A Conceptual Framework Highlighting Design Factors for Emotion-Aware Chatbots in Education

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Abstract

In large classrooms, teachers often cannot give individual attention to each student, limiting personalized support and timely feedback. AI-based educational chatbots serve as a valuable tool to teachers by assisting them with various routine tasks, such as answering student queries and providing learning guidance. However, most existing chatbots cannot detect students' emotions and lack pedagogical feedback loops, which reduces their effectiveness in creating truly adaptive learning environments. To address these gaps, this study proposes a conceptual framework of an expert system that integrates a personalized chatbot with a sentiment analysis engine and a pedagogical feedback loop. Initially, a systematic literature review of peer-reviewed studies published between 2018 and 2025 was conducted to identify the critical design factors required for developing such an emotionally aware, feedback-driven intelligent system. The findings from the review have been validated with a pilot study using two questionnaires, one for the students and the other one for the teachers. Based on the validations, a conceptual framework was formulated. The research outcomes provide an evidence-based foundation for designing intelligent learning systems capable of understanding learner emotions, enhancing students' engagement and supporting teachers in informed instructional decisions.

Keywords

Educational Chatbots, Sentiment Analysis, Pedagogical Feedback Loop, Expert Systems in Education, Intelligent Learning Systems.