

Research Article

The Impact of AI on Students' Reading, Critical Thinking, and Problem-Solving Skills

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Abstract

The integration of Artificial Intelligence into instructional ecosystems represents a paradigm shift. It has profound implications for student cognitive development. This article presents an analysis of the effect of AI on three cornerstone capabilities of education. These are reading, critical thinking, and problem-solving. AI offers extraordinary opportunities for personalized gaining knowledge of and adaptive comments. It also introduces great dangers. These include cognitive offloading, intellectual passivity, and the erosion of deep engagement. This paper employs a qualitative approach. It proposes a conceptual framework of “Cognitive Augmentation vs. Cognitive Atrophy” to dissect this duality. The evaluation suggests AI’s impact isn’t always monolithic. It is closely contingent on pedagogical strategy, tool design, and scholar mindset. AI gear can act as effective Socratic partners and simulators. They can help develop superior skills. They are also able to function as “solution engines” that shortcut vital cognitive methods. This could probably lead to a decline in foundational skills. The dialogue examines the interconnected nature of those capabilities. It argues that a decline in deep studying can immediately impair the raw fabric wished for crucial wondering. This in turn cripples trouble-solving. The article concludes with a fixed of actionable pointers for educators, policymakers, AI builders, and college students. It advocates for a human-targeted technique that leverages AI as a tool to enhance human intellect, in preference to replace it. The central thesis is that addressing the age of AI in education requires a deliberate focus. Promoting AI literacy and metacognitive awareness is necessary to ensure that technology serves as a catalyst for cognitive growth, not a crutch for cognitive decline.

Keywords

Artificial Intelligence, Education, Critical Thinking, Reading Comprehension, Problem-Solving, Pedagogy, Educational Technology (EdTech), Large Language Models (LLMs), Cognitive Skills, AI Literacy, Cognitive Offloading, Personalized Learning

1. Introduction

1.1. AI in the Classroom

The 21st-century educational landscape is undergoing a transformation. This change is as profound as the invention of the printing press or the advent of the internet. At the heart

of this revolution is Artificial Intelligence (AI). AI is a suite of technologies capable of performing tasks that traditionally require human intelligence. These tasks include learning, reasoning, and creativity. AI includes adaptive learning platforms that tailor curricula to individual student needs. It also includes generative AI models that can produce human-like

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text. AI is no longer a futuristic concept. It is a present-day reality in classrooms, libraries, and homes worldwide [1]. The promise of AI in education (AIED) is immense. Proponents envision a world where every student has a personalized tutor. Learning disabilities could be identified and addressed with unparalleled precision. Teachers could be freed from administrative burdens to focus on high-impact mentorship and instruction [2]. AI can democratize access to information. It can provide instant feedback. It can create immersive simulations that make abstract concepts tangible. These tools have the potential to make learning more engaging, efficient, and equitable. This rapid integration is not without its perils. The very power that makes AI so transformative also introduces significant challenges. It challenges traditional pedagogical models and the core objectives of education. Educators, parents, and policymakers are grappling with a host of complex questions. How does constant access to AI-generated answers affect a student's motivation to learn? What happens to the development of writing skills when a machine can draft an essay in seconds? Most critically for this paper, how does the pervasive presence of AI impact the fundamental cognitive skills that are the bedrock of a robust education and an informed citizenry?

1.2. Reading, Critical Thinking, and Problem-Solving

Education encompasses a vast range of knowledge and competencies. A trio of interconnected skills stands out as foundational for lifelong learning. These skills are reading, critical thinking, and problem-solving. Reading is more than the mere decoding of text. True reading comprehension involves the ability to understand, interpret, evaluate, and reflect on written material. Deep reading is a prerequisite for acquiring new knowledge and engaging with the complexities of history, science, and culture [3]. Critical thinking is a higher-order skill. It involves the objective analysis and evaluation of an issue in order to form a judgment. It is the ability to question assumptions, identify biases, weigh evidence, and construct a coherent argument. In an era of rampant misinformation, critical thinking is not just an academic skill but a civic necessity [4]. Problem-solving is the process of identifying a problem. It involves developing potential solution strategies and implementing and evaluating a solution. It requires a combination of creativity, logical reasoning, and perseverance. It is essential for navigating the complex challenges of both professional and personal life [5]. These three skills are not discrete. They are deeply intertwined. Effective problem-solving relies on the ability to critically evaluate information gathered through reading. Critical thinking is sharpened when it is applied to complex problems. Reading is the primary gateway to the information and ideas that fuel both critical thought and problem identification.

1.3. Problem Statement and Purpose of the Study

The central problem this article addresses is the uncertain and dualistic impact of AI on this core cognitive triad. A significant tension exists between AI's potential to augment these skills and its potential to cause them to atrophy. On one hand, AI can provide tools that enhance learning and cognitive performance. On the other hand, AI might prevent students from engaging in the "desirable difficulties" that are essential for building robust, long-term cognitive structures [6] through "offloading" cognitive tasks. The purpose of this article is to move beyond the simplistic "good vs. bad" dichotomy. It aims to provide a nuanced, in-depth analysis of the mechanisms through which AI influences students' skills. This paper synthesizes existing research, proposes a conceptual framework, and discusses the interconnected nature of these impacts. It aims to illuminate the specific ways AI tools are currently shaping each of the three core skills. It also seeks to identify the pedagogical and contextual factors that determine whether AI's impact is positive or negative. Finally, it intends to provide actionable recommendations for stakeholders to harness AI's benefits while mitigating its risks. This study seeks to contribute to a more informed and deliberate conversation. The conversation is about how to integrate AI into education in a way that cultivates resilient, adaptable, and deeply intelligent human minds.

2. Research Questions and Hypotheses

This inquiry is structured around the following research questions and corresponding hypotheses. The hypotheses are formulated to reflect the "double-edged sword" nature of AI's influence.

2.1. Research Questions

The first research question asks in what ways AI-powered tools affect the development of students' reading comprehension skills. This includes the distinction between surface-level understanding and deep, critical reading. The second question is how the use of AI influences the cultivation of students' critical thinking skills, such as evidence evaluation and logical reasoning. The third question explores the impact of AI applications on students' ability to develop and apply effective problem-solving strategies.

2.2. Hypotheses

The Reading Duality Hypothesis suggests that the use of AI in reading will have a bifurcated effect. AI-driven personalized learning systems and vocabulary builders will improve foundational reading fluency for many students. However, over-reliance on AI-powered text summarizers will hinder the development of sustained attention and deep

reading skills. The Critical Thinking Paradox Hypothesis states that AI tools will simultaneously present opportunities for enhanced critical thinking and risks of its erosion. When used as research partners, AI can augment critical inquiry. Conversely, the uncritical acceptance of AI-generated content will promote intellectual passivity and weaken students' ability to independently evaluate information. The Problem-Solving Trade-Off Hypothesis suggests AI's impact on problem-solving will involve a trade-off. AI-powered simulations will expose students to complex, real-world problems. This enhances their high-level modeling skills. However, the ubiquitous availability of AI tools that provide immediate, step-by-step solutions will reduce students' engagement in the fundamental process of trial-and-error and logical deduction.

3. Literature Review

This review synthesizes existing scholarship on the intersection of technology, AI, and cognitive skill development in education. It establishes the historical context. It defines key terms. It examines current research related to AI's impact on reading, critical thinking, and problem-solving.

3.1. The Evolution of Educational Technology (EdTech) to AIED

The use of technology in education is not a new phenomenon. B. F. Skinner's "teaching machines" in the 1950s proposed a form of programmed instruction that offered immediate feedback [7]. The 1960s saw the development of systems like PLATO, which introduced innovations like online forums [8]. The personal computer revolution of the 1980s and the rise of the internet in the 1990s brought digital content and connectivity to the forefront. This led to Learning Management Systems and educational software. The transition from traditional EdTech to AI in Education (AIED) marks a qualitative leap. Older EdTech often presented static or pre-programmed content. AIED systems are characterized by their ability to adapt, personalize, and generate [9]. This shift is primarily driven by advances in machine learning (ML), natural language processing (NLP), and data analytics. Instead of following a fixed decision tree, AIED systems can analyze vast amounts of student interaction data. They can infer knowledge gaps, predict performance, and dynamically adjust the learning path. This move from a one-size-fits-all model to a one-to-one model represents the core promise of AIED.

3.2. Defining Artificial Intelligence in the Education

For the purpose of this paper, AI in education is not a single technology. It is an umbrella term encompassing several key applications. Intelligent Tutoring Systems (ITS) aim to

replicate the benefits of a human tutor. They provide personalized instruction and targeted feedback [10]. Adaptive Learning Platforms use AI algorithms to adjust the entire curriculum pathway for a student. They create a unique learning journey for each user. Generative AI and Large Language Models (LLMs) are the most recent and disruptive form of AI in education. LLMs like OpenAI's GPT-4 can understand and generate sophisticated, human-like text [11]. Their versatility makes their impact incredibly broad. AI-Powered Assessment and Feedback Tools like Grammarly or Turnitin use AI to provide instant feedback on writing. Other systems can automatically grade certain types of assignments. The literature review will now examine the documented and theorized impacts of these types of AI on the three core cognitive skills.

3.3. AI's Impact on Reading Skills

Reading is the gateway to learning. AI's influence here is particularly pronounced and dualistic. A significant body of research points to the benefits of AI for developing foundational reading skills. AI-powered tools can offer personalized support. Applications can listen to a child read aloud and provide real-time phonetic correction [12]. Adaptive reading platforms can select texts matched to a student's current reading level [13]. The meta-analysis by Kulik & Fletcher (2016) of intelligent tutoring systems found consistently positive effects on student achievement [14]. This suggests that personalized feedback and mastery-based progression are effective. For students with learning disabilities like dyslexia, AI tools can be transformative [15]. In these contexts, AI acts as a powerful assistive technology. The advent of powerful LLMs introduces a new and more troubling dimension. Tools that can summarize a dense academic paper in seconds pose a direct challenge to the practice of deep reading. Wolf (2018), in *Reader, Come Home*, argues that the "digital brain" is developing a bias for speed over the slow, immersive process of deep reading [16]. This type of reading is about building mental models and critically engaging with an argument. The danger is that students may use AI summarizers as a substitute for actual reading. This cognitive offloading of the "work" of reading may prevent the development of neural pathways associated with sustained attention and inferential reasoning [17]. If students only ever engage with pre-digested summaries, they risk losing the ability to grapple with ambiguity and nuance in original texts. This aligns with the H1 hypothesis. It suggests that while AI may build a better "on-ramp" to reading, it may also inadvertently close the door to its highest levels.

3.4. AI's Influence on Critical Thinking

Critical thinking is often cited as one of the most important skills for the 21st century. Its development is complex. Its relationship with AI is deeply paradoxical. In its ideal applica-

tion, AI can be a formidable tool for enhancing critical thinking. LLMs can function as sophisticated research assistants. They can rapidly scan and synthesize vast amounts of information. A student could ask an AI to present the main arguments for and against Keynesian economics. This can accelerate the information-gathering phase of research, allowing students to spend more time on analysis [18]. Furthermore, AI can be programmed to act as a “Socratic partner.” An AI tutor could be designed not to give answers but to ask probing questions [19]. This dialectical process is at the heart of critical thinking. The primary risk to critical thinking comes from the uncritical acceptance of AI-generated output. LLMs are designed to produce plausible and confident-sounding text, regardless of its factual accuracy. The phenomenon of “AI hallucination,” where a model invents facts, is well-documented [20]. A student who trusts an AI’s output without verification is not practicing critical thinking. They are engaging in intellectual outsourcing. This problem is compounded by the inherent biases present in the data used to train AI models. AI systems can perpetuate and even amplify societal biases [11]. A critical thinker must be able to identify and question these biases. If students are not taught to treat AI as an unreliable narrator, they may learn to accept its outputs as authoritative truth. Moreover, the ability of AI to generate entire essays threatens to short-circuit the entire process of critical thinking. When the product can be generated without the process, the educational value is lost. This supports the H2 hypothesis. It shows the fine line between using AI as a tool for inquiry and succumbing to it as an oracle.

3.5. AI’s Role in Developing Problem-Solving Abilities

Problem-solving is a process that moves from a given state to a goal state. It involves understanding the problem, devising a plan, carrying out the plan, and looking back [5]. AI intervenes at each of these stages. It has both constructive and destructive potential. One of the most promising applications of AI in problem-solving is the creation of complex, dynamic simulations. In fields like science and engineering, AI can generate realistic virtual environments. Students can tackle problems that would be too costly or impractical to address in the real world [21]. These “microworlds” allow students to engage in hypothesis testing and observe the consequences of their actions. This type of experiential learning can cultivate a deep, intuitive understanding of problem-solving. This aligns with the augmentation side of the H3 hypothesis. AI can also provide adaptive scaffolding within these simulations. The primary threat to problem-solving skills comes from AI tools that focus on the product at the expense of the process. Platforms like WolframAlpha and now generative AI models can provide step-by-step solutions to complex problems instantly. Over-reliance on them can be detrimental. The cognitive struggle involved in finding a solution is where most of the

learning happens. This “desirable difficulty” forces students to retrieve prior knowledge and build mental resilience [6]. When an AI provides the entire solution path, it robs the student of this essential experience. They may learn to follow a procedure but fail to develop the strategic thinking required to solve novel problems. This is particularly concerning in fields like computer programming. A novice programmer who relies on a tool like GitHub Copilot may learn how to prompt the AI but not how to think like a programmer.

3.6. Synthesis of Gaps in the Literature

The existing literature addresses the impact of specific AI tools on specific skills. There are several notable gaps. First, much of the research predates the widespread availability of powerful generative AI. Its disruptive potential is still undertheorized. Second, there is a lack of longitudinal research tracking the long-term effects of sustained AI use on cognitive development. Third, few studies have explicitly examined the interconnected cascade effect. This is how a deficit in one AI-affected skill might trigger deficits in others. This paper aims to address this third gap in particular. It analyzes the triad of skills as an integrated system rather than as discrete components.

4. Conceptual Framework and Methodology

4.1. Methodological Approach

This article employs a conceptual analysis and literature synthesis methodology. Its contribution lies in the systematic organization and interpretation of existing academic literature, industry reports, and theoretical arguments. The “data” for this study are the findings and theories presented in the peer-reviewed papers. The analytical process involves several steps. First is categorization, which groups the impacts of AI according to the three core cognitive skills. Second is dichotomization, structuring the analysis around the central tension between positive and negative impacts. Third is synthesis, which develops a unifying conceptual framework to explain this tension. The final step is extrapolation, which draws logical implications and formulates recommendations based on the synthesized analysis. This approach is appropriate for a field that is evolving as rapidly as AIED. A conceptual map is needed to make sense of disparate findings and guide future empirical research.

4.2. The “Cognitive Augmentation vs. Cognitive Atrophy” Framework

To structure the analysis and discussion, this paper proposes the “Cognitive Augmentation vs. Cognitive Atrophy” framework. This framework posits that any given AI educa-

tional tool can be placed on a spectrum. Its place is based on how it interacts with a student's cognitive processes. Cognitive augmentation refers to tools and practices on one end of the spectrum. These tools enhance and extend human cognitive abilities. They handle lower-order tasks to free up mental resources for higher-order thinking. They act as cognitive partners, simulators, and scaffolds. An augmentation-focused approach makes the human user more capable even when the tool is taken away. Cognitive atrophy refers to tools and practices on the other end of the spectrum. These tools lead to the weakening or loss of skills through disuse. They achieve this through cognitive offloading. A task that is es-

sential for skill development is outsourced to the machine. They function as “black box” answer engines that bypass the learning process. An atrophy-focused approach makes the user dependent on the tool, and less capable in its absence. The key determinant of where a tool falls on this spectrum is often the pedagogy surrounding its use, not the technology itself. For example, using ChatGPT to generate a draft that is then critically analyzed and rewritten by the student is an augmentation practice. Using ChatGPT to generate a final draft that is submitted with minimal changes is an atrophy practice. This framework will be used in the following discussion to analyze AI's impact on each core skill.

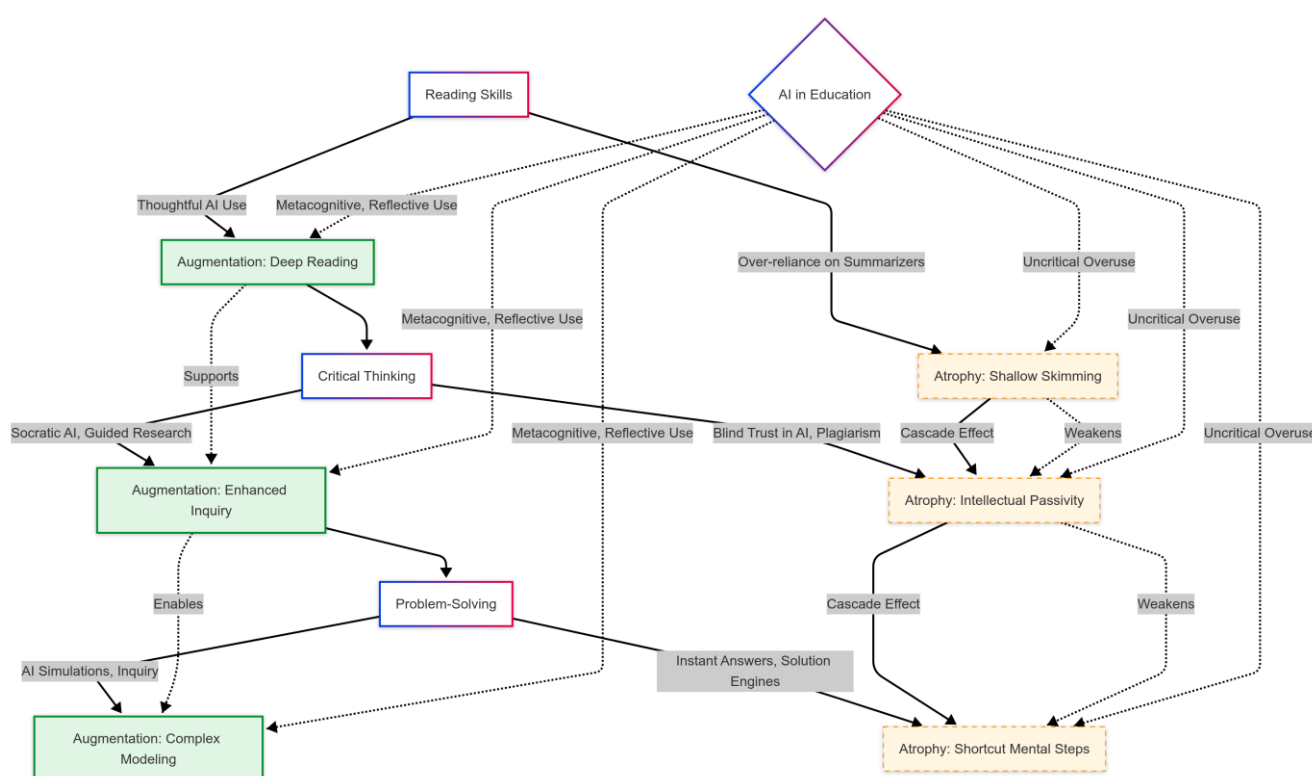


Figure 1. Dual Effects of AI in Education: Augmentation versus Atrophy on Students' Reading, Critical Thinking, and Problem-Solving Skills.

5. Analysis and Discussion

This section applies the “Cognitive Augmentation vs. Cognitive Atrophy” framework. It analyzes the evidence from the literature review. It explores the nuanced impacts of AI on the core cognitive triad.

5.1. The Dual Impact on Reading: Deep Dives vs. Shallow Skims

The H1 hypothesis proposed a bifurcated effect on reading. The analysis strongly supports this. AI's role in reading instruction perfectly illustrates the augmentation/atrophy

framework. As a form of cognitive augmentation, AI-powered adaptive readers are a clear example. They provide scaffolding that is precisely tailored to the learner's needs. They manage the difficulty of the text and provide real-time support with vocabulary. These tools reduce extraneous cognitive load [22]. This allows the student to focus their mental energy on comprehension. For struggling readers, this is not a shortcut. It is a necessary support structure that enables them to build fluency and confidence. The AI is not doing the reading for the student. It is creating the optimal conditions for the student to read. As a form of cognitive atrophy, the uncritical use of AI text summarizers represents a significant risk. The act of reading a complex text involves more than just extracting the main points. It involves following a sustained line of argument and building a rich

mental schema. When a student outsources this entire process to an AI, they are skipping the cognitive workout that builds these deep reading abilities. The danger is the cultivation of a “TL;DR” (Too Long; Didn’t Read) mindset. If students become habituated to this form of shallow information processing, their capacity for sustained attention may diminish. A citizen who cannot comprehend a complex legal document or a challenging work of literature is less equipped to participate fully in a democratic society. The atrophy here is not just of a skill, but of civic and intellectual capacity.

5.2. The Critical Thinking Paradox: Enhanced Inquiry vs. Intellectual Passivity

The H2 hypothesis posited a paradox in AI’s influence on critical thinking. This claim is central to the educational debate. The distinction between AI as a tool for inquiry and AI as a source of truth is paramount. As cognitive augmentation, a pedagogy would treat AI as a “cognitive sparring partner.” A teacher might instruct students to use an AI to generate an argument for a position they disagree with. The student’s task would then be to deconstruct that argument and formulate a robust rebuttal. In this scenario, the AI is used to catalyze the process of critical thinking. It helps the student see multiple sides of an issue. As cognitive atrophy, the path is paved with intellectual passivity. This occurs when the student’s relationship with the AI shifts from one of interrogation to one of transcription. When a student asks an LLM to write an essay and accepts the output uncritically, they have offloaded the entire thinking process. This practice is pernicious for two reasons. First, AI output is not inherently reliable. It can be biased or inaccurate. The student who does not develop the habit of verification is learning to be gullible. Second, even if the AI’s output is correct, the student has bypassed the struggle that builds critical thinking muscles. The ability to structure an argument and weigh evidence is developed through practice. AI-driven plagiarism is not just an academic integrity issue. It is a pedagogical failure.

5.3. The Problem-Solving Dichotomy: Complex Modeling vs. Instant Gratification

The H3 hypothesis suggested a trade-off in problem-solving. This dichotomy is especially clear in STEM fields. As cognitive augmentation, AI excels at creating complex, dynamic systems for students to interact with. These AI-powered “microworlds” provide a space for authentic, inquiry-based problem-solving. A student could ad-

just variables in a simulation and the AI could model the long-term effects. The student is not given an answer. They are given a world to experiment in. Their role is to form hypotheses, test them, and learn from feedback. This develops higher-order problem-solving skills like systems thinking and strategic planning. As cognitive atrophy, the “solution vending machine” model of AI poses the greatest threat. When a student is stuck on a math problem and immediately turns to an app for the solution, they are choosing immediate relief over long-term learning. The frustration and struggle of being stuck are a critical part of the problem-solving process. It is where students learn perseverance and creativity. An AI providing the complete solution path can create an “illusion of competence.” The student may look at the solution and think it makes sense, but they have not learned how to generate that path on their own. They have followed a map but have not learned how to navigate. If a student never learns to solve an algebraic equation by hand, they will lack the fundamental building blocks for higher-level mathematics.

5.4. The Interconnected Cascade: How Weakness in One Skill Affects Others

Perhaps the most crucial insight from this analysis is that the impacts on these three skills are not isolated. They are part of an interconnected cognitive system. A weakness in one area can trigger a cascade of negative effects. Consider the following chain of events, enabled by the misuse of AI. First, reading atrophy occurs. A student is assigned a dense historical text but uses an AI summarizer instead of reading it deeply. Their engagement is superficial. Second, this impacts critical thinking. The student is then asked to write a critical analysis of the text. Their raw material is a shallow summary, so their ability to think critically is hamstrung. They cannot evaluate evidence they haven’t seen. Third, this impacts problem-solving. The student is given a complex problem that requires applying lessons from the text. They never truly understood the model and never critically analyzed its components. They are unable to even begin to structure the problem. Their only recourse is to feed the new problem back into an AI, perpetuating the cycle of cognitive dependency. This cascade demonstrates that cultivating these skills requires a holistic approach. An educational strategy that allows for the atrophy of deep reading will inevitably undermine its own efforts to teach critical thinking and problemsolving. The skills are a three-legged stool. If AI is allowed to saw through one leg, the entire structure becomes unstable.

Table 1. AI’s Augmentation vs. Atrophy Effects on Core Cognitive Skills.

Skill	Augmentation (Positive Impact)	Atrophy (Negative Impact)
Reading	Personalized adaptive platforms enhance deep	Over-reliance on summarizers leads to shallow

Skill	Augmentation (Positive Impact)	Atrophy (Negative Impact)
	comprehension and fluency (e.g., real-time support for vocabulary and text difficulty).	skimming, reduced sustained attention, and loss of inferential reasoning.
Critical Thinking	AI as a Socratic partner or research assistant accelerates inquiry and exposes multiple perspectives (e.g., generating counterarguments for analysis).	Uncritical acceptance of AI output promotes intellectual passivity, biases, and hallucinations, bypassing evidence evaluation.
Problem-Solving	Simulations and microworlds enable complex modeling and hypothesis testing in safe environments.	Instant solution engines create dependency, shortcut trial-and-error, and foster an "illusion of competence" without strategic thinking.

6. Implications and Recommendations

The analysis makes it clear that the central challenge of AI in education is to cultivate a culture of mindful, critical, and strategic use. The following recommendations are offered to key stakeholders.

6.1. For Educators and Pedagogical Practice

Educators must shift from product to process. Assessment must evolve. Instead of grading only the final essay, educators should design assignments that make the student's process visible. This could include submitting an "AI usage report" or annotated drafts. Educators should teach AI literacy explicitly. AI literacy should be a core competency. This includes teaching students how LLMs work, their limitations, and the ethics of AI use. Educators should also design AI-resistant assignments. These problems often involve personal reflection or in-class activities. Conversely, they should design assignments that require the strategic use of AI as a tool for brainstorming or data analysis. Teachers should model the behavior they want to see. They can use AI tools transparently in the classroom, verbalizing their thought process.

6.2. For Policymakers and Educational Institutions

Institutions must invest in professional development. Teachers cannot be expected to navigate this new terrain without support. Institutions must invest heavily in high-quality, ongoing professional development. Schools and districts need clear and flexible academic integrity policies that address AI. These policies should focus on ethical use rather than outright prohibition. The goal should be to define the line between using AI as a legitimate tool and using it for plagiarism. Policymakers must also address the equity gap. The "AI divide" is a new facet of the digital divide. Access to premium AI tools and the knowledge to use them effectively will not be evenly distributed. Policymakers must en-

sure that the integration of AI does not exacerbate existing inequalities.

6.3. For AI Developers

Developers should collaborate with educators to build tools that are pedagogically sound. Instead of creating simple "answer engines," they should focus on tools that scaffold learning and encourage inquiry. For example, an AI math tutor could be designed to prompt a student to explain their reasoning. AI tools should be designed to be more transparent about their limitations. They should cite their sources whenever possible. They should express uncertainty when appropriate. They should make it easier for users to understand the provenance of the information provided.

6.4. For Students

Students must be encouraged to think about their own thinking. Before turning to an AI, they should ask themselves what skill a task is meant to develop. They should consider if they are using the tool to learn that skill or to avoid it. Students should adopt the mindset that they are the ultimate authority. They are responsible for anything they submit. An AI can be a junior writer, but the student is the editor-in-chief who must check every fact and own the final product. Students should learn the value of "unplugging" to engage in deep thinking. Building the mental discipline to work without technological aids is a crucial skill in itself.

7. Limitations and Directions for Future Research

This article, as a conceptual analysis, has several limitations that point toward avenues for future research. The arguments presented are based on a synthesis of existing research and logical extrapolation. They need to be tested through rigorous empirical studies. The capabilities of AI are evolving at a staggering pace. Any analysis is a snapshot in time. The impact of AI is also highly dependent on the context. Future research should prioritize longitudinal studies.

These would track a cohort of students over several years to measure the long-term effects of AI integration. Comparative experimental studies are needed to test different pedagogical approaches to using the same AI tool. Neuroscientific research could investigate how the brain adapts to sustained interaction with AI tools. Qualitative studies could explore the lived experiences of students and teachers.

8. Conclusion

The integration of Artificial Intelligence into education is not a passing trend. It is a fundamental shift that redefines the relationship between the learner, the teacher, and knowledge itself. This article has argued that AI is a quintessential “double-edged sword.” It holds the potential for both unprecedented cognitive augmentation and debilitating cognitive atrophy. Its impact on the foundational skills of reading, critical thinking, and problem-solving is not predetermined. It is actively shaped by the choices we make about how to use it. The “Cognitive Augmentation vs. Cognitive Atrophy” framework provides a useful lens for navigating these choices. The path to augmentation lies in using AI as a scaffold, a simulator, and a Socratic partner. The path to atrophy lies in using AI as a “black box” oracle. This is a cognitive crutch that allows students to bypass essential, effortful struggles. The interconnected nature of reading, critical thinking, and problem-solving means that we cannot afford to be complacent. A failure to cultivate deep reading will starve critical thinking of its necessary fuel. This in turn will cripple the ability to solve complex problems. Ultimately, the challenge is not technological but human. It is a challenge of pedagogy, of policy, and of personal responsibility. To thrive in the age of AI, we do not need students who can get answers from a machine. We need students who can ask the right questions and critically evaluate the machine’s answers. We need them to solve the problems that machines cannot. The goal of AI in education must be to build better thinkers, not better prompters. A human-centered, pedagogically-driven approach can help us harness the power of AI. We can build a future where technology serves not to replace our intelligence, but to amplify it.

Abbreviations

AI	Artificial Intelligence
AIEd	Artificial Intelligence in Education
EdTech	Educational Technology
LLMs	Large Language Models
ITS	Intelligent Tutoring Systems
ML	Machine Learning
NLP	Natural Language Processing
TL;DR	Too Long; Didn't Read

Author Contributions

Mohammed Zeinu Hassen is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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Biography



Mohammed Zeinu Hassen is an Ethiopian philosopher and academic who earned both his Bachelor of Arts and Master of Arts degrees in philosophy from Addis Ababa University. He has taught at Aksum University and currently serves as a senior researcher at Addis Ababa Science and Technology University. Presently, he is pursuing a PhD in philosophy at the University of South Africa. His research interests encompass ethics, consciousness, human purpose, analytical philosophy, axiology, and the philosophy of science, with a strong emphasis on intercultural dialogue. Among his notable publications are "John Dewey's Philosophy of Education: A Critical Reflection" (2023), and "Cartesian Methodological Doubt Vis-à-Vis Pragmatism: An Approach to Epistemological Predicament" (2020).

Research Field

Mohammed Zeinu Hassen, Consciousness, Human purpose, Analytical philosophy, Axiology, Indigenous knowledge, Philosophy of science, Epistemology, Intercultural dialogue, Philosophy of education. AI and Public policy, Social and political philosophy.