

[RE]IMAGINE EDUCATION

A weekly Design AI newsletter



FEYNMAN BOT: TEACHING TO LEARN IN THE AGE OF AI

Ms Akshaya Rajesh (SUTD alumnus) and Dr. Sumbul Khan, SMT

In Conversation with Nachamma Sockalingam, OSP



Akshaya Rajesh (L)

Dr. Sumbul Khan (R),
Senior Lecturer

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

In an era of rapidly evolving educational technology, the Feynman Bot represents a novel step toward deeper, self-regulated learning. Designed around the Feynman Technique, a method that encourages learners to explain topics in their own words to uncover gaps in understanding. This AI-powered chatbot simulates a Feynman dialogue where the student, not the system, does the teaching. Instead of delivering answers, the bot prompts learners to articulate their understanding, challenges inconsistencies, and pushes for conceptual clarity.

Developed by SUTD alumnus Akshaya Rajesh supervised by Dr. Sumbul Khan, the bot is now undergoing a real-world deployment in SUTD's Integrated Learning Program for Mathematics and Biology, offering learners an opportunity to experience AI-driven active learning firsthand.

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).

Editor of Newsletter:

Dr. Nachamma Sockalingam, Office of Strategic Planning

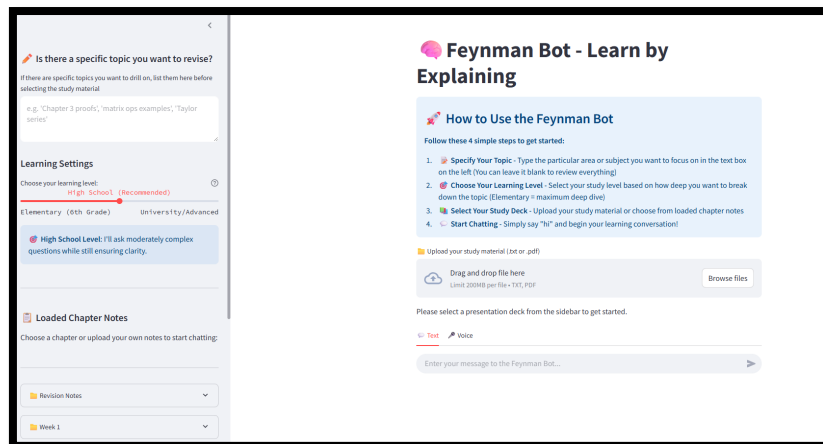


Hi Akshaya and Sumbul, I read your TALE paper on Feynman Bot. I think it is a very useful tool for our students. Can you tell us more about this bot?

The Feynman Bot is more than just another AI tool. It is a platform that challenges learners to think out loud, explain clearly, and take ownership of their understanding. In doing so, it addresses one of the most difficult aspects of independent study: moving beyond memorization into mastery. Teachers can use it to prepare for their classes too!

The bot is a Python-coded application that utilizes AI agents in a RAG (Retrieval Augmented Generation) framework, meaning it is flexible enough to engage in conversations about any material the student has uploaded without requiring custom GPT training.

As AI continues to shape the educational landscape, the Feynman Bot demonstrates how technology can be designed not just to deliver content, but to create opportunities for deeper learning. Try [The Feynman Bot](#) here!



Is there a pedagogical basis for this bot. The name obviously suggests that this is linked to Richard Feynman. So, tell us more.

Made famous by physicist Professor Richard Feynman, the Feynman Technique is a method of study for deep comprehension by explaining concepts simply to someone else. As an active learning approach that encourages peer teaching, self-explanation and scenario-based learning, the Feynman Technique has been shown to enhance retention and deepen understanding by requiring learners to simplify, clarify and teach content. The Feynman bot is conceptually rooted in this technique, supported by decades of on active learning and heutagogical methods.

While digital tools like flashcard apps or AI tutors have made self-study more efficient, most lack mechanisms for meaningful learner articulation. The Feynman Bot fills this gap by creating space for higher-order thinking, allowing students to reconstruct knowledge and explain it back in their own words, which is a hallmark of mastery.



While the Feynman Technique is often associated with simplifying narrative or conceptual material, making it well-suited for subjects like humanities and languages, it also holds strong potential for enhancing learning in STEM, particularly for abstract concepts.

Explaining topics such as limits in calculus, conservation laws in physics, or algorithmic complexity in computer science requires students to translate symbolic or theoretical material into plain language, revealing gaps in understanding and solidifying mental models.

The Feynman Bot leverages this process by prompting learners to articulate ideas step by step, ask clarifying questions, and confront misconceptions in real-time—making it a powerful tool for mastering complex, abstract STEM content through active reasoning.

How does this bot differ from other study tools?

Unlike traditional study tools that rely on flashcards, summarization, or question-and-answer formats, the Feynman Bot is designed to simulate peer-level discussions and student-led explanations.

It uses a large language model embedded in a Retrieval-Augmented Generation (RAG) framework, which ingests course slides or student notes uploaded by the user. The bot then conducts a guided conversation using targeted questions to explore the uploaded content. Prompt engineering ensures that the bot maintains both subject fidelity and conversational focus, adapting to the learner's pace and depth of explanation.

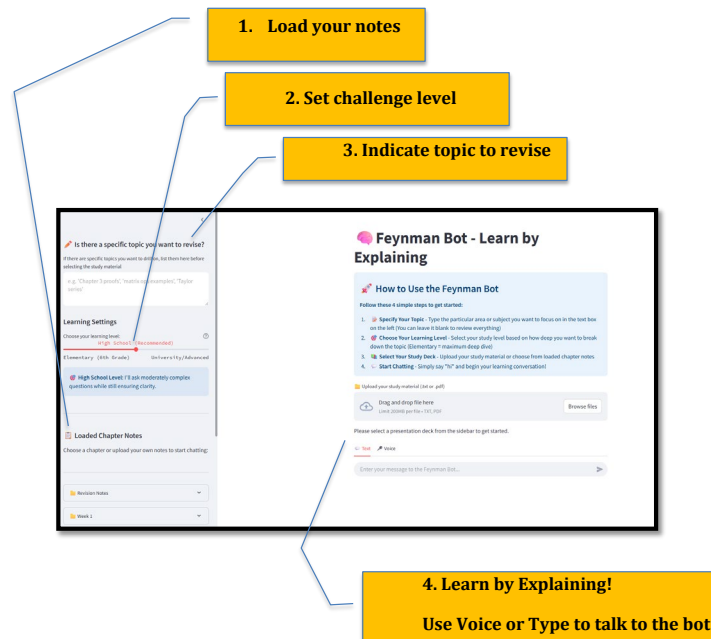
Learners can engage with the bot through typed or spoken responses, although feedback from early users suggests a strong preference for typing, as it allows for more deliberate and structured articulation of thought. **The Feynman Bot is therefore uniquely positioned to help students not just retain information but internalize it through a self-reflective teaching process.**

How can students use the bot?

To use the bot, learners can first choose a learning level between Elementary, High School and University. Learners who want to delve deeper into definitions and key terms can choose the elementary level. At the same time, those who would like to focus more on applications and high-level technical reasoning can opt for the university level.

Next, learners can type a part of the material they particularly want to focus on so that learning objectives created by the bot and the direction of the conversation are tuned for the user's current focus. Finally, learners upload their lecture slides, notes, or any material they wish to understand more deeply. A typical session begins with a prompt like:

"Hi! These are my Week 4 notes on differentiation. Can you help me understand this well enough to teach it to someone else?"



How to use the Feynman Bot

The bot responds by initiating a conversation in which it asks targeted questions based on the uploaded content. As the learner begins to explain, the bot probes for clarity, corrects misunderstandings, and invites further elaboration. Each session, learners are encouraged to provide quick feedback via the “End Conversation” button.

Students have reported that the bot is particularly useful after lectures, when consolidating key ideas; before quizzes, to test their ability to explain concepts; and when stuck, to help uncover what they might not yet understand. Others use it while preparing for presentations or revising complex topics, treating it as a study partner that offers structure and accountability.

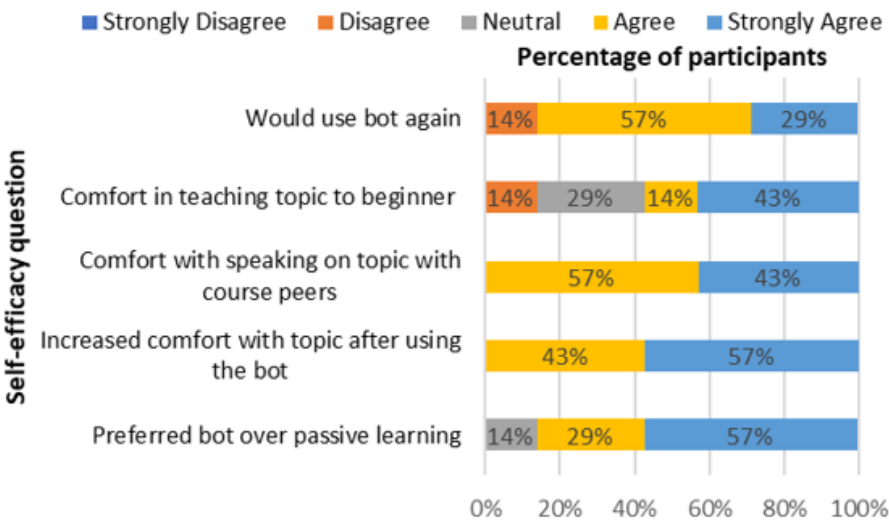
The interface supports both mobile and desktop access, and all conversations remain within the scope of the uploaded material — ensuring relevance and coherence.



You said you tried it out with students. What was their experience like?

The first formal evaluation of the Feynman Bot was conducted through an independent study with working professionals enrolled in an online course from Harvard University, offered on edX. Fourteen participants with no prior experience in philosophy were split into two groups: one group used traditional passive study methods (note-taking, rewatching lectures), while the other group used the Feynman Bot to engage in structured teaching-style conversations. All participants studied the same content over the same duration.

Results revealed that the Feynman Bot group demonstrated higher average learning gains on assessments, and more consistent improvement overall. Their open-ended answers included richer scenario-based elaborations, indicating deeper conceptual comprehension. Furthermore, over 80% of participants reported increased confidence in the material and expressed willingness to use the bot again for new topics. More than half felt ready to teach the content to others, a strong indicator of learning efficacy in heutagogical frameworks. **Findings from this study were published in IEEE International Conference on Teaching, Assessment and Learning for Engineering (TALE 2024).**



Self-efficacy survey results from online Humanities course

Are you planning to use this at SUTD?

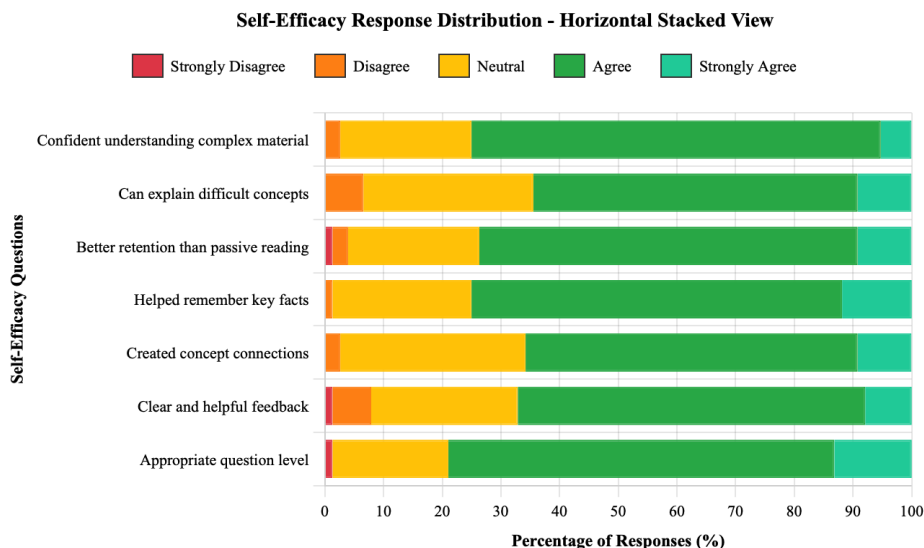
We conducted a 6-week study in SUTD's Integrated Learning Program for Mathematics with 76 students in total across three quizzes. While all 170+ students in the course had access, we focused on tracking how different usage patterns affected learning and confidence.

Most students used the bot just once per week, but those who invested more time in each session saw the real benefits. Students reported overwhelmingly positive experiences using the bot. Over 70% consistently agreed that it helped with learning, with nearly 80% saying the bot's questions were just right for reinforcing what they'd studied. Three-quarters of users felt more confident remembering key concepts after using the tool.

The feedback was encouraging: students said the bot helped "iron out wrong understandings" and appreciated how it made them think deeper, helping them "retain info better" and "create connections between concepts." Many found it "more engaging than traditional study methods."

The takeaway is clear: students who take time for deeper, sustained conversations with the Feynman Bot saw self-efficacy improvements.

Using the Feynman Bot for meaningful study sessions, rather than just for quick answers like other AI study tools, not only improves student efficacy, but their overall performance.



The Feynman Bot isn't just another AI tool. It's a catalyst for thinking out loud, digging deeper, and truly owning your learning. By turning students into teachers, it swaps passive recall for active mastery. We wish you continued success — and hope more faculty members and students will be inspired to try the Feynman Bot for themselves.