IS EDUCATION FALLING INTO THE AUTOMATION ABYSS? WHY STRUGGLE AND HUMAN CONNECTION IS ESSENTIAL FOR LEARNING IN AN AI-DRIVEN WORLD

This article explores the growing dependency on artificial intelligence in education and introduces the concept of the “automation abyss”, a new digital divide separating learners who retain agency from those who rely on AI-mediated experiences.

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MY RESEARCH AND CLASSROOM EXPERIENCE SUGGEST WE'RE APPROACHING WHAT I CALL THE "AUTOMATION ABYSS" WHICH A FUNDAMENTAL TRANSFORMATION IN HOW HUMANS LEARN AND DEVELOP SKILLS.

ABSTRACT

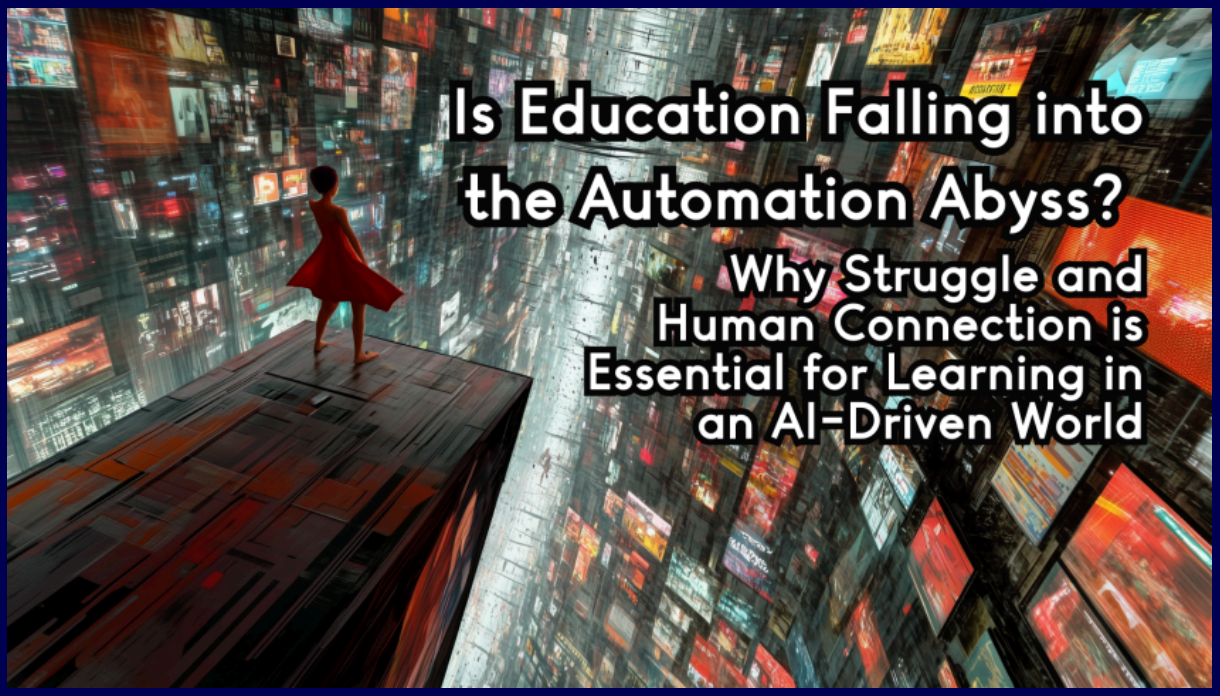
This article explores the growing dependency on artificial intelligence in education and introduces the concept of the "automation abyss", a new digital divide separating learners who retain agency from those who rely on AI-mediated experiences. Drawing on classroom observations, research on the Budding Botanist Paradox, and studies such as the Penn AI tutoring trial, the author argues that automation is not just improving efficiency but eroding core learning processes like struggle, inquiry, and human connection. The rise of tools like DeepSeek and the broader AI land rush reflect a transformation in the control of educational infrastructure, echoing historical shifts like the railroad boom.

Through examples from coursework and digital citizenship training, the article highlights a concerning feedback loop: teachers, students, and edtech companies increasingly use AI to replace, rather than support, authentic learning. To address this, the author proposes a framework centered on human checkpoints, critical reflection on automation, and self-awareness in technology use. Ultimately, the article calls for a shift toward "augmented pedagogy" that enhances rather than automates the learning experience. Without deliberate design to preserve struggle and inquiry, education risks losing its human core in the face of accelerating AI development.

QUESTION TO YOU

If we design learning environments that eliminate struggle through automation, are we also automating away the very experiences that shape resilience, creativity, and independent thought?

Is Education Falling into the Automation Abyss? Why Struggle and Human Connection is Essential for Learning in an AI-Driven World



Abstract

This article explores the growing dependency on artificial intelligence in education and introduces the concept of the "automation abyss", a new digital divide separating learners who retain agency from those who rely on AI-mediated experiences. Drawing on classroom observations, research on the Budding Botanist Paradox, and studies such as the Penn AI tutoring trial, the author argues that automation is not just improving efficiency but eroding core learning processes like struggle, inquiry, and human connection. The rise of tools like DeepSeek and the broader AI land rush reflect a transformation in the control of educational infrastructure, echoing historical shifts like the railroad boom. Through examples from coursework and digital citizenship training, the article highlights a concerning feedback loop: teachers, students, and edtech companies increasingly use AI to replace, rather than support, authentic learning. To address this, the author proposes a framework centered on human checkpoints, critical reflection on automation, and self-awareness in technology use. Ultimately, the article calls for a shift toward "augmented pedagogy" that enhances rather than automates the learning experience. Without deliberate design to preserve struggle and inquiry, education risks losing its human core in the face of accelerating AI development.

In my coursework and research… more often in recent times, I watched a familiar scene unfold, one that reminded me of Mr. Miyagi's (Pat Morita's character in 80's film, Karate Kid) wisdom about learning through doing. A student, faced with a complex problem, reached for ChatGPT rather than struggling through the fundamentals. It's a pattern I've observed intensifying over twenty years of teaching with technology: the shift from technology as a tool to technology as a substitute for essential learning processes. While AI and automation offer unprecedented efficiency in education, my research and classroom experience suggest we're approaching what I call the "automation abyss" a fundamental transformation in how humans learn and develop skills. The traditional digital divide of access to technology is evolving into something more subtle: a divide between those who maintain agency over their learning and those who become dependent on AI-mediated experiences. This shift, accelerated by powerful language models and automated learning tools, raises crucial questions about the future of human learning and development. In one of my first blog posts on this website in 2019, I started to put into words just how automation was going to start molding how we teach and learn. Some of the concepts and concerns here have become much more pronounced in the last 6-7 years.

The Digital Divide becomes the Automation Abyss

Drawing from my extensive work in digital citizenship and educational technology, I've observed a profound shift in how we think about the digital divide. While we once focused primarily on access to technology and digital literacy skills, we now face a more complex challenge that I call the

“automation abyss” a new kind of digital divide that separates human-centered and AI-mediated interactions.
As I outlined in my recent research on the Budding Botanist Paradox (Hawkinson, 2022), the more we automate learning processes through AI and immersive technology, the more dependent learners become on these automated systems. This creates a dangerous cycle where “the more automated the learning process becomes, enhanced and augmented with immersive technology, the more learners could be dependent on these automated systems for basic learning”.

The Budding Botanist Paradox: Automating Human Inquiry with Immersive Technology. (2022). International Conference on Computers in Education. https://library.apsce.net/index.php/ICCE/article/view/4550

This evolution mirrors what I’m seeing in my Digital Citizenship and Engagement course at the University of Foreign Studies, a course that will soon be adopted by other universities in other countries. Students increasingly rely on AI tools not just to complete tasks, but as intermediaries for fundamental learning and human interaction. The traditional digital divide of “haves” and “have-nots” is being replaced by a more insidious division, one between those who maintain agency over their learning and those who become dependent on AI-mediated experiences.
The stakes couldn’t be higher. As my research suggests, this isn’t just about educational outcomes. It’s about who controls the fundamental infrastructure of human interaction, learning, and commerce. We’re seeing this play out dramatically with developments like DeepSeek, which has “sparked market turmoil” and raised crucial questions about the control of AI infrastructure. What makes this particularly concerning is how AI content

is beginning to saturate our digital spaces. In my classroom observations, I've noted that "AI giving similar responses to student prompts get pulled up in class again and again, without much time to 'sit' in the issue or struggle in the unknown". This homogenization of thought and learning represents a fundamental shift from AI as a tool to AI as an intermediary controlling our thought processes.

The automation abyss presents a critical challenge for digital citizenship. As I teach my students, we must maintain human agency in an increasingly automated world while ensuring that technology enhances rather than replaces authentic human interaction and learning. This balance will determine not just the future of education, but the very nature of human society in the digital age.

Beyond the Space Race: Understanding the AI Land Rush in the Learning Space

Drawing from my research and experience in educational technology, I see striking parallels between today's AI race and the Space Race of the 20th century, but with a crucial difference. While the Space Race was fundamentally about technological supremacy, today's AI competition centers on controlling the infrastructure of human learning and interaction. The recent emergence of DeepSeek provides a perfect case study. Just as the Soviet Union's Sputnik moment catalyzed American technological development, DeepSeek's success has been described as "AI's Sputnik moment". However, what's particularly telling is that DeepSeek achieved comparable performance to leading AI models at "a tenth of the computing power" and significantly lower cost. This isn't just about

technological achievement it's about who controls the gateways of automated interaction.

In my work studying the Budding Botanist Paradox, I've observed how this mirrors historical patterns of infrastructure control. Just as railroad companies in the 19th century didn't just sell transportation but controlled the vital arteries of commerce, today's AI companies aren't just selling models they're establishing themselves as the essential intermediaries of human interaction and learning.

This automation gold rush has three distinct players:

- The miners: Early AI adopters and startups rushing to stake their claims
- The pickaxe sellers: Companies like DeepSeek and OpenAI selling AI models, fueled by chip makers like NVIDIA
- The railroad barons: Big Tech firms positioning themselves to control the automation infrastructure

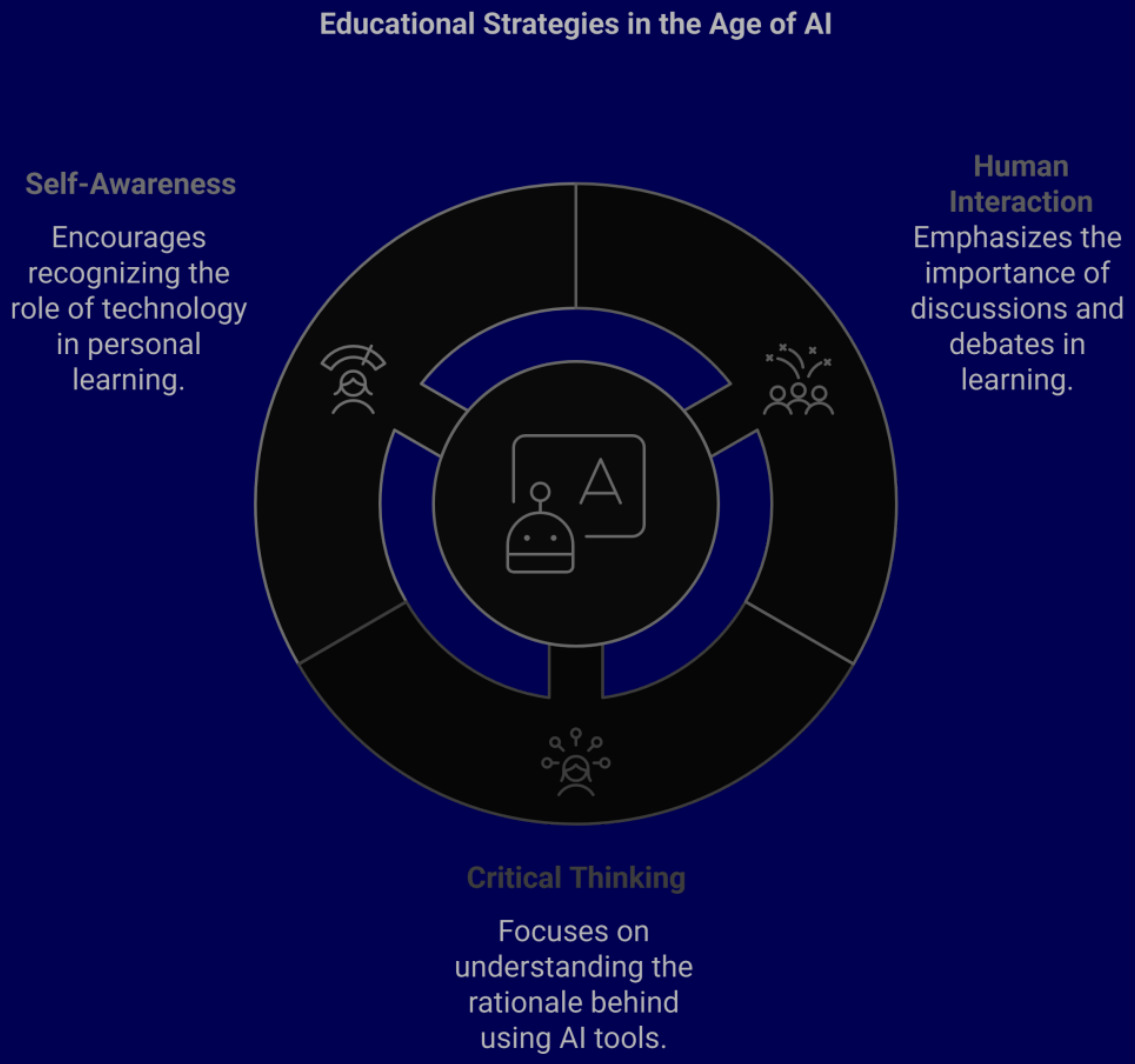
The consequences of this race are already visible in my Digital Citizenship classroom and others. As I've documented, students are becoming increasingly dependent on AI tools, not just for completing tasks but for fundamental learning processes. This mirrors what I call the "paradox of automation dependency" similar to what we saw with Air France Flight 447, where over-reliance on automation led to tragic consequences when human skills were suddenly needed.

Field experiments in education are starting to better confirm my work to show a concerning pattern: while AI tools provide impressive short-term gains, they can often lead to long-term skill erosion. Just as pilots can lose their edge when overly dependent on autopilot, students risk losing crucial critical thinking and problem-solving abilities when too reliant on AI intermediaries. This is why I advocate for a more nuanced approach to AI

adoption in education. As I tell my students, it's not about rejecting automation but understanding its proper role. The real challenge isn't winning the AI race, it's ensuring that in our rush to automate, we don't lose the essential human elements that make learning meaningful and lasting. As a learning futurist focused on the intersection of technology and education, I believe the recent Penn study on AI's impact on math learning (See Below) provides crucial validation of what I've observed in my Digital Citizenship and Engagement course and other related research. The research demonstrates that while AI tools can dramatically improve immediate performance (by 48-127%), they can actually harm learning outcomes when students lose access to these tools, with performance dropping by 17% compared to students who never used AI assistance. This mirrors what I've termed the "Budding Botanist Paradox", where increasing automation of learning processes leads to greater dependency on AI systems, especially as we move to use technologies like augmented and virtual reality. This is particularly concerning as we see major developments like DeepSeek pushing us toward more AI-mediated learning environments. In my classroom, I've observed how "AI giving similar responses to student prompts get pulled up in class again and again, without much time to 'sit' in the issue or struggle in the unknown". This homogenization of learning experiences threatens the development of critical thinking skills. The challenge ahead lies in designing learning environments that harness AI's benefits while preserving essential human learning processes.

Navigating the Automation Abyss: Digital Citizenship as Framework

What I am observing in the various institutions I work with, research or coursework related, Is an emerging pattern I call the “automation loop” in education. Teachers are using AI to refine coursework, students are using AI to complete that coursework, and educational technology companies are selling AI products to detect student AI work and then give AI generated feedback. This creates a concerning scenario where authentic human learning interactions become increasingly less common. Through my research on the Budding Botanist Paradox, I’ve found that safeguards are essential but must be implemented thoughtfully. For instance, the Penn study demonstrated that simply adding guardrails to AI tutoring systems (like requiring step-by-step problem solving) can eliminate the negative learning effects while maintaining performance benefits . In my coursework, I’ve developed a framework that emphasizes three key components:



1. Required Human Interaction: Designing learning activities that necessitate genuine human-to-human discussion and debate. As I tell my students, “your ability to critically think and exchange your opinions with others about these topics is more important than being able to write an essay about them”.
2. Critical Thinking About Automation: Teaching students to understand when and why to use AI tools, not just how. This aligns with my research showing that “the more automated the learning process becomes… the more learners could be dependent on these

automated systems for basic learning". One example of this is trying to build in some struggle into the learning, the essence of game based learning mixed with the hero's journey, understanding that its not about the destination but the process of asking questions and failing along the way.

3. Self-Awareness in Technology Use: Helping students develop metacognitive skills to recognize when technology is enhancing versus replacing their learning. This becomes particularly crucial as we see AI systems like DeepSeek becoming increasingly sophisticated and accessible. One example of this is a module on digital footprints, where I ask students to research and analyze what data has been collected about them online on various outlets.

For educational institutions and policymakers, I recommend implementing what I call "human checkpoints" at crucial moments in the learning process that require authentic human engagement. These might include peer-to-peer teaching, open-ended discussions, or creative problem-solving sessions that can't be easily automated. Educational technology companies need to shift their focus from pure automation to what I call "augmented pedagogy" tools that enhance rather than replace human teaching and learning. This means designing AI systems that prompt deeper engagement rather than providing quick answers, similar to the safeguards demonstrated in the Penn study's "GPT Tutor" system.

Final Thoughts

Education is at a turning point. Artificial intelligence is becoming a central force in classrooms, offering tools that automate tutoring, essay writing, and even grading. This shift raises an urgent question. Are we improving

learning or removing the very struggle that makes it meaningful? Efficiency is not the same as understanding. Struggle, uncertainty, and effort build deep learning. AI-generated assignments remove the need for original thought. AI-powered grading tools reduce the role of human mentorship. Students may learn to use AI, but will they learn to think critically without it? This is the Automation Abyss. AI makes learning easier but weakens curiosity, creativity, and resilience. Without grappling with complex ideas or struggling through mistakes, students risk losing the ability to problem-solve and think independently.

Education must not fall into this trap. AI should not replace the learning process. It should challenge students, encourage exploration, and enhance critical thinking. The future of education depends on keeping humans in the loop, not cutting them out of it.

ABOUT THE AUTHOR

ERIC HAWKINSON

Eric is a learning futurist, tinkering with and designing technologies that may better inform the future of teaching and learning. Eric's projects have included augmented tourism rallies, AR community art exhibitions, mixed reality escape rooms, and other experiments in immersive technology.

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LEARNING FUTURIST

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Roles

Professor – Kyoto University of Foreign Studies
Research Coordinator – MAVR Research Group
Founder – Together Learning
Developer – Reality Labo
Community Leader – Team Teachers
Chair – World Learning Labs

CORE VALUES

- Open Knowledge - Free and open access to information is a foundation to a productive modern life, connected to ideas of the open web and platform agnosticism.
- Privacy by Design - Business models are increasing moving toward supporting revenue by collecting, curating, and trading behavioral surplus through technology. These models should be tempered with safety, ethics, and privacy concerns and designed as such.
- Digital Literacy for All - An informed public about the use of technology is key for a responsible and engaged digital society.

PASSION PROJCTS

Together Learning
A community of technology minded learners. Exploring human potential... together.

Reality Labo
Augmented reality enhanced learning environments and mixed reality rapid prototyping.

Corefol.io
Showcase the Core of your Skills with AI Assisted Student Portfolios

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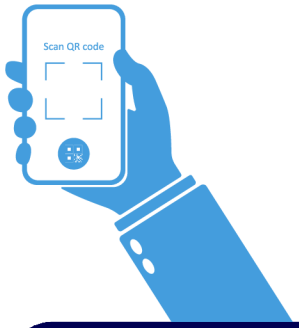
Together Research champions the spirit of co-creation without the constraints of traditional disciplinary boundaries. By deliberately eschewing a fixed list of research areas, we foster a uniquely flexible environment that encourages scholars from varied fields to collaborate and innovate together.



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