

# New Paradigm of What Learning Outcomes Are: The Role of Generative AI

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**Abstract.** *This essay explores the transformative potential of generative AI in redefining learning outcomes and assessment practices in education. We challenge the traditional reliance on grades and standardized tests, advocating for assessments that prioritize knowledge application over recall. The essay also raises critical questions about learning accountability and equity, particularly in the context of AI's impact on underserved communities. By embracing edometrics and focusing on personalized, adaptive learning environments, we argue that AI can enhance both formative and reflective assessment processes, provided that equitable access to these technologies is ensured for all students.*

## 1. Disrupting Traditional Learning Outcomes

Integrating generative Artificial Intelligence (AI) in education has sparked profound changes, challenging long-held assumptions about learning outcomes and their assessment. Historically, education systems have relied heavily on standardized tests and summative evaluations to measure student achievement. Evaluating learning is an inherent step in any pedagogical process. Therefore, to think about education is to think about assessment. These assessments focus on what students can recall and reproduce, often at the expense of deeper cognitive skills such as critical thinking, creativity, and problem-solving. As a result, traditional methods have been criticized for their inability to capture the full range of student learning [Shute 2008].

In contrast, generative AI (Gen-AI) systems are transforming our learning process by introducing real-time, personalized feedback and adaptive learning environments. These systems go beyond simple recall, enabling a dynamic, interactive learning process that evolves alongside the learner. However, these systems also raise important questions about the relevance of traditional summative assessments, which are increasingly misaligned with the capabilities of AI-driven learning tools.

It is crucial to reconsider what learning outcomes should represent. Are they still about knowledge recall, or should they emphasize the application, synthesis, and evaluation of ideas? Moreover, the role of assessments must be redefined from tools used only for grading (assessment *of* learning) to mechanisms that facilitate the learning process itself (assessment *for* learning and/or assessment *as* learning). This shift is not just a matter of educational philosophy but a necessary evolution in the face of AI's profound capabilities in the learning process.

## 2. Are Grades Still Relevant in an AI-Driven World?

In the traditional educational system, grades have long served as the primary measure of student success. However, AI challenges the validity and relevance of grades in this new landscape. With AI now capable of producing human-like behaviour, educators must question whether grades - based on static assessments - truly reflect a student's ability or understanding in an AI-enhanced environment.

Gen-AI tools offer real-time, adaptive feedback that helps students improve their work incrementally based on their own pace. These tools can guide students through problem-solving, provide hints, and even generate solutions, making it difficult to determine the line between student effort and AI contribution [Hillmayr et al. 2020]. In such contexts, grades may become outdated and ineffective for assessing student progress.

Moreover, Gen-AI enables personalized learning experiences that adapt to each student's needs and pace. This contrasts sharply with the one-size-fits-all approach of standardized testing, which often fails to capture a student's unique learning journey [Shute 2008]. In an AI-driven world, where learning is iterative and adaptive, a single grade may no longer suffice to measure the complexity of student achievements. Instead, formative assessments, which provide ongoing feedback and focus on continuous improvement, could offer a more accurate and meaningful evaluation of student learning [Isotani et al. 2023]. Should education systems continue to rely on grades as the primary marker of student success, or is it time to explore alternative assessment methods? With AI's increasing capabilities, we must reconsider whether the traditional grading system is still fit for purpose in evaluating learning outcomes.

## 3. Rethinking Learning Accountability – Who Owns the Knowledge?

Nowadays, education raises complex questions about learning accountability and the ownership of knowledge. Traditionally, education has operated under the assumption that students are the primary owners of their learning journey, demonstrated through tests, essays, and projects that reflect their understanding and skills. While Large Language Models (LLMs) can produce grammatically correct and coherent essays, current research indicates that these texts may lack depth and critical engagement with ideas [Brown et al. 2020]. This development challenges the concept of academic ownership. If a student uses AI to generate part of their assignment, to what extent can they claim ownership of the knowledge or learning that the assignment is supposed to reflect? This situation raises questions about the boundaries between student work and machine assistance and how much AI support undermines the authenticity of student learning.

Furthermore, AI's ability to generate content raises ethical concerns regarding the transparency of learning processes. A text devoid of grammatical errors is not inherently a text of substance. Students may often rely on AI-generated solutions without fully understanding the underlying concepts. This reliance on AI risks creating a divide between knowledge ownership and performance, where students appear to have mastered material based on Gen-AI outputs but lack a deep understanding of the subject matter.

The concept of accountability in learning becomes even more complex when we consider the depth of understanding students might or might not achieve through AI tools. As Gen-AI assists or even completes tasks for students, the authenticity of their learning

is called into question. Educometrics, as proposed by [Silva 2017], offers a framework for evaluating educational data through statistical methods, focusing on pedagogical intervention and measuring deeper learning contexts and outcomes beyond just the completion of tasks. In this sense, the accountability of learning, therefore, must be reconsidered in an AI-driven world. Does the use of AI for generating responses detract from genuine learning, or does it simply reflect a new way of interacting with knowledge? Who truly owns the learning process? Moreover, how do we ensure students develop a deep understanding of the material rather than simply producing superficially polished work facilitated by AI?

#### **4. From Knowledge Recall to Knowledge Application – Does AI Make Tests Redundant?**

Traditional assessments have long emphasized knowledge recall, utilizing standardized tests and exams prioritizing memorization over critical thinking and problem-solving skills. However, with AI systems capable of providing instant access to information and generating coherent responses, the efficacy of such assessments can be increasingly questioned. AI systems can recall vast amounts of information, generate solutions, complete tasks, and even simulate creative processes. It leads us to a critical question: Does AI make traditional tests that rely on recall redundant?

The assessment process must shift from evaluating rote memorization to assessing the application of knowledge and higher-order cognitive skills. This involves designing assessments that require students to analyze, synthesize, and apply information in novel contexts - competencies that AI cannot authenticate. For example, problem-based learning tasks, case studies, and project-based assessments encourage students to engage deeply with the material, fostering critical thinking and creativity.

Integrating formative assessments plays a crucial role in this transformation. These assessments provide ongoing feedback, allowing students to identify areas for improvement and deepen their understanding. When combined with generative AI, formative assessments can be enhanced through personalized learning experiences, further demonstrating their adaptability and effectiveness in the educational process.

By transforming assessment practices to focus on knowledge application and critical thinking, educators can better prepare students for the complexities of the modern world. This shift ensures that assessments remain relevant and meaningful in an AI-enhanced educational landscape, underscoring the importance of this educational change in shaping the future of our students.

#### **5. Equity in AI – Will AI Widen or Close Learning Gaps?**

The rapid integration of AI into education brings both opportunities and challenges regarding equity. On the one hand, AI promises to personalize learning experiences, adapt to individual student needs, and provide real-time feedback, which could close existing educational gaps by offering tailored learning pathways for students from different backgrounds. On the other hand, there is a growing concern that AI may exacerbate the digital divide, particularly between students with access to advanced technologies and those from under-resourced communities. The critical question is: Will AI in education widen or close existing learning gaps?

Transforming assessments to promote equity involves several key considerations: Developing low-tech assessment solutions, culturally responsive assessment practices, professional development for educators, collaborative policy efforts, and emphasizing formative assessments.

In many parts of the world, access to the necessary technology—reliable internet, devices, and technical support—remains a significant barrier. The digital divide between urban and rural students and wealthy and low-income students threatens to widen as AI becomes more prevalent in education [Isotani et al. 2023]. In resource-constrained environments, where access to technology is limited, students may not benefit from the same AI-powered learning tools as their peers in more affluent areas. This disparity raises concerns that AI could reinforce existing inequalities rather than mitigate them.

## 6. Embracing AI to Redefine Learning Outcomes

Integrating generative AI into education offers transformative potential but raises critical concerns that demand scrutiny. Excessive personalization can lead to isolation, limiting exposure to diverse perspectives and reducing opportunities for social interaction. Over-reliance on AI may diminish the development of essential soft skills fostered through human contact, causing learners to become passive recipients rather than active participants in their education. It's crucial to remember that human interaction is irreplaceable in education. Nevertheless, what are the long-term implications of substituting some aspects of human interaction with AI-driven personalization?

Strategic interventions are necessary to mitigate educational inequality in an AI-oriented world. Governments and policymakers must urgently invest in infrastructure to provide equitable access to technology, particularly in underserved communities. Implementing inclusive policies and ethical guidelines for AI use in education is crucial to ensure that advancements benefit all learners. What role should the state play in regulating AI deployment to guarantee quality education for all, and how can public policies address the digital divide effectively?

While generative AI holds the promise of promoting equity by offering personalized learning experiences, it also raises questions about who truly benefits from accelerated feedback and customization. Could the increased reliance on AI tools further marginalize students without access to advanced technologies? Are the corporations controlling large pre-trained models genuinely committed to addressing educational inequality, or do profit motives overshadow the pursuit of equitable outcomes?

Balancing technological innovation with human-centric learning approaches is essential to avoid the consequences of excessive reliance on computational tools. Ensuring that AI enhances rather than replaces human interaction preserves the vital role of educators in developing critical thinking and social skills. Who gains and loses in this shift toward AI-driven education, and what are the potential consequences for future generations' development? **The new paradigm emphasizes continuous, adaptive, and equitable learning experiences that prioritize higher-order thinking over rote memorization, supported by advanced AI tools and fair access for all learners.**

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**Thomaz E. V. da Silva** obtained a double PhD from the Federal University of Ceará and the University of Copenhagen, Denmark, in 2017, specializing in educational assessment and educational data analysis. Since 2015, Dr. Silva has worked on public policies related to learning assessment systems in over 30 Brazilian municipalities, including Sobral-CE, a reference city in Brazilian education. He has also served as a consultant for international organizations (World Bank and OEI) in the states of Ceará and Paraná, and in the capitals Recife-PE and Salvador-BA. He is currently a senior researcher at the Center for Excellence in Social Technologies (NEES) at the Federal University of Alagoas (UFAL), where he develops high-impact technological solutions for national policies in collaboration with the Ministry of Education (MEC). Dr. Silva has published over 50 articles and books in international conferences and journals, focusing on educometrics, educational assessment, artificial intelligence in education, and public policies.