GenAI-Driven Pedagogy: Transforming Education

Maikel Leon[a]

Department of Business Technology, Miami Herbert Business School,
University of Miami, Florida, USA

GenAI-Powered Learning (GAIL) is proposed as a pedagogy to enhance student engagement and productivity. This approach builds on existing methodologies such as Problem-based Learning (PBL), Collaborative Online International Learning (COIL), and the Harkness method (HM). GAIL offers a needed perspective on education that aligns with the current AI-driven technological wave.

Technology integration in education has been transformative, with various pedagogical approaches evolving to incorporate digital tools. When Generative AI (GenAI) went viral in 2022, many educators worldwide felt threatened and opposed its use in the classroom. Concerns about the potential for AI to replace teachers, undermine traditional teaching methods, and create an over-reliance on technology were prevalent. There were also ethical concerns regarding data privacy and the potential misuse of AI in monitoring and assessing students. As a result, initial adoption was slow, and GenAI faced significant resistance. However, educators have now recognized the value of AI in enhancing the learning experience and identifying areas of improvement to refine teaching strategies.

These benefits have led to a growing acceptance and integration of AI, transforming the classroom into a more dynamic and supportive environment. Most educators recognize PBL, HM, Experiential Learning (EL), Flipped Classroom (FC), and COIL. A new pedagogical method called Generative AI-Assisted Learning (GAIL) creates a personalized, interactive, and adaptive learning experience for students. By leveraging GenAI's capabilities, including explainability [1], GAIL provides customized learning pathways and enhances student engagement through interactive content. This approach supports differentiated instruction and empowers educators to focus on higher-order teaching tasks, such as fostering critical thinking and creativity. GAIL's need in today's education lies in its ability to accommodate diverse learning styles and prepare students for a future where AI is integral to every aspect of life. GAIL is a transformative method aiming to equip learners with the skills necessary to thrive in a rapidly changing world.

Popular Pedagogical Approaches

Pedagogical methods responding to current times have consistently revolutionized education by fostering critical thinking, collaboration, and global awareness. They have collectively contributed to creating more interactive, student-centered, and globally connected learning environments, preparing students for the complexities of the modern world. Over the years, pedagogical methods have evolved in response to new theories and students' changing needs. Below is an overview of key educational approaches introduced over the past decades:

- 1930s – HM: Emphasizes student-led discussions around a circular table. It fosters critical thinking and promotes collaborative inquiry to deepen understanding through dialogue.
- 1970s – PBL: Encourages students to solve real-world, open-ended problems in small groups, thus promoting independent learning and collaborative problem-solving as it focuses on applying knowledge in practical contexts.
- 1980s – EL: Emphasizes learning through direct experience, followed by reflection, conceptualization, and active experimentation. It encourages students to learn by doing.
- 1990s – FC: Although its foundations trace back to the 1990s, the model became widely popular in the 2000s. It inverts the traditional learning process by delivering instructional content outside of class, allowing class time for interactive and application-based learning.
- 2000s – COIL: Connects students and faculty across countries/regions through virtual collaboration. This method enhances intercultural competencies and broadens perspectives, providing students with a global learning experience in an increasingly interconnected world.

While these pedagogical methods have made significant strides in fostering critical thinking and collaboration, they fall short of meeting the dynamic needs of today's classrooms. We must face the reality that AI and GenAI are here to stay, and the educational landscape must adapt accordingly. To prepare students for the future, newer pedagogical methods must creatively leverage AI and GenAI, harnessing their potential to provide personalized learning experiences, enhance engagement, explain [2], and equip learners with the skills needed to thrive in an increasingly digital world.

Students' Perception of Using GenAI

Students are increasingly enthusiastic about incorporating GenAI into their classwork and group learning

activities. One of the primary reasons for this enthusiasm is the personalized learning experience that AI enables. GenAI can tailor educational content to meet individual students' needs, ensuring that each learner progresses at their own pace. Students value how AI provides instant feedback on assignments, which helps them understand their mistakes and improve in real time without waiting for instructor input. In addition, GenAI supports more engaging and interactive group learning experiences [3]. When integrated into group projects, AI tools assist students with brainstorming ideas, organizing tasks, and drafting content collaboratively. These technologies enhance collaboration by helping coordinate team efforts, improve communication through chatbots and virtual assistants that keep discussions focused, and support resource management by suggesting relevant articles, tools, and references to enhance project outcomes.

Case Study: Teaching Python Programming

Professor L., a business technology instructor, has integrated GenAI into his Python programming course [4]. He typically introduces several AI tools to his students, explaining how those will assist them throughout the course in providing instant feedback, generating code snippets, and offering suggestions. These tools help students understand Python syntax and encourage them to experiment through trial and error cycles. Students who use GenAI to complete class assignments receive immediate feedback on their attempts. For instance, if a student writes incorrect code, innovative tools highlight the errors and suggest corrections.

When the coursework advances to cover functions, object-oriented design, and data analysis with Python libraries such as Pandas, students use a GenAI tool with features like code completion and debugging recommendations. Prompts such as the following are utilized:

> "You are my Python tutor. I am working on a function to count the frequency of words in a text file. Please generate a concise code snippet following best practices for readability and performance. Afterward, explain how the code works and suggest ways to handle large datasets more efficiently."

After receiving AI support, learners are urged to refine the solution and reflect on alternative methods, thus cultivating coding fluency and critical thinking. In addition to individual tasks, group projects are integrated to promote cooperation on more significant, intricate coding challenges. Periodic assessments and coding exams are administered without AI assistance to ensure students can demonstrate independent mastery of Python. Professor L. subsequently reviews trends in common errors, turning these moments into broader lessons to strengthen technical knowledge. This framework is adaptable to other educators seeking to adopt GenAI in their programming courses: introduce AI tools thoughtfully, use them to reinforce active learning, embed collaborative assignments for deeper engagement, and maintain rigorous evaluations to validate proper comprehension [5].

Conclusion

GAIL framework presents a compelling approach for integrating GenAI with established pedagogical practices to increase student engagement, enhance learning efficiency, and better prepare students for a future shaped by AI. Although educators' roles remain essential for guiding learners, fostering trust, and ensuring academic quality, realizing AI's full educational potential will depend on sustained collaboration among educators, technology developers, and policymakers. Such cooperation is necessary to support student success and ensure equitable access to the benefits of AI-enhanced learning.

Notes

a. Email: mleon@miami.edu

References

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