



An Intelligent Virtual Teaching Environment with Emotional Recognition: Supporting Novice Teachers through LLM-Driven Multi-Agent Simulations

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ABSTRACT

Novice teachers frequently report insufficient preparation for dealing with disruptive behaviors in the classroom, a challenge that can impact both teacher confidence and student learning outcomes. To address this issue, we present a proof-of-concept virtual simulation framework, *Class Simulation*, designed to provide accessible and practice-oriented teacher training through Large Language Model (LLM)-driven multi-agent simulations. Developed in Unity, the framework integrates three key components: (1) an Orchestrator that generates authentic disruptive behavior scenarios; (2) Student Agents capable of expressing realistic emotional responses to teacher interventions; and (3) an Analyser that offers real-time feedback and explanatory insights. To adapt the system for educational use, we implemented a fine-tuning pipeline informed by input from educational professionals. Validation with expert reviewers assessed the quality of scenario generation, emotional authenticity, and feedback relevance, while usability testing with teachers evaluated pedagogical value and practical applicability. Findings indicate that teachers viewed the simulation as a useful tool for strengthening classroom management skills and bridging gaps in existing training. Although fine-tuning showed only limited improvements in scenario and feedback quality, emotional modelling enhanced the realism of interactions, contributing to more immersive experiences. Current limitations include scalability and reliance on commercial LLM APIs. Despite these challenges, our results highlight the potential of AI-driven simulation environments to provide flexible, realistic, and cost-effective training opportunities for teachers.

Keywords: artificial intelligence; class simulation; education; emotion modeling; fine-tuning