for the use of AI in curriculum design and educational planning (Memarian & Doleck, 2023). Lastly, a practical challenge concerns the role of teachers. Educators will increasingly be expected to work with and rely on materials that have been (at least partially) generated by machines. Ensuring adequate professional development is therefore critical: teachers must be supported in understanding both the capabilities and limitations of AI tools, so that they can confidently and responsibly incorporate AI-generated content into their instruction (Fissore et al., 2024).

In conclusion, the use of artificial intelligence in curriculum design and textbook development appears to offer a dual promise: on the one hand, the potential for more flexible, adaptive, and up-to-date educational content, tailored to the needs of 21st-century learners; on the other hand, a growing need to redefine the role of educators as curators and quality gatekeepers of knowledge produced with AI assistance. While artificial intelligence can undoubtedly provide powerful tools, the ultimate responsibility for deciding what is taught and how it is taught must remain in human hands—those of

educators, scientists, and pedagogical experts who can employ such tools with critical awareness, ethical consideration, and professional judgment.

Algorithmic Gatekeeping of Knowledge: The Role of AI in Information Filtering and Curriculum Structuring

The second dimension focuses on the role of AI-based algorithmic systems as "gateways" that regulate which scientific information enters the school environment and how it is prioritized. In the contemporary digital age, the flow of knowledge from science to society—and by extension, to education—is increasingly mediated by digital platforms and algorithms: search engines, academic databases that recommend relevant articles, news aggregation filters, and even intelligent personal assistants or chatbots that provide instant answers to user queries (Bezzera & Alemida, 2020; Gonçalves & Oliveira, 2021). All these systems, underpinned by AI technologies, perform functions of selection and classification concerning the vast corpus of available knowledge. The central question, therefore, is how this algorithmically mediated process influences the transformation of scientific knowledge into curricular content. As AI systems increasingly determine what information is retrieved, recommended, and foregrounded, they may shape not only access to knowledge but also its epistemological and pedagogical framing within educational contexts. In this emerging landscape, the transmission of scientific knowledge to the classroom is no longer mediated solely by human agents, such as curriculum designers or textbook authors, but increasingly by algorithmic architectures embedded in digital platforms. These systems operate as powerful filters that influence what is seen, what is prioritized, and what is omitted. Understanding their educational implications requires a critical examination of the mechanisms through which AI algorithms select, rank, and validate knowledge—and of the potential pedagogical, sociocultural, and ethical consequences that arise from their use.

Algorithmic Knowledge Selection and Information Gatekeeping: As previously discussed, the selection of scientific knowledge for educational purposes has traditionally been the responsibility of expert committees and curriculum authors. Today, however, even before reaching the formal curriculum design phase, knowledge is often filtered through digital search and dissemination platforms (Lu, 2022; Van Erkel & Van Aelst, 2021). The use of online sources and internet-based tools is now a common practice among textbook writers and educators seeking information to support the teaching of unfamiliar topics. Yet the ranking algorithms employed by search engines (AI-driven systems that consider variables such as popularity, keyword relevance, and user search history) significantly shape the order in which information is presented.

As a result, the hierarchical structuring of search results directly influences perceptions of what is considered important or valid knowledge. If an algorithm systematically prioritizes certain types of sources— such as those from specific countries, languages, or those with higher levels of online visibility—these sources will exert a disproportionate influence on instructional content. From a sociological perspective, it could be argued that algorithms have become new agents of pedagogical recontextualization, playing an active role in the transformation and reframing of knowledge, a function previously associated with identifiable institutional actors, such as ministries of education or academic bodies (Dowling, 2020).

What distinguishes this new context, however, is the opacity of algorithmic decision-making. Whereas traditional knowledge gatekeepers were visible and accountable, many of the current algorithmic agents are non-transparent and proprietary. This shift gives rise to growing demands for greater transparency in the functioning of algorithms that influence educational content (Chaudhry et al., 2022; Kasztelnik, 2024). Teachers and educational institutions must be able to understand the criteria by which algorithms select and prioritize information, to critically assess and, if necessary,

intervene in these automated choices. Ensuring such transparency is essential not only for maintaining trust in educational technologies but also for safeguarding the integrity of knowledge that reaches the classroom.

Prioritization and Classification of Scientific Information: Beyond the issue of which information is accessed, a crucial question arises regarding the order and emphasis with which that information is presented. Ranking algorithms effectively assign a degree of relevance or importance to each informational item. This process can influence curricular content on both a macro level (e.g., determining which chapters are considered central within a subject domain) and a micro level (Usta et al., 2021). For example, in the context of intelligent digital textbooks, AI-driven recommendation engines may suggest supplementary online resources related to the content students are studying. However, the selection of these external sources is governed by an algorithm that evaluates their relevance and reliability. Therefore, the quality and validity of recommended materials directly depend on the effectiveness and neutrality of the algorithm employed.

Research in the field of smart textbooks has raised a central pedagogical question: What mechanisms can be employed to effectively identify and retrieve pedagogically relevant content from the web for enhancing instructional materials? (Sosnovsky et al., 2025). A well-designed algorithm may indeed locate valuable resources that enhance student understanding. However, there is always a risk that algorithmic assessments of relevance do not align with pedagogical value. Ranking mechanisms may favor literal keyword matches or popular content over what is most educationally appropriate. This underscores the critical role of the human-in-the-loop: ideally, a teacher or instructional designer should be able to review, approve, or override the algorithm's recommendations, exercising pedagogical judgment (Chen, 2022).

In more advanced intelligent systems, such as adaptive learning platforms, algorithms classify and prioritize content on an individual learner basis (Sayed et al., 2020). Based on a student's profile and performance data, these systems decide which content to present next. For instance, a system may determine that a student has not yet mastered a prerequisite concept and may redirect them to revisit that material before proceeding. Such platforms integrate student modeling with curricular structure modeling, allowing for real-time instructional adjustments. Using learner interaction data (log data), these systems can detect which content areas are most challenging or identify navigation sequences that lead to better comprehension (Kim et al., 2020).

In this sense, the algorithm functions as a micro-level curriculum designer, deciding, for example, that Student X should revisit Subsection A before progressing to B. This internal algorithmic restructuring transforms the nature of the curriculum: it is no longer strictly linear or pre-defined but dynamically differentiated based on learner needs. The benefit of such a system lies in its ability to optimize learning, delivering the right content at the right time to each student (Lata, 2024). The downside, however, is the risk of undermining a shared knowledge base. If each learner encounters a different subset of the curriculum, it is crucial to ensure that all students attain core foundational knowledge, and that educational equity is not compromised (Li, 2023).

Algorithmic Knowledge Validation and Educational Integrity: A critical issue that has drawn increasing attention from scholars concerns the biases embedded within or resulting from knowledge selection algorithms. As previously noted, the process of selecting and prioritizing specific domains of knowledge inherently involves political dimensions, reflecting the exercise of influence and the advancement of ideological frameworks (Wu, 2024). If algorithms are trained on data corpora that replicate existing inequities, they risk reproducing those biases. For instance, in a scientific database dominated by English-language publications, an algorithm tasked with identifying important scientific

findings for school curricula might entirely overlook the contributions of non-Anglophone or less visible academic communities. This would result in a narrow, monolithic body of knowledge within schools.

It is therefore imperative that algorithm designers—and those who implement such systems—critically examine the data sources and decision criteria used. In other words, logic guiding AI systems must be aligned with educational values such as democracy, inclusion, and scientific validity (Holmes et al., 2022). A problematic practice would be, for example, using citation count as the sole indicator of significance, thereby overlooking recent or interdisciplinary research that may be highly relevant but not yet widely cited. A more effective approach would involve a combination of metrics and the inclusion of expert human oversight, involving educators and domain specialists in the curation process (Symons & Alvarado, 2022).

Literature has increasingly stressed the importance of responsible and ethical use of algorithms. From the design phase onward, systems should incorporate bias mitigation mechanisms and ensure that algorithmic decisions are both transparent and explainable (Barnes & Hutson, 2024; Mensah, 2023). For example, suppose an AI system recommends excluding a scientific theory as outdated. In that case, the underlying rationale and data behind that recommendation should be accessible to human experts for independent evaluation. Additionally, there is a strong case for continuously evaluating these systems in real-world educational contexts. Researchers and practitioners must examine whether algorithmic decisions improve instruction or generate unintended consequences, and revise the systems accordingly (Tulli, 2022).

Lastly—and crucially—algorithmic mediation must not replace the need for human pedagogical design. It is the educators and curriculum developers who construct meaningful learning contexts, bridge new and prior knowledge, and make content accessible and engaging for learners (Karataş et al., 2025). Intelligent subsystems may assist by providing curated information and initial filtering, but the educator's role is to interpret, transform, and situate that knowledge pedagogically. In this sense, AI should be regarded as a new actor within the ecosystem of didactic transposition—one that must collaborate with human agents rather than supplant them. The relationship is complementary: AI offers speed and breadth in accessing information, while educators bring depth and contextual meaning (Fitria, 2023; Yu, 2024).

In summary, the use of AI algorithms in selecting and organizing scientific information for educational purposes presents a dual potential. On the one hand, it offers democratized access to vast repositories of knowledge and the possibility of creating more flexible, responsive, and up-to-date curricula. On the other hand, if left unchecked, it carries risks of opacity and epistemic distortion, which may ultimately affect how educational goals are defined and prioritized (Alvarado, 2020; Katz, 2024). The key lies in the thoughtful design of these systems and their ongoing human oversight, guided by pedagogical principles and the commitment to equitable, democratic access to knowledge.

Table 1

Key Dimensions of AI's Role in the Transformation of Scientific Knowledge into School Knowledge

Dimension	AI Contribution	Educational Implications
Curriculum Development	AI-assisted mapping of standards; topic clustering; semantic analysis of learning objectives	Greater efficiency, alignment with frameworks, risk of decontextualisation

Textbook Authorship	Automatic summarisation; content generation via language models; keyword extraction	Faster development cycles, concerns over authorship and originality
Information Mediation	Content filtering, ranking, and recommendation systems; algorithmic knowledge curation	Influences what content reaches teachers and learners; potential for bias
Instructional Support	Personalised feedback; adaptive systems; automated task design	Supports differentiation; raises concerns about over-reliance and teacher agency

An AI-Assisted Model of Didactic Transposition: Integrating Artificial Intelligence across Educational Stages

Based on the preceding analysis, a clear need emerges for a conceptual framework that integrates artificial intelligence into the transformation of scientific knowledge into school knowledge, while simultaneously safeguarding core pedagogical principles. To this end, this study presents a four-stage theoretical model, inspired by the theory of didactic transposition, in which AI is integrated as a supportive agent at each phase of the knowledge transformation process. This framework is termed: "ReKnow-AI: A Framework for the Responsible Transformation of Scientific Knowledge into Educational Knowledge through Artificial Intelligence". The term "ReKnow-AI" is a composite abbreviation that encapsulates the core logic of the proposed model. The prefix "ReKnow" derives from "Recontextualized Knowledge", referencing the process through which scientific knowledge is selected, adapted, and transformed to become teachable within the school context—a process conceptually grounded in didactic transposition theory. The "AI" suffix explicitly signals the integration of Artificial Intelligence as a supportive mechanism throughout this transformation.

Taken together, "ReKnow-AI" denotes a framework for the responsible, reflective, and pedagogically guided transformation of knowledge, in which AI serves as a collaborative partner in knowledge mediation, rather than a substitute for human expertise. The name thus reflects both the epistemic trajectory of the knowledge itself (Re-Know) and the technological mediation (AI) that facilitates its transition into meaningful educational content. "ReKnow-AI" emphasizes the collaborative synergy between human expertise and AI-driven tools, ensuring that the knowledge selected, structured, delivered, and assessed within education remains pedagogically sound, ethically grounded, and dynamically adaptive. The model comprises four interrelated stages:

(1) **Production of Scientific Knowledge (Scientific Field):** The first stage is situated within the domain of the scientific and academic community, where new knowledge is generated through systematic research. At this level, artificial intelligence may already play a supportive role, assisting in the organization and structuring of knowledge, for example through the creation of indexes, conceptual maps, or the automatic classification of scientific publications by thematic categories (Cheng et al., 2022). However, in the context of the proposed model, AI is not yet a central actor at this stage. Its primary role begins once scientific knowledge is selected and prepared for transmission into the educational sphere.

(2) **External Transposition – Curriculum Design Supported by AI:** At this stage, curriculum development teams and textbook authors select elements from the broader corpus of scientific knowledge to shape what will be taught in schools—namely, knowledge for teaching and learning. Artificial intelligence is integrated here as a decision-support and content-generation tool, contributing to various sub-processes: (a) Knowledge extraction and selection: AI-powered platforms scan scientific literature and identify core concepts, emerging trends, and recent discoveries that align

with educational goals. For example, an AI system might inform a curriculum committee that "in the past five years, Theory X has been further validated and may merit inclusion in the secondary school Biology curriculum". (b) Automated content structuring: AI tools may assist in drafting curricular frameworks, suggesting time allocations across thematic units, or even generating initial drafts of content (e.g., chapter summaries or sample activities) (Sosnovsky et al., 2025). A generative AI model, for instance, could compose a draft Physics chapter written in accessible language, which human authors would then revise and refine. (c) Alignment with standards and learning goals: Through analysis of learning data and curricular frameworks across different educational systems, AI can help verify whether the proposed content is developmentally appropriate and aligned with learning objectives. This may involve tagging each content item to specific competencies or skills. (d) Cultural contextualization: Using natural language processing, AI can generate alternative formulations of examples or case studies tailored to diverse cultural contexts, thus increasing the relevance and inclusiveness of the curriculum. As for the role of humans, despite AI's contributions, educators and subject-matter experts retain ultimate authority. They critically review the AI's recommendations, determine which concepts are pedagogically sound, and perform quality assurance regarding accuracy, language, and sensitivity (Teye et al., 2024). The outcome of Stage 2 is an official curriculum and supporting instructional materials—including textbooks and teaching guides—informing the process, but validated by human experts.

(3) **Internal Transposition – Classroom Teaching Supported by AI:** In the third stage, teachers translate the official curriculum into actual instructional practice, implementing it in the classroom context. Here, artificial intelligence functions as a pedagogical assistant to both teachers and students throughout the learning process. Its role is not directive, but supportive and adaptive, enhancing the personalization, interactivity, and effectiveness of instruction. (a) Intelligent classroom tools: Teachers may utilize AI-enhanced digital textbooks or adaptive learning platforms that dynamically adjust content based on students' engagement and responses in real-time. These systems support differentiated instruction by tailoring materials to individual learners' needs and pace. (b) Personalized feedback: AI-driven performance analytics can provide each student with individualized exercises, feedback, and review activities. The textbook becomes interactive, posing questions, assessing responses, and redirecting learners to specific subtopics based on detected knowledge gaps. (c) Teacher support and instructional design: AI can assist teachers with lesson planning, suggesting daily instructional sequences, generating question banks, and even analyzing classroom interactions—for example, identifying when a discussion diverges from learning objectives. Such tools allow teachers to optimize their preparation and in-class decision-making. Throughout this stage, the teacher remains the orchestrator of the learning experience. AI tools and recommendations are used at the teacher's discretion, taking into account the classroom climate, student motivation, and the educator's professional judgment. The human–AI interaction is continuous and reciprocal: the teacher assesses the relevance and accuracy of the feedback provided by the AI, intervenes when needed, and feeds contextual insights back into the system (e.g., flagging a suggested activity as inappropriate, thereby refining the algorithm's future recommendations).

(4) **Learning – Feedback to the System:** The final stage involves the knowledge that the student ultimately acquires. Within the proposed model, the focus at this level is primarily on the feedback loop that returns from the classroom back to earlier stages of the knowledge transformation process (Atherton et al., 2024). Artificial intelligence enables this feedback to be rich, granular, and actionable. Student performance data, common misconceptions, time spent on specific tasks, and learning trajectories can all be collected—while respecting data privacy regulations—and analyzed in aggregate. This feedback serves multiple functions: (a) Curriculum improvement: If, for example, nationwide (or international) data reveals that students consistently struggle with a particular unit, or conversely, that a newly introduced scientific topic is well-understood, curriculum designers can take this into account in future revisions (Kasztelnik, 2024). With AI-based tools, this process can be dynamic: systems may proactively suggest reordering, simplifying, or expanding content based on

collective learning data. (b) Personalization of learning pathways: In real time, AI systems can further adapt to the individual learning experience by responding to evolving student performance data, thereby maximizing the depth and retention of knowledge acquired by each learner—building on mechanisms described in Stage 3. (c) Educational research and learning theory development: More broadly, the aggregation of large-scale educational data through AI systems provides researchers with a powerful basis to test learning theories, identify general patterns, and contribute to the field of learning analytics (Ang et al., 2020). In this sense, the model is circular: insights from learning data become new scientific knowledge about education, feeding back into Stage 1 as input for future research in didactics and curriculum studies.

The proposed model thus integrates artificial intelligence across all stages of the knowledge transformation process—from the initial design of curriculum content to classroom implementation and feedback-driven revision. It is grounded in four key principles:

- Human–AI collaboration: AI does not function autonomously but operates as a supportive agent to human actors (curriculum designers, teachers, learners), receiving direction and supervision from them at every stage.
- Transparency and accountability: All AI-generated recommendations or materials are subject to human review and are accompanied by clear explanations and modifiability options, ensuring that educators understand and control the pedagogical rationale behind algorithmic decisions.
- Adaptability and continuous updating: The system incorporates feedback loops based on learning data and performance analytics, enabling the ongoing refinement of both curricula and instructional strategies in response to real-world educational outcomes.
- Ethics and inclusivity: At every stage, safeguards are built in to prevent algorithmic bias and to ensure that content is culturally responsive, privacy-respecting, and representative of diverse perspectives and knowledge traditions.

It is worth noting that similar theoretical models are emerging internationally. For example, Wu (2024) proposes a hybrid framework known as the “Adaptive Integrative Curriculum”, which emphasizes real-time adaptability of content through AI and the integration of culturally diverse knowledge systems. The model presented in this study focuses more specifically on the process of didactic transposition, embedding AI as a supportive technology across the stages of transforming scientific knowledge into school knowledge. It aligns with the contemporary shift toward continuous curriculum development based on educational data and supports the broader idea that learning outcomes can inform instructional redesign.

In practical terms, the implementation of such a model requires significant investment in suitable infrastructure (namely, software platforms capable of supporting these functions) as well as the development of advanced algorithms that are sensitive to the specificities of education. It also necessitates pilot testing in school settings and, most importantly, the active involvement of teachers in the design process. Educators must not be treated merely as end users, but rather as co-designers of AI systems, ensuring that such technologies are responsive to real classroom needs and pedagogical realities.

Discussion

The preceding analysis highlights that the integration of artificial intelligence into curriculum processes constitutes more than a technical enhancement; it signals a reconfiguration of how educational knowledge is produced, selected, and validated. Within the field of curriculum studies, such a shift invites a re-examination of long-standing assumptions regarding pedagogical authority,

epistemic legitimacy, and the democratic function of education. The proposed 'ReKnow-AI' model offers a conceptual entry point for examining how algorithmic mediation influences traditional curriculum-making processes.

Notably, this study aligns with recent calls for curricular reform that foreground inclusivity, adaptability, and epistemic justice (e.g., Talbot, 2023; Wu, 2024). By framing AI not simply as an instructional aid but as an epistemic actor, the analysis contributes to an emerging scholarship that interrogates the sociotechnical conditions under which knowledge becomes teachable (Symons & Alvarado, 2022). This perspective resonates with Apple's (2004) argument that curricula are always the product of ideological negotiations, now further complicated by the black-boxed logic of AI systems.

Furthermore, the model proposed here positions teachers and curriculum designers not as passive recipients of AI-generated content but as critical co-mediators of knowledge. This contrasts with instrumentalist approaches that treat AI as a neutral optimization tool. Instead, it supports a critical-constructivist view of curriculum making, in which the role of human agency, ethical reflexivity, and cultural responsiveness remains central. It also contributes to broader debates in curriculum theory concerning the balance between global standardisation and local pedagogical autonomy in the age of digital infrastructures.

In this light, the 'ReKnow-AI' framework may serve as both an analytical lens and a practical roadmap: it clarifies the stages at which AI can intervene, while foregrounding the normative and pedagogical conditions that must accompany such interventions. Future research may explore how this model can be implemented in various educational contexts and disciplines, or how its principles can inform teacher education programs that aim to prepare educators to navigate AI-mediated curricula.

Table 2

Comparative Insights on AI's Role in the Didactic Transformation of Knowledge

Study	Main Argument	Relation to Current Study
Yang et al. (2022)	AI accelerates curriculum design by analysing content clusters and learning pathways	Both recognise AI's structural role
Hashim et al. (2022)	AI provides tools for textbook authoring but lacks critical analysis of knowledge selection	Present study critiques instrumentalist view
Symons and Alvarado (2022)	AI is an epistemic actor reshaping norms of validity and authority	"ReKnow-AI" builds upon their epistemic framing
Apple (2004)	Curricula reflect ideological negotiations and sociopolitical power structures	Current study applies this view to algorithmic mediation
Talbot (2023)	AI systems risk reinforcing existing inequalities unless curricular justice is prioritized	Supports the call for epistemic justice

To further situate the proposed model within current scholarship, Table 2 presents a comparative analysis of selected studies. While this article shares a foundational view with Symons and Alvarado (2022) regarding the epistemic agency of AI, it offers an original contribution by mapping the stages at which AI intervenes in curriculum-making. In contrast to more technocentric or instrumental approaches (e.g., Hashim et al., 2022), the ReKnow-AI model foregrounds the normative implications of algorithmic mediation and asserts the continuing importance of human agency. Notably, the study extends Apple's (2004) critique of ideological curricula by applying it to contemporary algorithmic infrastructures. This comparative lens underscores the theoretical novelty and positioning of the current proposal, while opening avenues for dialogue between critical curriculum studies and AI ethics.

In light of the preceding analysis, the hypotheses proposed at the outset of this study can be revisited. First, the findings confirm H1, indicating that AI integration introduces epistemic shifts in how

curricular content is structured and valued. Regarding H2, the study supports the notion that AI systems increasingly perform functions of didactic transposition, yet their role remains mediated by institutional and pedagogical frameworks. Lastly, H3 is partially supported: while AI can marginalise teacher agency when implemented uncritically, models like ReKnow-AI demonstrate how educator involvement can be maintained or even strengthened through reflective curricular design. These outcomes reaffirm the need for context-sensitive and ethically grounded approaches to AI-mediated education.

This study's conclusions resonate with prior findings that emphasize the transformative role of AI in curriculum development (cf. Kasztelnik, 2024; Yang et al., 2022), particularly regarding the automation of knowledge classification and the personalization of learning content. However, it diverges from perspectives that portray AI as an unequivocally neutral facilitator (e.g., Hashim et al., 2022), suggesting instead that its use raises complex questions of epistemic authority and pedagogical intentionality. In this regard, the ReKnow-AI model partially agrees with Karan and Angadi's (2023) emphasis on AI's filtering mechanisms, yet it also extends their work by theorizing the recursive human-AI negotiation at each stage of knowledge transformation.

Concluding Remarks

The study aimed to explore two key questions: (1) In what ways does AI influence the structuring of curricula and the development of school textbooks? and (2) How do algorithmic systems function as mediators in the transformation of scientific knowledge into teachable content? The analysis has shown that AI contributes to curriculum structuring through automation, semantic clustering, and adaptive content generation, while also raising concerns regarding authorship and pedagogical coherence. Moreover, AI-driven systems are increasingly acting as epistemic filters, determining the visibility and hierarchical organization of scientific information, thereby reshaping the boundaries of what is deemed teachable. These findings confirm the central role of AI in knowledge mediation and highlight the need for educator oversight and critical frameworks.

The integration of artificial intelligence into curriculum design and didactic transposition is not merely a matter of technological optimisation; it marks a more profound shift in the way educational knowledge is produced, legitimised, and transmitted. AI systems, far from being neutral mediators, are embedded within sociotechnical assemblages that reflect values, assumptions, and exclusions. In this sense, the use of AI in knowledge transformation processes demands not only technical regulation but pedagogical and ethical scrutiny.

This article argues that the didactic transposition of knowledge—traditionally guided by human judgment—must now be reimagined within hybrid frameworks that include algorithmic actors. The proposed ReKnow-AI model provides a conceptual framework for understanding how AI can intervene at various stages of knowledge mediation, ranging from scientific knowledge production to classroom implementation. Yet the model also foregrounds that these interventions are never value-free; they carry epistemic and pedagogical consequences that must be critically examined by educators, curriculum designers, and policy-makers.

Moreover, the increasing algorithmic governance of curricular content challenges the democratic and deliberative character of education. When AI systems participate in decisions about what knowledge counts as teachable, whose knowledge is included or excluded becomes a question of power as much as pedagogy. As such, teacher agency and critical professional judgement must remain central to any educational framework that incorporates artificial intelligence.

While the study was initially framed around the potential of AI for instructional optimisation, it became apparent through theoretical analysis that the normative and political dimensions of AI

deployment in curriculum-making are often underexplored in the literature. This emergent emphasis on epistemic justice and teacher agency was not anticipated initially as a dominant outcome, yet proved central during the conceptual development of the ReKnow-AI model. The absence of empirical implementations, however, limits the generalisability of this observation.

The contribution of this study lies in articulating a theoretical lens through which the reconfiguration of knowledge in the digital age can be understood, not simply as a process of efficiency and scaling, but as a contested pedagogical field. Future research should examine how the 'ReKnow-AI' model can be adapted to different educational levels and cultural contexts, its interactions with national curriculum policies, and how educators experience and respond to AI-mediated materials in practice. In rethinking the very foundations of what and how we teach, the challenge is not to resist technological change, but to shape it by the enduring educational aims of critical inquiry, social justice, and epistemic plurality.

Although this paper did not formulate explicit hypotheses, it was guided by a central research question concerning the influence of AI on the didactic transformation of knowledge. The findings consistently return to this inquiry, revealing that AI does not merely affect technical processes but reshapes the conceptual boundaries of what constitutes teachable knowledge. In this respect, the study contributes to theory building rather than hypothesis testing.

Suggestions for Future Research

Given the conceptual nature of this study, several avenues for empirical and theoretical exploration emerge. First, the "ReKnow-AI" model warrants implementation-based validation. Future research should investigate how this model can be operationalized in real educational settings, including national curriculum agencies, textbook production teams, and teacher education programs. Specific case studies could examine how AI tools (e.g., generative models or content classifiers) reshape the decision-making processes involved in curriculum design.

Second, there is a pressing need to explore the socio-technical dynamics of AI-mediated knowledge selection. What forms of knowledge tend to be privileged or excluded by algorithmic processes? How do these biases interact with existing epistemic inequalities across subjects, regions, or learner profiles? Empirical studies, especially comparative and cross-national, could illuminate these mechanisms in varied cultural contexts.

Third, teacher perspectives should be foregrounded in future work. Interviews, surveys, and classroom-based research could explore how educators perceive the epistemic authority of AI-generated content and how this affects their role as curriculum mediators. Special attention should be paid to the ethical and professional development challenges posed by AI integration.

Finally, future research could investigate how AI systems may influence the construction of interdisciplinarity within school curricula. Can algorithmic tools support the meaningful integration of knowledge domains, or do they reinforce disciplinary silos?

Altogether, future studies should combine conceptual frameworks with empirical rigor to guide the ethical and pedagogically sound use of AI in curriculum-making.

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