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**Personalized affective feedback to address students’ frustration in ITS**

**Abstract**

The importance of affective states in learning has led many Intelligent Tutoring Systems (ITS) to include students' affective states in their learner models. The adaptation and hence the benefits of an ITS can be improved by detecting and responding to students' affective states. In prior work, we have created and validated a theory-driven model for detecting students' frustration, as well as identifying its causes as students interact with the ITS. In this paper, we present a strategy to respond to students' frustration by offering motivational messages that address different causes of frustration. Based on attribution theory, these messages are created to praise the student's effort, attribute the results to the identified cause, show sympathy for failure or obtain feedback from the students. We implemented our approach in three schools where students interacted with the ITS. Data from 188 students from the three schools collected across two weeks was used for our analysis. The results suggest that the frustration instances reduced significantly statistically (p < 0.05), due to the motivational messages. This study suggests that motivational messages that use attribution theory and address the reason for frustration reduce the number frustration instances per session.