Simulating Professional Workplaces: A Pedagogical Framework for Generative AI-Powered Role-Play for Competency-Based Education

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1. Introduction

Modern workplaces are becoming increasingly complex and there is an urgent need for higher education to align classroom instruction with the practical demands of professional workplaces [1]. While role playing has been proposed as a means to bridge academic knowledge and real-world application, the hiring of professional actors for in-class role play in domains like social work is too costly for large enrollments. Consequently, many graduates may not receive adequate training in practical skills [2].

Recent advances in generative AI (GenAI) offer an opportunity to implement role play in higher education. Large Language Models (LLMs) today can mimic human behaviours very well [3, 4]. Arguably, they can already pass the *Turing test* [5]. By using LLMs to simulate realistic workplace interactions, we can generate context-rich scenarios that will allow learners to learn domain-specific skills.

In this paper, we present a conceptual framework that uses GenAI to implement role-play in the classroom and to bridge the gap between academic instruction and workplace readiness. Focusing on domain-specific problem identification, scenario-focused prompt engineering, interactive practice, and automated, rubric-guided feedback, our framework provides a guided approach for integrating immersive simulations into professional education. To the best of our knowledge, ours is the first framework that operationalizes AI-powered role-play for authentic professional skill development across disciplines.

2. Related Work

Simulation-based learning in competency-based education can allow learners to practice and demonstrate essential skills through authentic, task-oriented activities [6]. Traditional role-play exercises, long employed in fields like social work [7], have proven beneficial for experiential learning, but they have several drawbacks, such as resource-heavy setups, limited scenario variety, and inconsistent feedback [8]. With GenAI-enabled simulation, we believe that we can do better.

Recent strides in GenAI, in particular LLMs, allow simulations to incorporate adaptive, context-sensitive dialogues [9]. Existing research on AI-driven chatbots in education report gains in personalized guidance and immediate feedback [10], and are well-aligned with the iterative nature of competency-based frameworks. However, much of these work are focused on simple tutorial dialogues or standardized cases. In our work, we focus on the design and assessment of complex, domain-specific simulations [11]. Moreover, ethical considerations, bias risk, and validity of automated assessments highlight the need for a more integrated, scalable approach [12].

3. Conceptual Framework

We propose a conceptual framework that uses GenAI to create adaptive, high-fidelity simulations conducive to professional skill development. This framework comprises four interlocking components designed to foster an iterative learning cycle (see Fig. 1):

1. **Domain-Specific Problem Identification:** Instructor begins by articulating the learning objectives to identify authentic challenges that the learner needs to master.

2. **Specialized Prompt Engineering:** GenAI is used to recreate these authentic challenges in textual form, embedding role-relevant terminologies, ethical considerations, and situational complexities. The prompts developed act as the backbone of the simulation, guiding AI-generated characters to respond dynamically to learner inputs.

3. **Interactive Conversational Practice:** Learners engage in the AI-generated role-play to learn real-time decision-making, promoting skill refinement in a psychologically safe environment, thus reducing performance anxiety. This process also allows for repeated practice, and opportunities to refine strategies.

4. **Automated, Rubric-Guided Feedback:** A prompt can also be designed to evaluate learner interactions based on a set of predefined assessment criteria, providing immediate, structured feedback. This immediate and individualized feedback loop—covering cognitive, interpersonal, and procedural dimensions—-enhances reflective practice and allows for continuous skill refinement.

By systematically integrating these four components, our framework can produce an immersive educational experience that takes advantage of the

scalability, adaptability, and responsiveness of modern LLMs.

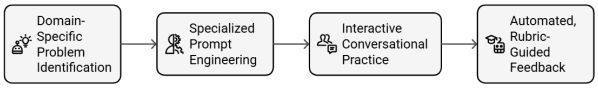

Fig. 1: Conceptual Framework for Generative AI-Enhanced Role-Playing Simulations

4. Implementation Across Professional Domains

To evaluate the effectiveness of this framework, we have implemented it for several undergraduate courses at the National University of Singapore, demonstrating its versatility and adaptability in different professional education contexts. The methodology was implemented with *ScholAIstic* [13], our proprietary Generative AI-driven platform developed for interactive learning.

Legal Education. For legal education, we developed a roleplaying chatbot to train advanced courtroom skills using simulated witness examination scenarios. We identified key challenges like witness management, objection handling, and adaptive questioning. Realistic witness profiles with varying cooperation levels and communication styles were created. Students practiced direct and cross-examinations with AI-generated witnesses, supported by case backgrounds and psychological profiles. Instructors taught practical courtroom skills, by combining AI role-play and in-class mock trials.

Nursing Education. For nursing education, we developed scenario-based simulations focused on critical nursing situations such as cancer diagnosis, post-surgery recovery, and discharge instructions. These scenarios aimed to enhance students' clinical knowledge and empathetic communication skills. Students practiced gathering medical information while establishing compassionate patient relationships. The rubric-based assessment evaluated their clinical reasoning and empathetic communication.

Overall, these examples demonstrate that our framework can be applied across different disciplines. By aligning prompt engineering, interactive practice, and rubric-based assessment with field-specific needs, the pedagogy provides scalable, authentic learning experiences that help bridge the gap between classroom teaching and professional competency training.

5. Implementation Challenges and Reflections

We have developed role-playing chatbots for 5 different use cases and they will be trialed in classroom from March 2025 to May 2025. In this section, we discuss the challenges and learning points thus far.

Prompt Engineering Complexity. The development of effective scenario prompts was more complex than expected. Balancing professional authenticity, appropriate learning scaffolds, and consistent AI responses required multiple iterations. For example, in a legal education scenario, we developed an "Examination-in-Chief Bot"—a forgetful witness who sometimes provides incorrect details. Students must spot and correct these errors without asking leading questions, which would trigger a judge's intervention. This illustrates how a carefully designed prompt can reinforce both procedural knowledge and adaptive questioning skills. A structured prompt framework, with standardized components for context, character profiles, and response parameters, ultimately improved consistency and educational alignment [14].

Faculty Role Transition. The introduction of GenAI in teaching required a substantial shift in faculty roles [15]. Educators now need competencies in problem identification, prompt engineering, and LLM-enabled assessment design–skills that were rarely needed in traditional teaching. To enable this transition, we designed a comprehensive faculty development programme, prompt libraries, and created a collaborative community. The most successful implementations occurred when instructors were engaged as learning designers rather than content deliverers, and received support to develop their educational technology literacy.

AI Safety, Ethics, and Hallucination Considerations. In education, safety is paramount. While GenAI can engage learners by simulating realistic professional dilemmas, it also raises ethical concerns about content boundaries, bias, and emotional well-being. Balancing authenticity with protection from harm and stereotypes is crucial [16]. Moreover, LLMs can "hallucinate" or produce inappropriate or culturally insensitive content, potentially undermining both educational goals and ethical standards [17]. Automated feedback may also become misleading if unchecked. To address these concerns, practice with *ScholAIstic* grants teachers visibility into student activities, enabling timely intervention when necessary. Additional features that automatically flag suspicious or anomalous behavior can further reinforce a secure and supportive learning environment.

6. Conclusion and Future Directions

In this paper, we described a four-step framework—incorporating domain analysis, prompt engineering, interactive practice, and automated assessment to develop role-playing chatbots that address the theory-practice gap in professional education. Our pilot applications in legal, nursing, and some other contexts demonstrate that our framework applies to diverse domains. This is still work in progress. Further studies will be needed to (i) quantify the effectiveness of skill transfer from simulated practice to real-world performance, (ii) compare different prompt engineering strategies, and (iii) improve multimodal analytics for deeper feedback. A longitudinal inquiry into actual workplace outcomes would offer clearer evidence of long-term efficacy.

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