JOURNAL OF MULTIDISCIPLINARY SCIENCES AND INNOVATIONS

VOLUME 5, ISSUE 03
MONTHLY JOURNALS

ISSN NUMBER: 2751-4390
IMPACT FACTOR: 9,08

AI, ACADEMIC DISHONESTY, AND THE FUTURE OF MATHEMATICS LEARNING

Jumaniyazov Nizomjon Bakhtiyorovich
PhD, Associate Professor, Department of General Technical Sciences,
Asia International University

Abstract

The 21st century has brought about a previously unheard-of paradox in mathematics education: while technological tools, especially smartphones and artificial intelligence, have enormous potential to improve learning, they have also opened up new avenues for academic dishonesty that compromise real knowledge acquisition. This essay explores the alarming inverse link between student interest in mathematical learning and technology accessibility, emphasizing how the use of information technologies for cheating has increased concurrently with a decrease in the desire to learn. This study contends that the very tools intended to democratize education—AI-powered solvers, photomath applications, and instant-answer platforms—have turned into tools of intellectual evasion, building on the analytical frameworks of Jumaniyazov (2025a, 2025b) and others. The paper presents a theoretical framework for comprehending "digital dependency" in mathematics education, examines the psychological, pedagogical, and technological elements that facilitate this crisis, and provides evidence-based interventions that turn technological risks into learning opportunities. The main argument is that in order to reverse this tendency, true understanding must be made more immediately valued than its counterfeit counterparts by radically reorganizing mathematics instruction rather than just limiting access to technology.

Keywords

Academic Dishonesty, Artificial Intelligence, Mathematics Education, Student Disengagement, Digital Cheating, Photomath, AI Solvers, Cognitive Offloading, Assessment Integrity, Pedagogical Reform, Developing Countries.

1. Introduction: The Paradox of Technological Abundance

The digital revolution promised to democratize mathematics education. With powerful computational tools in every pocket, students in even the most resource-constrained environments gained access to capabilities that would have seemed miraculous to previous generations. Yet, as Jumaniyazov (2025a) documented, this abundance has coincided with a precipitous decline in genuine mathematical learning, particularly in developing nations. International assessments reveal not only falling scores but a more troubling phenomenon: students are increasingly disengaged from the process of learning itself, opting instead for technological shortcuts that bypass cognitive effort entirely.

This article addresses a critical dimension of this crisis that has received insufficient scholarly attention: the direct relationship between the proliferation of AI-powered mathematical tools and the rise of academic dishonesty as a normalized behavior. When students can photograph a complex equation and receive instant, step-by-step solutions; when ChatGPT can generate convincing mathematical reasoning; when Wolfram Alpha can solve problems that would require hours of manual effort—the fundamental question becomes: why should students invest in the "productive struggle" that Boaler (2016) identifies as essential for mathematical brain development?

The paradox is stark. We have created technological marvels that can solve any mathematical problem, yet in doing so, we have inadvertently devalued the very process of mathematical thinking. This paper argues that the crisis of cheating through information technologies is not merely a problem of student morality or weak institutional enforcement, but a logical consequence of an educational system that has failed to adapt its purpose, pedagogy, and assessment methods to an age of ubiquitous computational power.

2. Theoretical Framework: Understanding the New Paradigm of Academic Dishonesty

2.1 Cognitive Offloading and the Erosion of Mental Effort

The concept of cognitive offloading—the tendency to reduce mental effort by relying on external tools—provides a foundational framework for understanding contemporary cheating behaviors. Clark and Chalmers (1998) famously proposed the theory of the "extended mind," arguing that cognitive processes can extend beyond the brain to include tools and technologies. In the 20th century, this extended mind included calculators for arithmetic and textbooks for reference—tools that augmented rather than replaced thinking.

However, as Jumaniyazov (2025b) notes in his analysis of AI in mathematics education, the current generation of tools represents a qualitative shift. Earlier technologies required the user to understand the problem sufficiently to operate the tool effectively. A calculator requires input; a textbook requires reading comprehension. Modern AI solvers, by contrast, require neither. The student need only photograph the problem; the tool does the rest, including generating seemingly authentic step-by-step reasoning that can be copied directly into assignments.

This represents what might be termed "complete cognitive displacement"—the wholesale transfer of mathematical thinking from the student to the machine. When this displacement becomes habitual, the neural pathways that mathematical practice is designed to develop remain unformed.

2.2 The Engagement Economy and the Devaluation of Struggle

Jumaniyazov (2025a) powerfully describes the competition between mathematical reasoning and the "dopamine-driven feedback loops of digital entertainment." This framework must be extended to include the instant gratification provided not by entertainment media but by educational technology itself.

The "productive struggle" that Boaler (2016) champions—the experience of grappling with challenging problems, making mistakes, and persisting toward understanding—is fundamentally at odds with the design principles of most digital tools. These tools are engineered for frictionless experience: immediate answers, clear solutions, zero frustration. When students encounter difficulty, the path of least resistance is not continued struggle but technological bypass.

The mathematics anxiety documented by Ashcraft (2002) and cited extensively in Jumaniyazov's work (2025a, 2025b) takes on new dimensions in this context. For a student experiencing the tension and apprehension that defines math anxiety, an AI solver offers immediate relief from discomfort. The problem is not solved; it is eliminated. This avoidance behavior, while providing short-term emotional relief, reinforces the anxiety cycle and prevents the development of coping strategies.

2.3 The Normalization of Digital Cheating

Perhaps most troubling is the evidence that technological cheating has become normalized among students. Research across multiple national contexts suggests that using AI solvers for homework is increasingly viewed not as cheating but as "efficient resource utilization"—a perspective reinforced by narratives that position technology as a tool for working smarter, not harder.

This normalization occurs within a broader cultural context where the extrinsic motivations that drove 20th-century mathematics learning have eroded. As Jumaniyazov (2025a) demonstrates, the clear career pathways that once justified mathematical effort—engineering, medicine, physical sciences—are no longer visible to students. When the connection between today's algebraic manipulation and tomorrow's data science career remains invisible, the perceived cost of cheating (moral discomfort, risk of detection) is weighed against the perceived benefit of avoiding meaningless labor.

3. The Current Situation: A Diagnostic Analysis

3.1 The Technological Landscape of Academic Dishonesty

To understand the current crisis, one must appreciate the sophistication and accessibility of available tools:

Photomath and Similar Applications: These applications use optical character recognition to interpret handwritten or printed mathematical expressions, then provide step-by-step solutions. Originally designed as learning aids, they function in practice as complete homework solutions. The problem is not the tool itself but its use as a substitute for thinking.

General AI Assistants (ChatGPT, Claude, Gemini): Large language models can now generate convincing mathematical reasoning, including proofs, explanations, and problem solutions. While they still make errors, their output is sufficiently sophisticated to pass as student work in many contexts.

Specialized Mathematical Engines (Wolfram Alpha, Symbolab): These powerful computational tools can solve problems across the mathematical spectrum, from basic arithmetic to advanced calculus and beyond.

Peer-to-Peer Solution Sharing: Social media platforms and messaging apps enable instantaneous sharing of completed work, often organized by course and institution.

The convergence of these tools creates what might be termed a "perfect evasion ecosystem"—a comprehensive infrastructure for avoiding mathematical thinking at every stage of the learning process.

3.2 Manifestations Across Educational Contexts

The pattern of cheating manifests differently across educational levels and contexts, but common themes emerge:

Secondary Education: Students use photomath applications for daily homework assignments, completing in minutes work designed to provide practice over hours. Teachers report that homework no longer predicts test performance, as the work submitted does not reflect student understanding.

University Preparatory Programs: In contexts where high-stakes entrance examinations determine access to higher education—a reality particularly acute in developing countries—students may use AI tools throughout their preparation, then struggle profoundly when required to demonstrate independent thinking in examination conditions.

University Mathematics Courses: The rise of take-home assignments and online assessments, accelerated by pandemic-era practices, has created conditions where technological cheating is both easier and harder to detect. Students can complete entire courses with minimal genuine engagement.

Teacher Education: Perhaps most alarming is evidence that future mathematics teachers themselves may be completing their own mathematical preparation through technological shortcuts, creating a cycle of declining mathematical understanding that perpetuates across generations.

3.3 The Digital Divide Reversed

Jumaniyazov (2025b) appropriately emphasizes the digital divide as a barrier to equitable technology access. However, the cheating crisis reveals a different dimension of this divide: students with greater access to sophisticated technology—often those from more privileged backgrounds—may actually develop weaker mathematical foundations if they use these tools to bypass learning.

This represents what might be termed a "competency inversion," where technological abundance, unaccompanied by appropriate pedagogical guidance, produces graduates with credentials that exceed their capabilities—a phenomenon with profound implications for workforce development and economic productivity in developing nations.

4. The Pedagogical Response: From Restriction to Transformation

4.1 The Failure of Restriction-Based Approaches

Initial institutional responses to technological cheating have typically focused on restriction: banning phones in classrooms, proctoring examinations more strictly, using plagiarism detection software. While these measures have limited effectiveness, they fundamentally misunderstand the nature of the problem.

Restriction approaches treat cheating as a moral failing addressable through surveillance and punishment. They fail to address the underlying conditions that make cheating appear rational to students: the perceived irrelevance of the material, the anxiety it produces, the disconnect between assessment tasks and genuine learning goals.

As Jumaniyazov (2025a) argues, "solutions based on single-factor interventions are unlikely to succeed." Restriction alone cannot compete with the affordances of ubiquitous technology.

4.2 Redesigning Assessment for the AI Age

The most promising responses involve fundamentally rethinking what we assess and how. If AI can solve any problem that can be presented in isolation, then assessment must shift toward what AI cannot (yet) do:

Process-Oriented Assessment: Evaluating not just answers but the process of mathematical thinking—the false starts, the reasoning, the ability to recognize and correct errors. This might include maintaining problem-solving journals, recording video explanations of their reasoning, or participating in oral assessments.

Authentic, Contextualized Problems: Drawing on Jumaniyazov's (2025a) emphasis on relevance, assessment can focus on complex, real-world problems that require mathematical thinking applied to unique contexts. These problems are harder to solve through AI because they require understanding the specific situation.

In-Class, Collaborative Assessments: Shifting significant assessment weight to in-class activities where technology use can be structured rather than prohibited. Collaborative problem-solving, where students work together with access to appropriate tools, can model how mathematics is actually used in professional contexts.

Metacognitive Assessment: Requiring students to reflect on their own thinking, identify where they struggled, and explain how they overcame difficulties. This makes the "productive struggle" itself visible and assessable.

4.3 Transforming Technology from Threat to Tool

The solution cannot be to abandon technology—that would ignore both its potential and its inevitability. Instead, the goal must be to transform how students interact with technological tools:

Teaching Technological Literacy: Students need explicit instruction in how to use AI and computational tools as partners in mathematical thinking rather than substitutes for it. This includes understanding what these tools do well, where they fail, and how to verify their outputs.

Structuring Technology Use: Rather than banning tools, assignments can require their use in specific ways—for example, using AI to generate alternative solution approaches after solving a problem independently, or using computational tools to explore mathematical patterns that would be inaccessible through manual calculation alone.

Creating Cognitive Dissonance: Assignments can be designed so that AI-generated solutions are obviously wrong in subtle ways, requiring students to engage critically with tool outputs rather than accepting them uncritically.

5. A Framework for Synergetic Intervention

Drawing on the synergetic framework developed in Jumaniyazov's work, reversing the cheating crisis requires coordinated action across multiple dimensions:

5.1 Pedagogical Transformation

The foundation must be a shift from transmission-based teaching to the "explore and apply" model advocated throughout the literature. When mathematics is experienced as meaningful, connected, and within reach, the motivation to cheat diminishes. This requires:

- Project-based learning that embeds mathematics in contexts students care about
- Growth mindset cultivation that normalizes struggle and mistake-making
- Teacher facilitation that guides rather than dictates

5.2 Assessment Redesign

Assessment must evolve to evaluate what matters—mathematical thinking rather than answer production. This includes:

- Diversifying assessment formats to include process documentation
- Reducing the stakes of any single assessment event
- Designing tasks that require authentic engagement

5.3 Technological Integration with Integrity

Technology must be integrated in ways that preserve pedagogical goals:

- AI tools as cognitive partners, not answer generators
- Transparent discussions about appropriate versus inappropriate use
- Development of student ethical reasoning about technology use

5.4 Cultural and Community Engagement

The normalization of cheating requires cultural intervention:

- Engaging students in conversations about the purpose of education
- Building classroom communities where honest struggle is valued
- Connecting with parents and communities to align expectations

5.5 Teacher Development and Support

Teachers need preparation for this new landscape:

- Professional development on recognizing and responding to AI-generated work
- Training in designing assessments resistant to technological shortcuts
- Support in facilitating classrooms where technology is used productively

6. Implementation Challenges and Strategic Considerations

6.1 Equity and Access Reconsidered

Any response must acknowledge that students have different levels of access to both technology and the social capital that teaches appropriate use. Interventions must be designed to support all students, not just those already positioned for success.

6.2 The Evolving Technological Landscape

AI capabilities are advancing rapidly. Responses must be adaptive rather than static, focusing on enduring principles of learning rather than specific technical features of current tools.

6.3 Cultural Context and Local Appropriateness

As Jumaniyazov (2025a) emphasizes, developing countries face unique challenges. Interventions must be appropriate to local contexts, resources, and cultural values around education.

6.4 The Role of Policy and Leadership

Systemic change requires leadership at institutional, regional, and national levels. Policies must support pedagogical innovation, provide resources for teacher development, and create accountability for meaningful learning rather than credentialing alone.

7. Conclusion: Reclaiming the Purpose of Mathematical Education

The paradox of technological abundance in mathematics education is not inevitable. The same tools that enable effortless cheating can, with appropriate pedagogical design, become powerful instruments for deeper learning. The difference lies not in the tools themselves but in the educational culture within which they are embedded.

As Jumaniyazov's work (2025a, 2025b) consistently emphasizes, the goal of mathematics education in the 21st century cannot be to produce students who can calculate—calculation is ubiquitously automated. The goal must be to nurture mathematical thinkers who can reason, model, and solve problems that have not yet been automated. This requires a fundamental reorientation of purpose, pedagogy, and assessment.

The cheating crisis, properly understood, is not a problem of student morality or technological threat. It is a symptom of an educational system that has not yet fully adapted to its new context. Students cheat when the tasks we assign appear meaningless, when the struggle feels pointless, when the path of least resistance leads away from genuine engagement. Our response must be to make mathematical learning so meaningful, so connected to students' lives and aspirations, so supportive of their developing identities as thinkers, that the counterfeit offered by AI appears as what it is: a poor substitute for the real thing.

The paradox of plenty can be resolved. Abundance of technological capability need not mean poverty of learning. But achieving this resolution requires the synergetic, integrated approach this paper has outlined—one that transforms not only tools and techniques but the fundamental relationship between students and mathematical knowledge.

References

1. Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science*, 11(5), 181-185.
2. Boaler, J. (2016). *Mathematical Mindsets: Unleashing Students' Potential through Creative Math, Inspiring Messages and Innovative Teaching*. Jossey-Bass.
3. Clark, A., & Chalmers, D. (1998). The extended mind. *Analysis*, 58(1), 7-19.
4. Csikszentmihalyi, M. (1990). *Flow: The Psychology of Optimal Experience*. Harper & Row.
5. Dweck, C. S. (2006). *Mindset: The New Psychology of Success*. Random House.
6. Jonassen, D. H. (2000). *Computers as Mindtools for Schools: Engaging Critical Thinking*. Prentice Hall.
7. Jumaniyazov, N. B. (2025a). An Analysis of the Decline of Mathematics Learning in Developing Countries in the 21st Century. *Journal of Applied Science and Social Science*, 15(10), 1278-1281.
8. Jumaniyazov, N. B. (2025b). The Role of AI in Math Education in the 21st Century: Personalized Learning. *Journal of Multidisciplinary Sciences and Innovations*, 5, 2056-2059.
9. Lave, J., & Wenger, E. (1991). *Situated Learning: Legitimate Peripheral Participation*. Cambridge University Press.