Introduction & Context

Technology has undergone significant transformations in recent years, while education has remained stale for many years. Because of that many traditional teaching methods fail to cater to today’s digitally native students, leaving them disengaged and lacking critical problem-solving skills. It has been proven that students learn better when they’re actively engaged in realistic challenges rather than passively consuming information, which is what Scenario-Based Learning is.

Scenario-Based Learning, or SBL, bridges this gap by immersing students in realistic scenarios that promote deeper understanding and skill application. With advancements in AI, particularly Large Language Models like ChatGPT, we now have the tools to make SBL more adaptive, engaging and personalized than ever before.

Problem Statement & Research Questions

The challenge is clear, how can AI be used to provide real-time, personalized feedback and guidance in educational scenarios? Well, more often than not AI tools for education lack a strong pedagogical foundation, leaving them misaligned with effective learning strategies.

So, with that in mind we will answer the following questions:

How can AI be effectively integrated into educational scenarios to provide real-time, personalized feedback?

How can an LLM-based agent be effectively designed to guide students through scenario-based learning experiences?

In what ways can the integration of AI in education enhance personalized learning and

student engagement?

How can the performance and effectiveness of an LLM-based educational agent be evaluated in terms of student outcomes and learning engagement?

Literature Review & Theoretical Framework

To explore these questions, we conducted a systematic literature review across ACM Digital Library and IEEE Xplore, screening over 1500 papers to identify trends, gaps, and opportunities in the integration of AI with education. This process uncovered critical challenges and limitations like already existing tools such as ChatTutor and CodeTutor and showed us the lack of a dedicated system that integrates pedagogical principles with LLMs in a SBL environment.

State of the Art & Advances

As AI is transforming education by enabling personalized learning paths, real-time feedback, and gamified experiences. For instance, tools like ChatTutor simulate tutor-student interactions, and CodeTutor which aids in programming education. However, these systems often rely on static prompts and lack role-specific, scenario-driven adaptability. Emerging techniques, such as Retrieval-Augmented Generation and Chain-of-Thought reasoning, are paving the way for more dynamic AI systems. Still, integrating these advancements into SBL to provide real-time, personalized feedback remains an open challenge.

Proposed Approach & Methodology

This research proposes an LLM-based intelligent agent tailored specifically for Scenario-Based Learning. The approach includes three key steps:

1. Leveraging advanced prompt engineering to design adaptable scenarios that cater to diverse learning needs.
2. Building an intuitive user interface for seamless interaction, ensuring accessibility for both students and educators.
3. Iteratively refining the system through user feedback and performance metrics to optimize learning outcomes.

The system will adapt dynamically to students’ choices, providing role-specific feedback and real-time guidance to enhance engagement and skill development.

Expected Contributions & Impact

By bridging the gap between LLM-driven technologies and Scenario-Based Learning, this research aims to:

* Extend the capabilities of AI into an underexplored educational domain.
* Provide an innovative platform that promotes deeper engagement and critical thinking.
* Empower educators with a scalable, flexible tool to facilitate experiential learning.

Wrap-Up

Ultimately, this project has the potential to revolutionize how students interact with educational content. By combining the power of LLMs with strong pedagogical principles, we can create a truly transformative learning experience that adapts to the needs of every student. Preparing them more effectively for real-world challenges.