

[RE]IMAGINE EDUCATION

A weekly Design.AI newsletter



AI IN EDUCATION: SIMPLIFYING, SUPPORTING AND SURVIVING

Dr. Sumbul Khan, SMT

*In Conversation with Dr. Qian Huang, LKYCIC
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How is AI transforming education?

This week, we speak with Dr. Sumbul Khan, Senior Lecturer from the Science, Mathematics and Technology (SMT) cluster at SUTD. Her journey, deeply rooted in Design and Math teaching, reveals how AI is helping in simplifying complex subjects, reshaping how students learn, and redefining what educators value in knowledge-building.

From the classroom to research supervision, Sumbul reflects on what it means to teach and conduct research in the age of ChatGPT, custom GPTs, and Copilot.

Let's get inspired!

<https://www.sutd.edu.sg/profile/sumbul-khan/>

This newsletter is produced with ChatGPT and other AI tools as super-collaborators. The authors contribute the core ideas, drafts, strategic framing, pedagogical insights, and design direction, while AI supports by refining, formatting, and creative articulation. (CC BY-NC-ND 4.0).

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From Simplification to Personalization: The Role of AI in STEM and Design Education

"STEM fields have traditionally been intellectually elitist, catering to a narrow definition of academic ability," says Sumbul. "Only the 'top kids' seemed to thrive. But what about those students with different learning styles?"

Sumbul believes AI holds immense promise in making STEM subjects more accessible. Many students struggle with abstract Science or Math concepts due to traditional teaching styles. Here, AI can play a vital role: by simplifying lecture notes, adapting content to various learning styles, enabling personalized learning journeys, and leveraging custom GPTs. She points out that many AI tools have built-in summarization and explanation features. These can transform dense chemistry, math, and physics concepts into digestible content. "We are exploring the possibilities," she adds. "We can turn our notes into simpler versions and reach more students."

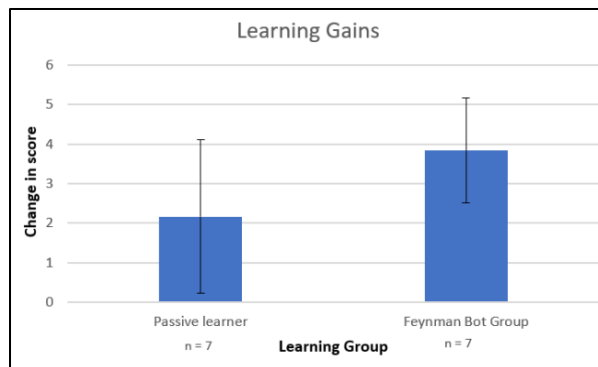
AI, in her view, is not a shortcut but an amplifier for learning, teaching and communication.

She is supervising the research of SUTD alumnus, Akshaya Rajesh, in the development and usability testing of the Feynman Bot, an AI powered learning assistant that uses the famous Feynman technique of **learning by explaining**, to simplify complex concepts through interactive discussions.

The bot challenges users through **question-driven discussions**, simulating the process of teaching to reinforce understanding. In a study with 14 self-regulated learners, those who lack instructor or peer support, they found that the learners who used the Feynman Bot **showed higher learning gains and greater comfort with the subject matter** compared to those using passive study methods. This research was published in IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE 2024), and more testing is currently underway in the SSILP Math classes. These findings highlight the potential of AI tools like Feynman Bot to enhance conceptual learning, especially for students studying independently. Future research will explore scaling the tool across larger student populations and diverse academic subjects.

"I have heard some people say AI has done more damage to education than COVID," Sumbul remarks.

She agrees that AI has transformed learning, but insists the solution lies not in resistance, but reinvention.



**Learning gain of Feynman bot users vs passive learners
(Raresh and Khan, 2024)**

Teaching AI and Teaching With AI

At the recently concluded Design Thinking and Innovation (DTI) course, Sumbul played a leading role in embedding AI based interventions through out the course such as adding AI based design methods in the course content, providing students with AI graders for all assignments, hosting talks on AI tools, and collaborating on the Best Use of AI contest in the course.

In DTI, AI supported students in their user research analysis, idea generation and critique, concept sketching, prototyping, testing, and evaluation. Students used tools like Midjourney, Figma AI, RunwayML, and custom GPTs throughout the design process. The course saw a noticeable rise in the quality of submissions evidenced by an increase in number of 'A's since previous years. [Watch the video](#) Sumbul created on students' use of AI as tool and teammate in DTI.

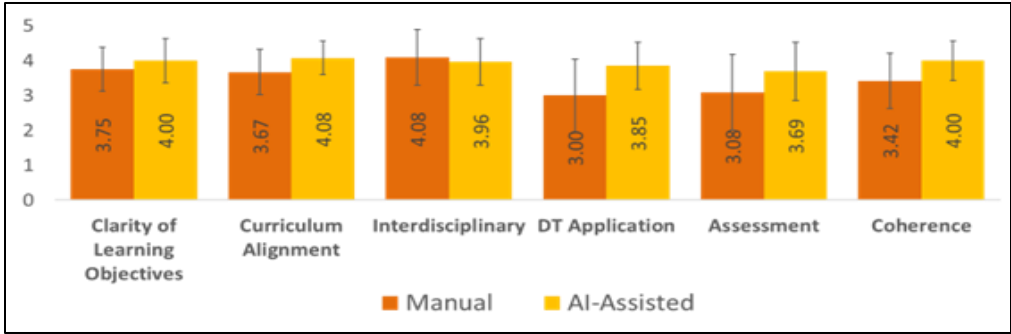
The AI graders (co-developed by LKYCIC and DTI teaching team) are rubric-based tools that offered feedback to students before final submissions to encourage reflection and iteration. Students also reported that the AI graders helped them brainstorm unconventional ideas, refine their work, and gain valuable feedback before final scoring by instructors.



AI enhanced Design Innovation workshops for MOE teachers

As part of the ERFP funded project on **Interdisciplinary creative problem solving** (PI: Ricky Ang), Sumbul played a key role in the organization of an AI enhanced Design Innovation workshop for 45 MOE teachers from nine school, in June 2025. The workshop introduced teachers to practical ways AI can support teaching and learning. Over three days, teachers explored AI tools like Figma AI, Vizcom, and custom GPT-powered chatbots for co-designing syllabi, assessment and learning. Developed by research fellow Dr. Liow Wei Ting, the **AI-assisted tool for planning interdisciplinary projects**, the planner uses SUTD's Design Innovation framework, the MOE syllabus, and 21st century competencies to generate a complete interdisciplinary project plan, with learning objectives, various subjects involved, student deliverables and assessment techniques—a process that has traditionally been time-consuming, laborious and logistically demanding for teachers.

The AI assisted interdisciplinary project planner was tested with the MOE teachers at an AI enhanced Design Innovation workshop in June 2025. The tool received positive feedback from teachers for improving both quality of output as well as efficiency. Teachers found the AI tool better than manual methods in curriculum alignment, Design thinking application and coherence. "The AI interdisciplinary project planner showcases the vast potential of AI in supporting teachers with instructional design."



Comparison of AI assisted project plans vs project plans developed manually by teachers in Workshop (Liow, Khan and Ang, under review)

Building AI Literacy: Structured Guidance for Students

Sumbul sees a distinct difference in how Freshmore and Capstone students use AI.

"Freshmores are exploring AI for the first time. Capstone students, particularly those in design-AI majors, are more assured in their AI usage. They have incorporated AI into their design workflows and solutions."

She believes while students improve with practice, but structure is critical. "If we want responsible AI use, we must include it in the curriculum from day one. She recommends:

- Roadmaps for AI integration across subjects.
- Ethical AI use workshops.
- Opportunities for hands-on exploration in Fab Labs.

"Right now, most students use AI in an ad hoc manner. We need deliberate design, both in what we teach and how we teach."



Final thoughts: Education After the AI Tsunami

"We must stop expecting 21st-century learners to behave like 20th-century students. The world has changed. So should education."

She envisions a future where critical thinking, ethics, and interdisciplinary understanding are core to every curriculum.

"People must learn to discern real from fake, develop critical awareness, and question what AI tells them."

In research, too, she notes that while AI can simulate molecules or summarize datasets, human judgment and expertise remain essential:

"We can do more, faster. But quality control becomes even more important."

For her, the real shift is mindset:

"It's not about if we use AI. It's about how well we use it."

Key Takeaways

For Students

- **Use AI as a Thought Partner**
Explore, prompt, and review—but don't skip the thinking.
- **Respect the research process**
AI is a tool, not a replacement for scholarly rigor.

For Educators

- **Design for AI Fluency**
Introduce AI literacy from the start and scaffold it across levels.
- **Support diverse learning**
Use AI to simplify, personalize, and visualize complex STEM ideas.
- **Teach ethics as Core Curriculum**
Embed ethical reasoning in key places

References

A. Rajesh and S. Khan, "Learn Like Feynman: Developing and Testing an AI-Driven Feynman Bot," 2024 IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE), Bengaluru, India, 2024, pp. 1-8, doi: 10.1109/TALE62452.2024.10834370