

AI in Education Through a Structuralist Lens: Reconfiguring Knowledge, Authority, and Learning Systems

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Abstract

Artificial Intelligence has moved from the margins to the mainstream of educational discourse, promising personalized learning, efficient assessment, and data-driven decision-making. Yet beneath these promises lies a more fundamental transformation—one that alters how knowledge itself is organized, interpreted, and transmitted. This paper moves beyond instrumental evaluations of AI in education to examine it as a structural phenomenon that reshapes the underlying architecture of learning.

Drawing on the linguistic structuralism of Ferdinand de Saussure, the anthropological frameworks of Claude Lévi-Strauss, and the knowledge-power analysis of Michel Foucault, the study investigates how AI systems function as coded meaning-making apparatuses rather than neutral tools. Through this lens, AI emerges as a force that reconfigures educational authority, curriculum design, assessment logic, and student subjectivity.

The paper examines both the transformative possibilities—democratized access, adaptive learning pathways, and multimodal knowledge representation—and the structural risks embedded within algorithmic systems, including epistemic standardization, categorical reduction, and the reinforcement of existing inequalities through biased data architectures. It concludes by advocating for reflexive, transparent, and ethically grounded AI systems that preserve interpretive diversity while harnessing computational capabilities. By proposing a structuralist framework for understanding AI-mediated pedagogy, the study highlights how algorithmic systems are reshaping the epistemological foundations of contemporary education.

Keywords: Artificial Intelligence, Structuralism, Educational Technology, Knowledge Architecture, Algorithmic Governance, Digital Pedagogy, Power and Discourse

INTRODUCTION

Artificial intelligence has rapidly become one of the most influential forces shaping contemporary educational discourse. Adaptive learning platforms, automated grading systems, and predictive analytics are increasingly integrated into classrooms, universities, and digital learning environments. Governments and educational institutions worldwide are investing heavily in AI-driven technologies in hopes of improving learning outcomes, enhancing efficiency, and expanding access to knowledge.

Recent scholarship has increasingly examined the role of artificial intelligence in educational contexts. Studies by Holmes et al. (2019) and Luckin (2018) emphasize the potential of AI to enhance personalized learning and improve instructional efficiency, while Williamson (2017) and Selwyn (2019) critically explore the implications of datafication and algorithmic governance in education. More recent contributions, such as Perrotta et al. (2023), highlight the distributed and platform-based nature of digital pedagogy. However, these approaches largely remain within functional or policy-oriented frameworks and do not fully interrogate the structural transformations that AI introduces into the organization of knowledge and learning systems. This study builds upon and extends these discussions by offering a structuralist interpretation of AI in education.

Despite the growing enthusiasm surrounding AI, most discussions remain focused on instrumental questions. Researchers frequently ask whether AI improves student performance, reduces teacher workload, or enhances administrative efficiency. While such questions are important, they overlook a deeper issue: the ways in which AI restructures the very foundations of educational systems.

This paper takes a different path. It asks not what AI does to education, but what AI does within education—how it restructures the very ground upon which teaching and learning take place.

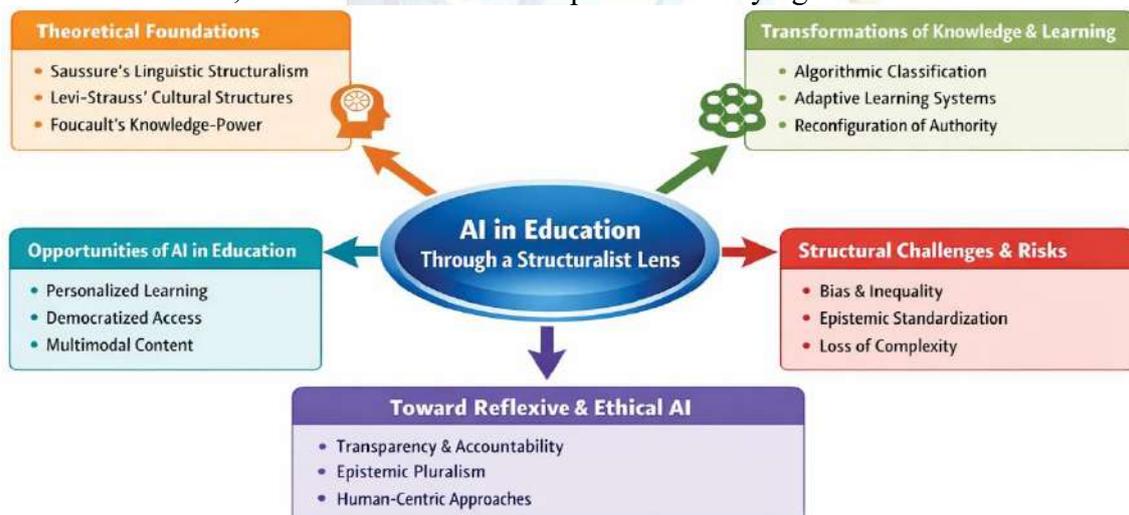
The argument unfolds in three movements. First, that AI represents not merely a technological intervention but a structural transformation of educational systems. Second, that this transformation operates at the level of knowledge itself, reorganizing how we classify, evaluate, and transmit what counts as learning. Third, that understanding this shift requires theoretical tools capable of grasping structures rather than surfaces.

Structuralism offers precisely such tools. Developed in the early twentieth century through the work of Ferdinand de Saussure in linguistics and extended by Claude Lévi-Strauss to anthropology, structuralism insists that meaning emerges not from isolated elements but from the relations between them. A word means what it does because of its difference from other words, not because of any inherent property. A myth carries significance through its underlying patterns, not its surface details. Applied to education, this perspective reveals curricula, assessment frameworks, and pedagogical models as structured systems that organize knowledge in particular ways.

The paper proceeds by first outlining the theoretical foundations of structuralism and then applying this framework to the emerging role of artificial intelligence in education.

Throughout, the aim is not to celebrate or condemn AI but to understand it—to grasp the deep grammar of algorithmic education and to consider what kinds of knowledge, what forms of learning, become possible or impossible within its structures.

Despite the expanding body of literature on artificial intelligence in education, much of the existing research remains focused on instrumental outcomes such as efficiency, performance enhancement, and administrative optimization. While these studies provide valuable insights, they often overlook the deeper epistemological and structural transformations that AI introduces into educational systems. In particular, limited attention has been given to understanding AI as a structural force that reconfigures the organization of knowledge, authority, and meaning-making processes. This paper addresses this gap by employing a structuralist framework, drawing on the works of Ferdinand de Saussure, Claude Lévi-Strauss, and Michel Foucault, to examine how AI reshapes the underlying architecture of education.



This figure presents the structural framework of the study, illustrating how artificial intelligence reconfigures educational systems through theoretical foundations, knowledge transformations, opportunities, and structural challenges, ultimately leading to the need for reflexive and ethical AI.

Figure 1: Structural Framework of AI in Education Through a Structuralist Lens

Research Approach

This study adopts a conceptual and theoretical research design. Rather than conducting empirical data collection, the paper engages in philosophical and structural analysis of artificial intelligence in educational systems.

Drawing upon structuralist traditions developed by Ferdinand de Saussure and Claude Lévi-Strauss, along with the knowledge-power framework proposed by Michel Foucault, the study interprets AI technologies as socio-technical structures that organize and mediate educational

meaning.

Through theoretical synthesis and interpretive analysis, the paper explores how algorithmic systems classify knowledge, structure learning pathways, and influence educational authority. This conceptual approach enables a deeper understanding of the epistemological transformations occurring within contemporary digital learning environments.

STRUCTURALISM AND THE ARCHITECTURE OF MEANING

To grasp what structuralism offers, we need to set aside a familiar way of thinking. Most of us assume that things carry meaning by themselves—a word means something because it points to an object, a gesture means something because it reveals an inner feeling. Structuralism turns this assumption on its head. Meaning, it insists, comes not from isolated things but from the systems of relation in which those things exist.

a) Saussure and How Language Works

Ferdinand de Saussure, a Swiss linguist whose lectures from the early 1900s shaped modern thought, argued that language operates as a system of signs. Each sign joins a signifier—the sound or image we hear or see—with a signified—the concept it brings to mind. The connection between them, Saussure pointed out, is arbitrary. Nothing about the sound "tree" naturally connects to the idea of a tree. We understand it only because we share a convention.

This leads to Saussure's central insight: signs mean what they do because of their differences from other signs. "Tree" makes sense because it is not "bush," not "plant," not "forest." Meaning flows from relationships, not from isolated terms. You cannot understand individual words without grasping the larger system that organizes them.

Saussure also distinguished between *langue*—the underlying system of language—and *parole*—the actual instances of speaking. *Langue* provides the structure, the rules, the possibilities. *Parole* puts that structure to work. This idea proved powerful because it suggested that beneath the surface variety of human behavior lie deep patterns that shape what we can think and say.

b) Levi-Strauss and Cultural Patterns

Claude Levi-Strauss took Saussure's insights beyond language and applied them to culture. In his studies of kinship, myths, and rituals across different societies, he looked for underlying structures that might explain why seemingly different cultures produced similar patterns of meaning.

He found that binary oppositions—nature versus culture, raw versus cooked, life versus death—appeared again and again as organizing principles. These oppositions, he argued, form a kind of grammar through which human societies make sense of their world. Myths that appear completely different on the surface might share the same deep structure when examined closely. For Levi-Strauss, cultural practices were not random collections of customs but coherent systems with their own internal logic. A society's rules about marriage, for instance, might look like arbitrary traditions, but they often encode deeper patterns about how that society organizes relationships, exchanges, and alliances.

c) Education as a Structured System

How does this help us understand education? Think about what schools and universities actually do. They divide knowledge into subjects—mathematics, literature, history, biology. They arrange this knowledge in sequences, deciding what gets taught when. They create systems for evaluation—grades, tests, rubrics. They establish roles and relationships: teacher and student, expert and beginner, evaluator and evaluated.

None of this is neutral. A curriculum that prioritizes classic texts and one that builds on student experience reflect different assumptions about what matters. A grading system built on standardized tests and one that includes portfolios and projects embody different values. These arrangements shape not just what students learn but how they come to see knowledge itself.

Education, in short, functions as a meaning-making system. It sorts, orders, and judges. It sets

up relations between elements—this subject before that one, this answer right and that one wrong, this student advanced and that one struggling. These relations form the deep structure of educational practice, often operating below the surface of everyday classroom life.

d) Structuralism as Analytical Lens

For the purposes of this paper, structuralism provides three crucial analytical resources.

First, it turns our attention to systems rather than isolated pieces. Instead of asking whether a particular AI tool works well, we ask how it reshapes the relations within educational systems. Instead of judging individual algorithms, we examine the patterns of thinking they embed.

Second, it helps us see underlying structures beneath surface differences. Two AI platforms might look quite different, but they may share common features—both, for instance, might sort students into categories based on similar kinds of data.

Third, it reveals how meaning gets made through difference and relation. When AI systems label student responses as correct or incorrect, they are not just measuring something. They are participating in building what counts as knowledge in educational settings.

With these tools, we can approach AI not as a collection of gadgets and software but as a force that reshapes the deep grammar of education—the taken-for-granted patterns that organize how teaching and learning happen.

AI AS A STRUCTURAL REORGANIZATION OF KNOWLEDGE

The introduction of artificial intelligence into educational environments alters the structural organization of knowledge. AI systems operate through algorithmic classification, predictive analytics, and data-driven decision-making processes.

Unlike traditional pedagogical practices, which rely heavily on human interpretation and contextual understanding, AI systems translate learning activities into computational variables. Student interactions are converted into data points that algorithms analyze to determine learning progress and recommend subsequent instructional steps.

This shift introduces a computational logic into education. Knowledge becomes modular, learning pathways become adaptive, and evaluation processes increasingly rely on algorithmic prediction rather than human interpretation.

Conceptual Framework: Structural Transformation of Educational Systems

The integration of artificial intelligence represents a shift from traditional teacher-centered education toward algorithmically mediated learning environments.

Traditional Educational Structure

Teacher → Curriculum → Student → Human Assessment

AI-Mediated Educational Structure

Algorithmic System → Data Analytics → Adaptive Learning Content → Predictive Assessment

In the AI-mediated model, algorithms function as intermediary agents of knowledge organization, influencing how information is delivered, interpreted, and evaluated. Educational authority becomes distributed between human educators and digital infrastructures.

OPPORTUNITIES OF AI IN EDUCATION

Artificial intelligence offers several transformative opportunities for educational systems.

First, AI can expand access to educational resources by overcoming geographical and institutional limitations. Students in remote or under-resourced regions can access high-quality digital learning materials and adaptive instructional platforms.

Second, AI enables personalized learning experiences. Adaptive systems can adjust instructional pace and content based on individual student performance, allowing learners to progress according to their own needs.

Third, AI technologies support multimodal knowledge representation. Digital learning environments can integrate text, video, simulations, and interactive visualizations, thereby expanding the range of pedagogical strategies available to educators.

STRUCTURAL CHALLENGES AND RISKS

The same changes that create opportunities also carry real dangers. These are not bugs that can be fixed with better programming. They grow out of how AI systems work.

a) The Persistence of Bias

AI learns from data, and data carries history. Old patterns of inequality, long-standing prejudices, unexamined assumptions—all these live in the information algorithms are trained on. When AI learns from this data, it learns these patterns too.

Think about a system trained on decades of college admissions. If those admissions favored certain groups over others, the system will absorb that favoritism. Think about language models trained on the internet. If the internet contains stereotypes and slurs, the models will reproduce them.

This is not about a few biased programmers. It is structural. The bias sits in the data, and the data shapes what the algorithm does. The system learns to see the world the way the data sees it.

b) The Pull Toward Standardization

AI assessment systems work best when answers fit expected patterns. They spot correct responses, flag unusual ones, score based on features they have been trained to recognize. This makes them efficient. It also creates pressure toward uniformity.

The danger is that education bends toward what machines can measure. Creative answers that do not match any pattern get marked down. Unusual interpretations get lost. Students learn to produce what the system rewards, and what the system rewards is often predictable and safe.

This narrows what counts as knowledge. Ways of thinking that cannot be easily categorized become harder to express and harder to validate. The structural logic of AI pulls education toward the measurable and away from the messy.

c) The Reduction of Complexity

Real learning is not tidy. It moves forward and backward. It gets confused before it gets clear. It holds contradictions and half-understandings. This messiness is not failure. It is how humans actually learn.

Algorithms prefer tidy. They need clear categories, clean data, predictable patterns. They work in binaries—right or wrong, on track or off track, proficient or not proficient. They have no place for ambiguity.

The risk is that learning gets pressed into shapes that fit the machine. Rich, complicated understanding gets reduced to simple categories. The depth of human thinking gets flattened into what algorithms can process.

POWER, AUTHORITY, AND KNOWLEDGE MEDIATION

Every educational system has to answer certain questions. Who decides what matters? Who judges whether learning happened? Who holds the authority to say this is true and that is not? AI changes how these questions get answered.

a) Foucault and the Knowledge-Power Relation

Michel Foucault spent years studying how modern institutions shape people. Prisons, hospitals, schools—all these places developed ways of watching, sorting, and normalizing human behavior. These techniques, Foucault argued, were forms of power. Not the old power that threatened punishment, but a subtler power that shaped what seemed normal and possible.

When schools test students and sort them into categories, they exercise this kind of power. When curricula decide which knowledge is worth teaching, they shape what counts as truth. These are not neutral acts. They create hierarchies and possibilities.

b) AI and the Redistribution of Authority

AI brings new players into these old dynamics. Algorithms now help decide who is struggling and who is advanced. They help determine what content students see and what paths they

follow. Authority that once lived mostly with teachers now spreads across humans and machines.

This is not simple replacement. Teachers still matter. But they work within systems that algorithms increasingly shape. A teacher using an adaptive platform may find that platform deciding the pace and sequence of instruction. The teacher works alongside something that also directs.

c) The Opacity Problem

Complicating all this is how hard AI systems are to see inside. Students and teachers usually cannot tell how an algorithm reached its conclusion. They get recommendations, scores, and labels without understanding the reasoning behind them.

This matters for power. When decisions come from processes you cannot examine, you cannot really question them. The system that classifies you remains itself unclassified. The gaze that watches you is not watched in return.

FUTURE DIRECTIONS: TOWARD REFLEXIVE AND ETHICAL AI

If AI is going to serve education well, it needs to be built and used thoughtfully. Several directions matter.

a) Structural Transparency

First, AI systems should be transparent about how they work. Not just open code, but open logic. What categories do they use? How are those categories defined? What patterns do they look for?

When teachers and students can see this, they can understand where they stand in relation to the system. They can ask questions. They can push back.

b) Epistemic Pluralism

Second, AI should make space for many kinds of understanding. Not just one right answer, but multiple valid responses. Not just standard approaches, but creative ones. Not just what is easy to measure, but what is hard to measure too.

This means resisting the pull toward uniformity. It means building systems that can recognize diverse ways of thinking and expressing.

c) Human Interpretation at the Center

Third, algorithmic outputs should guide but not decide. Teachers should have the final say, especially when context matters. They should be able to override recommendations when their knowledge of a student suggests something different.

This is not about rejecting technology. It is about recognizing what machines cannot grasp—the particularity of individual situations, the depth of human relationships, the things that do not fit in data.

d) Diverse Development

Fourth, the people building AI should come from many backgrounds. Right now, the tech world is narrow. Its assumptions shape what gets built. Bringing in educators, students, communities, and scholars from different fields would broaden those assumptions.

More voices at the design table would mean systems that serve more kinds of people in more kinds of situations.

e) Continuous Ethical Reflection

Finally, this work never ends. Technologies change. Contexts shift. What seems right today may look wrong tomorrow. Ongoing reflection, questioning, and adjustment are not extras. They are essential.

Structural thinking helps here. It reminds us that AI reshapes the deep patterns of education. Those effects will unfold over time. We need to keep watching, keep asking, keep pushing for systems that serve learning rather than just measuring it.

DISCUSSION

The analysis presented in this paper positions artificial intelligence not merely as a

technological tool but as a structural force that reshapes the epistemological foundations of education. By applying a structuralist lens, the study reveals how AI systems reorganize the relationships between knowledge, learners, and institutional authority.

This perspective extends existing debates in educational technology by shifting attention from surface-level functionalities to deeper systemic transformations. While previous studies have emphasized efficiency and personalization, this analysis highlights how algorithmic systems influence what counts as valid knowledge, how learning is categorized, and how authority is redistributed between human and non-human agents.

The findings suggest that AI-mediated education operates within a new structural logic characterized by datafication, standardization, and predictive governance. At the same time, this transformation opens possibilities for more inclusive and adaptive learning environments, provided that ethical safeguards and interpretive flexibility are maintained.

Therefore, the challenge is not simply to adopt AI technologies but to critically engage with the structures they produce, ensuring that educational systems remain responsive to diverse forms of knowledge and human experience.

CONCLUSION

Artificial intelligence is not waiting on the horizon of education. It is already here. Adaptive platforms shape what millions of students see each day. Automated tools score countless responses. Predictive systems flag some students for attention while letting others pass unnoticed. The question is no longer whether AI will transform education, but how we understand that transformation and what we choose to do about it.

This paper has argued for seeing AI as something more than a collection of tools. It is a structural force—one that reorganizes the deep patterns of educational systems. Drawing on structuralist thinking from Saussure, Levi-Strauss, and Foucault, we have traced how AI introduces new ways of classifying knowledge, new forms of organizing learning, new distributions of authority between humans and machines. We have looked at both the possibilities AI opens up and the dangers it carries.

A few things become clear from this view.

First, AI does not simply add itself to unchanged schools and classrooms. It actively reshapes them. It redraws relations between teachers and students, between knowledge and assessment, between learning and measurement. These changes run deep.

Second, understanding these changes requires ideas equal to their depth. Structuralism, whatever its limits, gives us language for talking about systems and patterns, about the hidden grammar that organizes surface activity. It helps us see beneath the buzz of new technologies to the deeper shifts taking hold.

Third, the shape AI takes in education is not fixed. It depends on choices being made now—by developers, by policymakers, by educators, by all of us. Those choices should be informed by real understanding of what is at stake. Not just test scores or efficiency gains, but fundamental questions about what knowledge counts, who gets to decide, and what learning should look like.

Fourth, building AI wisely means building it with eyes open. Designers need to understand themselves as participants in reshaping education. They need to build systems that respect many ways of knowing, that leave room for human judgment, that stay open to questioning and change.

The classroom where a teacher and an algorithm work alongside each other is not just a technological space. It is a place where new forms of knowledge are taking shape, where old authorities are shifting, where possibilities for learning are opening up even as others close down. Understanding what happens in that space—and working to make it serve human flourishing rather than just efficient measurement—is one of the most important tasks education faces today. Ultimately, the structural transformation wrought by AI demands not

that we become more efficient processors of information, but that we become more conscious architects of the educational worlds we are building for the future.

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