Unlocking the Power of Artificial Intelligence: A Playbook for Educators and Students

Daniel W. Baker
Teaching Associate Professor
Colorado State University
What informs my perspective 👀?

I’m an engineering educator with 100+ person classes 🧑‍🏫

I’m a father of three girls in grade school 🧑‍👧‍👧


I’m white, male, heterosexual, able-bodied, and super-tall 🎲

I was born in 1977, so I am a Gen X / Millennial hybrid 📅

I tend to be an early-majority adopter 📣
How many of you are already using artificial intelligence? Stand and stay up if you have...

Used ChatGPT 📱
Talked to your Alexa, Siri, or Hey Google 👤
Logged on your phone 📱 with face recognition
Used a map application to navigate 🚗
Watched recommended shows on Netflix 🎥
Browsed your feed on social media 🚪
Terminology

Artificial intelligence (AI): algorithms capable of understanding and generating responses as learning from vast datasets to demonstrate understanding in specific domains.

Generative artificial intelligence (GenAI): AI technologies that can generate text, images, music, and computer code based on the patterns and information they have learned from vast datasets.

Large Language Models (LLMs): Artificial intelligence algorithms trained on extensive datasets to understand, generate, and interact with human language in a contextually relevant manner.
Another way to think about LLMs:

Large Language Models are calculators for words
GenAI does things we’ve never seen non-humans do before…

...and this power can make us nervous.
and create infinite possibilities!
Activity 1: Pairs of 2, 1-min each

1. Introduce yourself to your neighbor
2. Answer: What is the most tedious part of your work?
GenAI Playbook
for Teachers and Staff

Draft content
Summarize text
Draft lesson plans
Find & connect information
Draft a recommendation letter for a student who is smart but lazy, rarely comes to class, but does B level work on exams.

To Whom It May Concern,

I am writing to recommend [Student's Name] based on my interactions with them as an engineering teacher at Colorado State University. [Student's Name] has demonstrated a unique blend of intelligence and a penchant for independent study that I believe is worth highlighting.

While [Student's Name] may not be a regular attendee in class, their performance on exams consistently showcases their intellectual capabilities. It's evident that they possess a keen grasp of the subject matter and are capable of achieving B-level work when they apply themselves. In fact, their exam results often exceed my expectations, reinforcing their potential in the field.
I had a 1.5-hour Zoom meeting on Tuesday with my textbook co-author and used Tactiq to take notes.

During the meeting, Dan and William discussed updates and potential improvements. They considered restructuring Chapter 4 to better present the concept of moments and the use of cross products. They also considered the integration of additional learning resources, such as Dan's instructional video, into a landing page to enhance accessibility to various book-related materials. Lastly, they planned to make minor edits directly in the main branch using Code Spaces, building, and deploying updates to the book.

Action Items - Top 5

1. Dan will finalize the "moment about a line" example and ensure it is up to the required standard before syncing it with the main branch of the textbook.

2. William will review and potentially restructure the introductory sections of Chapter 4 to improve the organization and presentation of topics such as moments, torque, and cross products.

3. Both parties will consider the best approach to merging changes, with the possibility of creating separate branches for different topics and using pull requests to keep the main branch updated.

4. The team will explore ways to incorporate Dan's video resources into the textbook, possibly through a landing page or directly within the book, leveraging Dan's authorship and expertise.

5. They will address the permalink issue by potentially using labels for sections to create more stable and persistent links, ensuring that references to sections remain consistent even after updates and renumbering.
What are 10 ways I can incentivize students to complete low stakes assignments?

Certainly! Encouraging students to complete low-stakes assignments can be achieved through various strategies. Here are ten ways to incentivize them, using real-world analogies:

1. **Gamification**: Treat assignments like a game, with points, badges, and rewards. Just as completing levels in a video game is rewarding, students can earn points for completing assignments.

2. **Progress Bars**: Visualize their progress, similar to tracking steps on a fitness app. As they complete assignments, they can see themselves getting closer to a goal.

3. **Peer Recognition**: Create a "Wall of Fame" or an online platform where students can showcase their completed assignments, akin to social media likes and comments.

4. **Competition**: Host friendly competitions with small prizes for those who consistently complete assignments. This mirrors the motivation in sports to outperform peers.

5. **Real-world Application**: Show students how these assignments connect to their future careers, just as athletes follow rigorous training to succeed in their sport.
Lesson Plans: Customization

Lesson Plan: Radicals and Connections to Geometry with Marvel Superheroes

Objective:

Students will understand how to simplify radical expressions and apply these principles to solve geometric problems inspired by Marvel superheroes scenarios.

Materials:

- Whiteboard and markers
- Graphing calculators (optional)
- Worksheets featuring Marvel superhero

Introduction (10 minutes):

- Begin with a short video montage or images of Marvel superheroes performing incredible feats, focusing on scenarios that can be linked to geometry (e.g., Spider-Man swinging between buildings, Iron Man's flight trajectory).
- Pose the question: “How can we use algebra to understand the superhero actions we see in the Marvel universe?”
- Briefly introduce the concept of radicals and their connection to geometry, highlighting how they will be used to solve problems related to the superheroes’ actions.

Direct Instruction (15 minutes):

- Explain the basics of simplifying square roots and other radicals, including the product and quotient rules for radicals.
- Introduce geometric formulas that involve radicals, such as the

Guided Practice (20 minutes):

- Distribute worksheets with problems set in Marvel superhero scenarios. For example:
  - “Calculate the height of a building that Spider-Man needs to leap over if he jumps 30 feet away and lands at the same height from where he jumped.”
  - “Iron Man flies in a straight line from Stark Tower to the Avengers headquarters. If the coordinates of Stark Tower are (3, 5) and the Avengers headquarters are at (10, 12), how far did he fly?”
- Walk through the first problem as a class, demonstrating how to apply the concept of radicals and geometric principles to find the solution.
- Allow students to work in pairs or small groups to solve the remaining problems, circulating to provide support and clarification as needed.
I'm helping a student who wants to study engineering at Colorado State University decide what math classes to take in high school. What should I tell them?

ChatGPT
For a student aspiring to study engineering at Colorado State University (CSU), taking a strong set of math classes in high school is crucial for building a solid foundation. Here's what you should recommend:

1. **Algebra 1 and 2**: Essential for developing basic algebraic skills and understanding functions, variables, and equations, which are fundamental in all areas of engineering.
2. **Geometry**: Important for grasping spatial concepts and properties of shapes, beneficial for fields like civil, mechanical, and aerospace engineering.
3. **Trigonometry**: Key for understanding relationships between the sides and angles of triangles, which is crucial in many engineering fields for analyzing forces, designing components, and more.
4. **Pre-Calculus**: Prepares students for college-level calculus by introducing concepts such as limits, sequences, and series, and reinforces trigonometry and algebra.
5. **Calculus**: Ideally, both Calculus AB and BC if available, as calculus is central to engineering for modeling and solving real-world problems.
So, where should you start?

Try
Fail
Learn
Repeat
Now let’s focus on your students
Think of GenAI as *tools for your students’ future*

- Exposed them to the possibilities and have them use GenAI in your courses
- Stress that AI does not think but is a tool for exploration and understanding.
GenAI Student Playbook

Gather & clarify information
Generate ideas
Structure & improve writing
Find gaps in logic
Prepare for interviews & debates
Gather and explain information

While LLMs are knowledgeable, always cross-reference facts

Use LLMs with website search

Prompts:
- Provide a comprehensive overview of TOPIC and its primary principles
- Cross-reference the key advantages of TOPIC with reputable scientific sources.
Customize the level of information

Rewrite the following text in simpler language “____”

Provide 5 real-world examples of when ____ is used.

How would I use the concept of ____ in engineering school.

When can’t we make the assumption of ____.
Generate ideas

If students are stuck have them generate ideas as starting points

Prompts:

- Develop 5 hypotheses for TOPIC based on current scientific understanding
- What are 10 creative ways to apply TOPIC to FIELD
- I am a NUMBER grade student writing a paper on TOPIC. Generate 10 topics for my paper.
Structure and improve writing

Clarify expectations on which steps in the process can be AI-assisted and which cannot

Prompts:

Provide an outline for a 5-page technical report on TOPIC.

Provide 3 options to make the following statement more succinct. "STATEMENT"
Find gaps in logic

Unlike our human minds that are anchored to our experiences, ChatGPT will take any angle you ask

Prompts:

You are a forensic investigator, name 10 ways this IDEA could fail

You are an expert in FIELD, provide 5 probing questions to IDEA

What are the 5 most common errors when computing TOPIC?
Prepare for interviews or debates

Quickly set up an interactive interview and get feedback on your responses.

Prompts:

What are some interview questions I might be asked for this JOB TITLE?

You are a hiring manager at BUSINESS. Ask me questions about JOB. After I provide answers, give me feedback on the strengths and weaknesses of my answers.
ChatGPT Custom Instructions for Students

"Please provide explanations and insights that guide me toward finding the solution myself, rather than giving direct answers."

"If you're helping me with a specific problem, focus on explaining the methodology and underlying concepts, rather than solving the problem for me."

"When discussing academic texts or theories, summarize the main points and guide me on how to critically analyze the material, rather than interpreting it for me."

"If you provide information that could answer a homework question or assignment, remind me to paraphrase and cite the source."
Ethical Use

- Emphasize the importance of not using it for plagiarism.
- It is easy, so the temptation is high to use generated content as your own.
- Remind students that while LLMs can help them understand or explore topics, true learning comes from grappling with challenges and internalizing knowledge.
- Remind students of the importance of producing original work and not relying solely on LLM-generated content.
- Provide clear guidelines on when and how to use LLMs, especially in assignments and research.
Clear is kind. Unclear is unkind.

We must be clear with our students about the power and pitfalls of using GenAI.

It is our responsibility as educators to clearly outline how and when GenAI can be used.

GenAI can be part of the solution to better prepare our students for a rapidly developing future.
<table>
<thead>
<tr>
<th>Natural Language Tool</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>OpenAI ChatGPT GPT3.5</td>
<td>• Free</td>
<td>• Less functionality than GPT4.0</td>
</tr>
<tr>
<td><a href="https://chat.openai.com/">https://chat.openai.com/</a></td>
<td>• Custom instructions available</td>
<td>• No access to internet</td>
</tr>
<tr>
<td></td>
<td>• Good code translator</td>
<td>• Lacks customized options</td>
</tr>
<tr>
<td>OpenAI ChatGPT+ GPT4.0</td>
<td>• Custom instructions available</td>
<td>• Costs $20/month</td>
</tr>
<tr>
<td><a href="https://chat.openai.com/">https://chat.openai.com/</a></td>
<td>• Improved Factual Performance over GPT3.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Includes access to DALLE-3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Allows image, data input</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Excellent code translator</td>
<td></td>
</tr>
<tr>
<td>CoPilot (Bing) AI</td>
<td>• Free</td>
<td>• No conversation history</td>
</tr>
<tr>
<td><a href="https://www.bing.com/search?q=Bing+AI&amp;showconv=1">https://www.bing.com/search?q=Bing+AI&amp;showconv=1</a></td>
<td>• Accesses internet</td>
<td>• Lacks customized options</td>
</tr>
<tr>
<td></td>
<td>• Provides access to GPT4.0 in Creative Mode</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Includes access to DALLE-3</td>
<td></td>
</tr>
<tr>
<td>Google Gemini (Bard)</td>
<td>• Free</td>
<td>• Lacks customized options</td>
</tr>
<tr>
<td><a href="https://gemini.google.com/app">https://gemini.google.com/app</a></td>
<td>• Ethical and transparent AI development approach</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Accesses internet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Integrates with Gmail, Google Calendar, etc</td>
<td></td>
</tr>
<tr>
<td>Anthropic Claude</td>
<td>• Free</td>
<td>• No conversation history</td>
</tr>
<tr>
<td><a href="https://claude.ai/">https://claude.ai/</a></td>
<td>• Higher user engagement and feedback.</td>
<td>• Lacks customized options</td>
</tr>
<tr>
<td></td>
<td>• Detailed and easily understood answers.</td>
<td></td>
</tr>
<tr>
<td>Perplexity</td>
<td>• Free</td>
<td>• Lacks customized options</td>
</tr>
<tr>
<td><a href="https://www.perplexity.ai/">https://www.perplexity.ai/</a></td>
<td>• resource for students, researchers, and anyone seeking precise answers supported by citations</td>
<td></td>
</tr>
</tbody>
</table>
# Image genAI Tools

<table>
<thead>
<tr>
<th>Tool</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
</table>
| DALL·E 3 in Bing AI and ChatGPT+ | • Free and easy to access  
• High-quality images 2-4 at a time | • Revisions create new images instead of just editing old |
| Adobe Firefly               | • Awesome generative fill and text effects  
• Novel text effects and regenerative color | • Text to image is not a precise as DALLE-3 |
| MidJourney                  | • Must access via Discord  
• High quality images | • Only paid plans starting at $10/month |
| Recraft Vector & Raster Images | • Create an artboard of images using a color palette  
• Can export as editable SVG | • Inaccurate spelling |

*and too many more to list!*
Recommended AI in education resources:

Videos to share with colleagues and students

- Wharton Interactive Crash Course: Practical AI for Instructors and Students

Prompt Libraries

- Prompt Library — AI for Education
  microsoft/prompts-for-edu
- Assigning AI: Seven Approaches for Students with Prompts - Ethan & Lilach Mollick, UPenn

Training

- Generative AI Prompt Literacy - Michigan Office of Online and Digital Education
- Empower educators to explore the potential of artificial intelligence - Training | Microsoft Learn
AI in education social media channels

https://www.linkedin.com/in/conorgrennan/ or https://twitter.com/conorgrennan
https://www.linkedin.com/in/emollick/ or https://twitter.com/emollick
https://www.linkedin.com/in/leonfurze/
https://www.linkedin.com/in/jason-gulya/ or https://twitter.com/jasongulya
https://www.linkedin.com/in/jaeden-schafer/ or https://twitter.com/jaeden_ai
https://www.linkedin.com/in/rob-lennon/ or https://twitter.com/thatroblennon
https://www.linkedin.com/in/theaieducator/ or https://twitter.com/theaieducatorx/
Activity 2 (5 min):

1. Individually or in groups of 2, use CoPilot, ChatGPT, or Gemini to brainstorm 10 solutions to the pain points you identified in Activity 1.
   1. “How can I use AI to ____?”

2. Count the number of solutions that are
   Already known
   Invalid or useless
   Novel and useful

3. Discuss your findings with your neighbor
Q&A and Discussion

What questions do you have?

What generative artificial intelligence (GenAI) tasks are you now going to try?

Feel free to follow up and connect:

Dan.Baker@colostate.edu
@drdanteaches on

Stock image from Microsoft