Rethinking Teaching and Assessment with Generative AI

Ximena Alva, Benjamin Bolling, Matilda Lundström,
Emil Östberg

Lund University

Mentor: Lena Håkansson

Faculty of Science

Contents

Rethinking Teaching and Assessment with Generative AI

Ximena Alva, Benjamin Bolling, Matilda Lundström & Emil Östberg February 22, 2026

Abstract

The aim of this study is to analyse how generative AI currently is used in higher education as well as how it can be effectively incorporated in the future as a tool for both teaching and learning. The study also seeks to suggest methods for integrating generative AI into course design and learning outcome assessment. To explore these questions, a literature review and an interview were conducted. The literature review focused on adapting courses to generative AI, the challenges that arise, and observed changes in student learning outcomes. We address the structural considerations of redesigning courses in an academic environment where educators find themselves balancing the clear efficiency benefits of generative AI with the institutional challenges it poses, particularly regarding assessment integrity and the risk of diminished student learning.

Keywords: *generative, artificial, intelligence, AI, GenAI, higher education, teaching, learning*

I. Background

Heavy reliance on generative AI (hereafter, only AI) to complete assignments has been shown to inflate students' self-efficacy, consistent with the Dunning-Kruger effect, while negatively predicting their actual academic achievement (Jia et al., 2025). As many university courses were developed before the recent "AI revolution", they have not been adapted to account for AI as an accessible learning tool. As a result, current course designs and assessment methods appear unprepared for a context in which student performance may depend as much on their ability to use AI effectively as on their own independent knowledge. This raises new questions about how to evaluate student learning and competency in a fair and meaningful manner (Jia et al., 2025).

The Dunning–Kruger effect describes how lower-performing individuals overestimate their competence due to limited metacognitive insight, as confirmed in empirical studies of students' self-assessment accuracy (Kruger and Dunning, 1999; Knof et al., 2024). The findings highlight the importance of developing realistic self-assessment skills to support effective learning and goal-setting (Knof et al., 2024). In the context of AI-enhanced education, one could argue that heavy reliance on generative AI without fostering metacognitive awareness could similarly inflate perceived competence while masking gaps in actual understanding.

The aim and goal of this study is to analyse how AI (generative AI) currently is and, in the future, can be incorporated in higher education as a tool for learning and teaching. The study also aims to suggest possible methods on how to successfully incorporate AI in course design and learning outcome assessments. To explore these issues, a literature review and an interview have been conducted focusing on the use of AI in higher education, its challenges, and as well as observed changes in student outcomes. The interview was conducted with JanFredrik Olsen, a senior lecturer in mathematics at Lund University with practical experience of adapting courses to the use of AI.

I.1. Current use of AI in higher education

To give a some context about the current use of AI in higher education we consulted three surveys, two done in Sweden (Wackenhut et al., 2025; Internetstiftelsen, 2025) and one in England

(Freeman, 2025). One of the Swedish surveys, done by researchers at the University of Gothenburg between late 2024/early 2025 (Wackenhut et al., 2025), showed that 80% of students reported using AI on their courses and educational work, whereas over 90% reported having used AI at least once. Regarding the frequency of use, more than half of the surveyed students reported using AI 'sometimes' or more often (Wackenhut et al., 2025).

Another study that surveyed Swedish students over the age of 18 (Internetstiftelsen, 2025), showed that over two thirds of students used AI for their studies. For working professionals over the age of 18 almost half of them (48%) reported the use of AI in their daily jobs (Internetstiftelsen, 2025).

A UK survey, which sampled over 1000 undergraduate students in 2024 and 2025 found a surge in the use of AI from 63% in 2024 to 92% in 2025 (Freeman, 2025). If we take a look at the percentage of students reporting using AI for assessments specifically the surge goes from 53% in 2024 to 88% in 2025 (Freeman, 2025).

Despite the prevalence in its use among students, only 20% of teachers report active integration of AI into their courses and teaching activities (Wackenhut et al., 2025). However, most teachers (88%) have used AI at least once and 83% of them are familiar with the concept (Wackenhut et al., 2025). Therefore, we find that despite AI being widely use by students and a majority of teachers finding it useful and are aware of how it works, it is fairly uncommon to see AI being integrate in courses.

I.2. Literature review

In an interview conducted by Bloomberg TV, the Arizona State University president Michael Crow referred to AI as a "hyperspeed calculator that provides the most probable answer" (Crow, 2025). He claimed that if an AI system can ace a test, it means that the question and answer complexities must be enhanced and perceives AI as a way to accelerate, broaden and speed up the process of learning. The previous way of learning was conducted "too much in a regimented and industrialised way", but with the rise of AI, education is forced to focus on asking the right questions rather than finding the right answers (Crow, 2025).

I.2.1. Course adaptation and implementation details

The solution presented by Crow centers on transforming the educational model from one focused on transmitting fixed knowledge to one centered on creating highly adaptive "Master Learners" (Crow, 2025). Crow advocates for specific structural changes to enable for the development of interdisciplinary skills (combining a broad perspective with a crucial technical skill), skills integration in order to acquire diverse adaptive skills outside of their main major, and a grounded foundation in core subjects (Crow, 2025).

In the paper *Responsible Adoption of Generative AI in Higher Education: Developing a "Points to Consider" Approach Based on Faculty Perspectives* (Dotan et al., 2024) the authors discuss structural features of adapting a course to the use of AI. It is here stated that when developing curricula and courses the faculty must consider and decide regarding when it is appropriate to transition to the use of AI, including whether the use of AI will enhance learning or if AI itself should be a learning objective (Dotan et al., 2024).

The integration of AI in higher education was found to significantly enhance teaching and learning, albeit a structured implementation plan is crucial to ensure this (Rao and Suhasini, 2025). The plan should include a detailed strategy for AI tools as well as training and support. Regular reviews of the effectiveness of AI tools are also needed and here the authors highlight the importance of peer learning at institutions (Rao and Suhasini, 2025).

The use of AI tools could be an asset in teaching by providing immediate feedback on formative assessments to students which in turn would give the teacher more time to focus on, e.g., critical thinking and problem solving in their lectures (Rao and Suhasini, 2025). However, two studies (Dotan et al., 2024; Rao and Suhasini, 2025) identified concerns regarding increased workload for faculties incorporating AI into courses and other activities. Revising syllables and creating new assignment might take time that course responsible personnel currently do not have (Rao and Suhasini, 2025).

I.2.2. Student Outcomes and Impact (Observed Changes)

In a study wherein AI integration was examined across five higher education institutions it was found that its use has contributed to higher average grades and increased student retention (Rao and Suhasini, 2025). These improvements were attributed to several factors, including enhanced comprehension, greater engagement, and the personalisation of learning materials (Rao and Suhasini, 2025). Their findings illustrate how AI-supported learning environments can positively influence students' academic outcomes.

Other studies further highlight advantages AI tools offer to students, including saving time, generating effective summaries, clarifying complex concepts through accessible and adaptable explanations, and providing personalised academic support, making them highly valuable in higher education (Freeman, 2025). Across multiple surveys, students report that using AI for assignments frees up time for meaningful learning rather than administrative or mechanical tasks (Freeman, 2025; Internetstiftelsen, 2025). For example, AI can scan a 30-page PDF in seconds to determine its relevance for an assignment, enabling students to focus more on understanding the material and less on searching for sources. Students also describe benefits such as increased inspiration, help with generating ideas, and feedback on written work. Those whose first language is not English or Swedish, as well as students with reading or writing challenges, frequently emphasise AI tools' value as linguistic support tools (Wackenhut et al., 2025).

I.2.3. Challenges, Ethics, and Integrity

For students in higher education, AI acts like a highly specialised academic assistant, which can read and summarise textbooks instantly and explain complex concepts on demand. However, just like any powerful tool, its improper use is a temptation, and many users still look at it with apprehension, fearing that its efficiency may eventually replace them in the workforce instead of aiding them. From a teacher's perspective, AI is often viewed with concern because potential risks to academic integrity and student learning can overshadow its benefits. As a result, teachers feel a need for clearer institutional policies and guidance on how to manage these risks while still taking advantage of the potential of AI (Wackenhut et al., 2025).

However, most students in higher education consider the use of AI a risk for being accused of cheating as well as reporting on false facts due to AI's hallucinations (Freeman, 2025). Other common concerns include the impact that AI can have on their academic skills, making them more dependent on it and reducing overall learning capacity (Wackenhut et al., 2025).

The unclear and changing institutional rules on the use of AI also contribute to the 'grey zone' making it hard to determine on which contexts is AI use acceptable (Wackenhut et al., 2025). Other minor concerns include data accessibility and ethical issues. For example, the improper use of AI could lead to data security breaches, use of information without the authors consents and would have a negative environmental impact (Freeman, 2025).

Teachers often use AI as a tool to reduce the time spent on administrative tasks and on grading assignments (Wackenhut et al., 2025). However, teachers find the drawbacks of the use of AI greater than the benefits. Among the most common reported drawbacks we have: cheating risks due to it being difficult, if not impossible, to detect or prove cheating; dependence and uncritical use of it by students; mediocre results when not double-checked by humans; inferior to human interaction and the lack guidance on how to integrate AI tools in courses (Wackenhut et al., 2025).

There is no doubt that for both students and teacher, there is a stigma that comes with AI use, leading to feelings of anxiety, misjudgment, or a lack of trust from teaching personnel and students (Wackenhut et al., 2025). The AI ban that some teachers have implemented discourage students from its use (Wackenhut et al., 2025), but it is unclear the extent to which the students act accordingly.

Teachers feel caught between the undeniable efficiency benefits AI offers (especially for preparation and administration) and the major institutional dilemma it creates regarding assessment integrity. They demand clearer, forward-thinking institutional policies and comprehensive training to address their professional uncertainty and mitigate the risks to student learning (Wackenhut et al., 2025).

II. Design

A report published by the United States Office of Educational Technology highlights AI as a rapidly expanding set of tools that can support personalisation, increase efficiency, provide richer formative and more timely feedback, support diverse learners and inclusion whilst also posing risks related to bias, privacy, inequity, and diminished human judgment. Effective implementation requires educator involvement in both selection and classroom use, as well as policy guardrails that mitigate unintended consequences. The report emphasises that AI in education must prioritise human oversight and alignment with clearly defined learning goals whilst ensuring transparent and ethical data practices. It stresses that AI should augment rather than replace human expertise, with pedagogy guiding its role and technology serving as a supportive tool (United States Office of Educational Technology, 2023).

II.1. The Interview

Jan-Fredrik has adapted two of his courses in analysis for the use of AI. Here, a summary of the ideas from the interview is included. For the full interview, contact authors.

Course Adaptation and Implementation

The course adaptation demanded significant upfront time for course redesign, but the focus of instruction shifted. Being able to trust the AI to cover detailed, technical information has offloaded some cognitive stress. This shift allows for focusing on nurturing the group and process-oriented aspects such as the "soul" of being a mathematician. In other words, how to think as mathematician. In his course adaptations, Jan-Fredrik is primarily trying to help students help themselves. It can be used as a tool for students to adapt teaching materials to get personalised explanations, like a tutor. Jan-Fredrik included a mathematics communication task in which AI was used to solve a difficult proof. The students wrote the solution in LATEX, and provided a reflection on whether they trusted the AI-generated proof.

In the *Higher Analysis* course which he is the course responsible for, students were required to use AI to brainstorm a group project idea that connected to the course content. The assessment

of the course was altered to preserve traditional learning methods. The project required an in-person conference. In the conference, students asked questions and defended their own findings, the setting made cheating with AI impossible. Seminars are designated AI free zones, which helps dispel the "illusion of learning" that AI can create.

Student Outcomes and Impact (Observed Changes)

After the integration of AI, students are more confident and aware of their own knowledge. It has also successfully provided essential support for students with anxiety issues, even enabling one student to perform well in an oral exam who was very nervous. AI can aid students with learning disabilities, such as converting voice recordings into structured bullet points for those with dyslexia and ADHD. However, over-relying on AI might only satisfy the surface-level, motivational aspects of learning. In this way, there is a risk of students falling into a "hole" and never finding their way out. Deep engagement with the necessary "boring stuff" might be lacking, which is particularly challenging and important for those students.

Challenges, Ethics, and Integrity

The greatest challenge encountered was initial student reluctance, as many students viewed AI as "evil" based on their high school teachers' opinions. In essence, AI is a much "sharper knife" than previous tools. Students may be exposed to a lot of information and feel motivated, but this does not equate to genuine knowledge or skill acquisition. Using that analogy, students can accomplish much more, but it's important to be cautious not to hurt themselves.

II.2. Proposed Solutions

Incorporating AI into a course works best when it is framed as a learning tool rather than a shortcut. Students benefit most when AI functions as a tutor—providing personalised explanations, examples, and tailored interpretations of the material (Van den Berg, 2024). For this to be effective, AI use should be embedded directly into the structure of the course, clearly linked to learning outcomes, tasks, and assessments so that interacting with AI becomes a natural and purposeful part of the learning process (Van den Berg, 2024).

Since AI fundamentally changes what students can produce and how they learn, teachers may need to refine their learning outcomes to clarify what students should be able to accomplish independently and where AI can appropriately support their work(Prather et al., 2025). Students likewise need guidance on how to use AI effectively and responsibly, including how to develop a critical stance toward AI-generated content. Frameworks such as the Paul–Elder model (Lee and Low, 2024) can help students evaluate AI responses, assess their reliability, and avoid spreading incorrect information.

Introducing AI early in the course can also help reduce resistance. Many students have previously encountered AI in contexts where it was treated as "cheating," and this perception can limit their willingness to engage with it constructively. Low-stakes assignments that require AI use early on can help build familiarity, confidence, and a shared understanding of how AI fits within the course's expectations (Tsai et al., 2023).

Clear rules about acceptable AI assistance are equally essential. Students should know when and how they are allowed to use AI and what forms of engagement are required to demonstrate their own understanding—for instance, through reflection questions, oral clarifications, or explanations of their reasoning. Assessment strategies may also need to adapt, shifting toward formats that make misuse difficult while making student learning more visible. This could include asking students to justify solutions, designing personalised or iterative tasks, or rewarding the learning process as much as the final product (from interview with Jan-Fredrik Olsen).

Since AI is far more powerful than many traditional educational tools, both students and teachers may require training to ensure its use is meaningful rather than superficial. When implemented with care, AI can help create a more equitable learning environment, providing students who previously lacked personalised support with new opportunities to connect with course material and succeed (Van den Berg, 2024).

Building on these principles, there are several concrete ways that AI can be meaningfully integrated into university teaching. One option is to begin the course with a dedicated training session in effective and responsible AI use. This could involve demonstrations of tools that summarise academic articles, identify relevant literature, or clarify research methods. Such

training should be paired with explicit boundaries that indicate when AI use is discouraged or inappropriate (Liu et al., 2024).

Beyond introductory training, courses can embed AI more deeply by incorporating structured AI-based tasks. For example, students might use a tool such as Elicit to produce a one-page report on a selected topic and present it in class. Oral examinations can then assess students' depth of understanding, while written assignments ensure continued engagement with course materials (Prather et al., 2025).

A more advanced approach involves developing a course-specific chatbot. This approach if particularly valuable in fields like programming, where students often need immediate guidance. Inspired by models such as CS50.ai, a customised chatbot can act as a personalised subject-matter expert (Liu et al., 2024). Using AI, it can provide guidance without revealing full answers, adapt to updates in course content, and offer explanations that remain aligned with instructional goals. When embedded in a course's discussion forum or Q&A system, the chatbot can respond to student questions in real time, with instructors reviewing its responses afterward to correct any potential inaccuracy. In this capacity, the chatbot serves as an automated tutor, offering prompt feedback, clarifying complex ideas, and supporting problem-solving across a wide range of topics (Liu et al., 2024).

To maximise effectiveness, such a chatbot must be equipped with appropriate guardrails. These might include giving hints instead of direct answers, encouraging students to critically evaluate its suggestions, and reducing the risk of hallucinated content through the use of Retrieval-Augmented Generation (RAG) that grounds responses in validated course materials. With these safeguards in place, students may be less inclined to rely on unrestricted general-purpose AI tools such as ChatGPT (Liu et al., 2024).

The main limitation of this strategy is the substantial time and technical expertise required to develop and maintain a custom chatbot. For instructors who are less familiar with AI technologies, implementing such a tool can be challenging (Prather et al., 2025). Nevertheless, the potential benefits are considerable—functionally equivalent to adding several teaching assistants who can support students continuously throughout the course.

II.3. Pros and Cons of the Proposed Solutions

Integrating AI into higher education offers clear pedagogical advantages whilst introducing significant challenges. Integrating AI into higher education and learning has been found to significantly enhance teaching and learning, resulting in higher student grades and increased student enrollment (Rao and Suhasini, 2025). In the interview with Jan-Fredrik he pointed out increased student confidence as a result from utilising AI in the learning process as well as positive benefits from using AI as a supporting tool in notetaking. Both research and Jan-Fredrik's experience show that AI enhances personalisation, provides immediate formative feedback, increases student engagement, and supports equitable learning by providing students the possibility of generating on-demand explanations and/or examples. It can also free teachers from routine tasks, allowing more time for "higher-value interactions" such as coaching critical thinking and problem solving (Rao and Suhasini, 2025).

However, notable drawbacks an the teachers' side caused by AI includes substantial work required by educators to redesign courses, align learning outcomes and develop new assessment formats ensuring the academic integrity (Dotan et al., 2024). Jan-Fredrik stated that the workload could increase if you are adapting an already existing course but when it comes to designing new courses there is no significant differences in workload. From the student perspective, AI can act as a distraction and some students may initially resist using AI due to fear of cheating accusations.

Furthermore, unresolved ethical concerns such as bias, privacy and over-reliance on automated reasoning remain. There is a need for clear institutional policies addressing and controlling the use of AI mitigating these risks (Wackenhut et al., 2025).

II.4. The AI Fluency Initiative at Ohio State University

Ohio State University has launched a so-called AI Fluency initiative which aims to embed AI education across its undergraduate curriculum to ensure that every student, starting with the class of 2029, becomes bilingual - fluent in both their chosen field of study and the effective application of AI within that field. Beginning in autumn 2025, AI concepts will be integrated into the required "General Education Launch Seminar" and as part of workshops in the required "First Year Success

Series". Rather than treating AI as a standalone technical skill, the initiative emphasizes that students should be able to think, work, and innovate fluently at the intersection of AI and their own discipline, while also understanding the ethical and societal implications of these technologies (Ohio State University, 2025).

This initiative exemplifies how integrating AI education across curricula can prepare students to use AI thoughtfully within their disciplines. The approach aligns with our proposed strategies, illustrating how structured AI integration and skill development can support both competence and ethical use in higher education.

III. Assessment and evaluation

To evaluate whether the integration of AI is succeeding, student assessments should be redesigned to measure the skills and thinking that AI cannot easily replace. This involves shifting exams and coursework toward tasks that emphasise critical thinking, real-world application, and the ability to use AI as a learning tool rather than treating it as a threat. Assessments can include randomised questioning, project-based assignments, oral examinations, and activities where AI is intentionally incorporated into the process, requiring students to demonstrate how they apply, interpret, and build upon AI-generated output. By focusing assessment on problem-solving, reasoning, and the meaningful application of knowledge rather than artefacts produced in the learning process, teachers can more accurately determine whether students are developing higher-order competencies and AI literacy. This approach is strongly supported by research (Francis et al., 2025), highlighting the need to move beyond traditional testing methods to capture deeper learning in an AI-enhanced environment.

Conclusively, whilst AI-enhanced course design can improve learning outcomes, its successful implementation into academia whilst ensuring the academic integrity depends on careful transparency, and institutional support. We conclude by asking AI about its opinion on this topic by creating an example of what can be considered as a "good prompt" (Inp1) and its resulting text (Out1) versus what can be considered as a "bad prompt" (Inp2) and its resulting text (Out2) to illustrate the importance of AI literacy when utilising AI and the difference between careful versus careless prompting in ChatGPT (OpenAI, 2025).

Inp1: Write a concise two-sentence conclusion for an academic paper discussing the integration of generative AI in higher education, emphasizing the need for transparency, thoughtful assessment practices, institutional support, and the maintenance of academic integrity. **Out1:** The integration of generative AI in higher education holds significant potential to enhance learning, but its effective use requires transparency, carefully designed assessment practices, and strong institutional support. Upholding academic integrity while fostering AI fluency ensures that both students and educators can engage meaningfully with these tools in a responsible and equitable manner.

Inp2: Write a two-sentence conclusion about how AI should be used in universities, focusing on how it is better than human teachers and makes everything easier for students.

Out2: AI should be embraced in universities as a superior educational tool, capable of providing instant, personalized guidance that surpasses the limitations of human teachers. By automating routine tasks and tailoring learning experiences, AI makes studying more efficient and accessible, allowing students to achieve their goals with greater ease.

IV. Feedback Summary

Most of the received feedback has been incorporated into the revised report, contact authors for details. The structure has been improved by moving the aim to follow the background section, and the theoretical framework has been strengthened through an expanded discussion of the Dunning–Kruger effect. AI fluency has been added as a dedicated subsection, and a reflective conclusion, including the AI's perspective on the task, has been integrated into the *Assessment and evaluation* section. Terminological consistency has also been improved by removing inconsistent references to generative AI.

Some feedback could not be fully addressed due to time constraints. This includes further condensing the section on teacher workload, clarifying or removing quotation-marked terms, expanding and better integrating the discussion on self-efficacy, and making some sections more concise overall. These points are noted as priorities for future revisions.

References

Crow, M. (2025). '20 PhDs' In the Time of One: How AI Is Changing College. Bloomberg TV.

Dotan, R., Parker, L. S., and Radzilowicz, J. (2024). Responsible adoption of generative ai in higher education: Developing a "points to consider" approach based on faculty perspectives. In *Proceedings of the 2024 ACM conference on fairness, accountability, and transparency*, pages 2033–2046. ACM.

Francis, N. J., Jones, S., and Smith, D. P. (2025). Generative ai in higher education: Balancing innovation and integrity. *British Journal of Biomedical Science*, 81:14048.

Freeman, J. (2025). Student generative ai survey 2025. Technical report, Higher Education Policy Institute: London, UK.

Internetstiftelsen (2025). Svenskarna och internet 2025: Kapitel 2 – ai – artificiell intelligens. Report.

Jia, W., Pan, L., and Neary, S. (2025). Effect of genai dependency on university students' academic achievement: The mediating role of self-efficacy and moderating role of perceived teacher caring. *Behavioral Sciences*, 15(10).

Knof, H., Berndt, M., and Shiozawa, T. (2024). Prevalence of dunning-kruger effect in first semester medical students: a correlational study of self-assessment and actual academic performance. *BMC Medical Education*, 24(1).

Kruger, J. and Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, 77(6):1121–1134.

Lee, C. C. and Low, M. Y. H. (2024). Using genai in education: The case for critical thinking.

Frontiers in Artificial Intelligence, 7:1452131.

Liu, R., Zenke, C., Liu, C., Holmes, A., Thornton, P., and Malan, D. J. (2024). Teaching cs50 with ai: leveraging generative artificial intelligence in computer science education. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education, Volume 1*, pages 750–756.

Ohio State University (2025). Ohio state launches bold fluency initiative to redefine learning and innovation. Online news article. Accessed: 2025-12-13.

OpenAI (2025). Chatgpt (gpt-5.2). https://chat.openai.com. Large language model.

Prather, J., Leinonen, J., Kiesler, N., Gorson Benario, J., Lau, S., MacNeil, S., Norouzi, N., Opel, S., Pettit, V., Porter, L., et al. (2025). Beyond the hype: A comprehensive review of current trends in generative ai research, teaching practices, and tools. In *2024 Working Group Reports on Innovation and Technology in Computer Science Education*, pages 300–338.

Rao, G. T. and Suhasini, N. (2025). Integrating artificial intelligence in higher education to enhance teaching and learning. *Computer Applications in Engineering Education*, 33(6):e70085.

Tsai, M.-L., Ong, C. W., and Chen, C.-L. (2023). Exploring the use of large language models (llms) in chemical engineering education: Building core course problem models with chat-gpt. *Education for Chemical Engineers*, 44:71–95.

United States Office of Educational Technology (2023). Artificial intelligence and the future of teaching and learning: Insights and recommendations. Technical report, U.S. Department of Education, Washington, D.C. Accessed November 26, 2025. University of North Texas Libraries, UNT Digital Library.

Van den Berg, G. (2024). Generative ai and educators: Partnering in using open digital content for transforming education. *Open Praxis*, 16(2):130–141.

Wackenhut, A., Gillette, M., and Olsson, E. (2025). Exploring the use of generative artificial intelligence applications in higher education.