



Evaluating Student Agency in AI-Generated Lesson Plans

Jiayu Cheng¹, Chen Wang², Bodong Chen¹

1 University of Pennsylvania Graduate of Education, 2 University of Michigan

Introduction

Generative AI in Education

AI-generated lesson plans offer speed and convenience for educators, but often lack pedagogical depth, cultural relevance, and responsiveness to diverse student needs.

Why Student Agency Matters

Student agency is vital for developing lifelong learners and is a core component of AI literacy and competence (OECD, 2019; UNESCO, 2024).

Research Gap

Few studies have examined how student agency is supported or hindered in AI-generated lesson plans.

Our Contribution

This study investigates the extent to which student agency is embedded in lesson plans generated under four conditions—two commercial AI tools and two custom-designed workflows.

Method

AI Conditions Compared

We compared two commercial AI tools with two GPT-4-based generators.

Subjects & Standards

120 lesson plans were generated across Grade 8 math, science, and history using topics from CCSS, NGSS, and NY State standards.

Coding

Plans were coded for the presence (1) or absence (0) of 11 student agency constructs.

AI CONDITIONS	SUBJECT & STANDARD	LESSON PLANS
<ul style="list-style-type: none">• MagicSchool• School AI• Basic GPT4o• GPT4o+Student Agency	<p>Grade 8th</p> <ul style="list-style-type: none">• Math (CCSS)• Science (NGSS)• History (NY State)	<ul style="list-style-type: none">• 2 topics per subject• 5 versions per topic <p>120 plans</p>

Framework

Based on a literature review (e.g., Aldi et al., 2018; Vaughn, 2020), we synthesized a framework with three dimensions and eleven constructs.

Dimension	Key Construct
Dispositional	Authentic Problems
	Goal-directed
	Make Choices
Motivational	Take Actions
	Problem Solving
	Self-Efficacy
	Interaction
Positional	Collaboration
	Opportunities to Share Ideas
	Play Different Roles
	Share Authority

Conclusions

- Current AI-generated lesson plans show significant gaps in supporting student agency.
- Educators should engage with AI tools critically and intentionally.
- Developers must collaborate with educators and learning scientists to embed core educational values.
- Future research should explore ways to diversify perspectives in AI tools and address cultural relevance.

Findings

Student agency in AI-generated plans

- Teacher-centric structure
- Unbalanced construct coverage
- Patterned use of constructs

Enhancing agency through prompt design

- Encourage self and peer assessment, enabling students to take on diverse roles.
- Offer more resources and choices, such as presentation formats and research topics
- Promote goal-setting and community-connected reflection

Science example: Natural Selection and Adaptations

MAGICSSCHOOL	STUDENT AGENCY
<p>Opening:</p> <ul style="list-style-type: none">• Begin with thought-provoking questions: "What traits do you think would help an animal survive in a changing environment?"• Show a short video clip illustrating how different species adapt to their environments.• Engage students in a brief discussion about traits they observed in the video and how they might relate to survival. <p>Introduction to New Material:</p> <ul style="list-style-type: none">• Explain the concept of natural selection using real-world examples (e.g., peppered moths, finches).• Introduce key vocabulary such as adaptation, traits, and survival of the fittest.• Present data sets demonstrating changes in traits over generations.• Common Misconception: Clarify that adaptation does not happen within a single lifetime of an organism but over many generations. <p>Guided Practice:</p> <ul style="list-style-type: none">• Divide students into small groups and provide them with a sample data set.• Have students calculate the average trait measurements and discuss their findings.• Scaffold questions such as:<ul style="list-style-type: none">• "What trend do you notice in the data?"• "How might these changes affect survival?"• Monitor student performance by rotating around and listening to discussions, providing support as needed. <p>Independent Practice:</p> <ul style="list-style-type: none">• Assign students to analyze a different data set on their own, where they will calculate probabilities of traits being passed on.• Students will write a brief report summarizing their findings and how they relate to natural selection.• Expect students to use appropriate vocabulary and mathematical representations in their reports. <p>Closing:</p> <ul style="list-style-type: none">• Conduct a quick "exit ticket" where each student writes down one new thing they learned about natural selection and one question they still have.• Show a few responses with the class to encourage further discussion. <p>Extension Activity:</p> <ul style="list-style-type: none">• Provide an additional data set for students who finish early to analyze and create a presentation on the implications of their findings in real-world scenarios. <p>Homework:</p> <ul style="list-style-type: none">• Assign students to research a specific species and its adaptations, prepare a short presentation or poster to share with the class the following week.	<p>Opening:</p> <p>Begin the class by sharing a short video of various animals and their unique adaptations (like a camel's hump or a puffer fish's defense). Ask students to think about why these animals have these specific traits and how they might have developed over time.</p> <p>Introduction:</p> <p>Introduce the concept of natural selection and adaptations, explaining how certain traits become more common in a population over time due to environmental changes. Use real-world examples to ensure students see the relevance of this topic to their daily lives.</p> <p>Guided Practice:</p> <p>Divide students into small groups and provide each with a different data set representing changes in a specific trait in a certain animal species over time. Ask them to identify patterns and use mathematical representations to support explanations of how natural selection may have affected the trait.</p> <p>Independent Practice:</p> <p>Have students choose an animal of interest and research how a particular trait has evolved due to natural selection. They should use mathematical representations to support their conclusions and prepare a short presentation for the class.</p> <p>Closing:</p> <p>In a whole-class discussion, students share their findings and discuss similarities and differences in how natural selection has influenced different species. Facilitate a reflection on the experience of adaptation for survival.</p> <p>Assessment:</p> <p>Students will be assessed on their presentations and their ability to use mathematical representations to explain natural selection. They will also self-assess and peer-assess, reflecting on their learning process and providing feedback to their peers.</p> <p>Extension Activity:</p> <p>Invite students to imagine a future scenario where the climate in their local area drastically changes. What adaptations might local animals develop in response? They can create a visual representation or write a short story to illustrate their predictions.</p> <p>Homework:</p> <p>For homework, students can explore more examples of natural selection and adaptations in their own communities or in the news. They should reflect on how this understanding of natural selection can inform their actions to protect local wildlife.</p>

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