

Toward Automated Scoring for Qualitative Problem Solving in Earth Science Education

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Abstract

In this paper, we present a summary on our recent results on developing automated scoring technologies that may efficiently and reliably evaluate students' open-ended responses against qualitative problem solving assessments for science learning. Students are expected to perform more authentic scientific reasoning when dealing with scientific inquiry questions in this type of assessments. Students express problem solving ideas and reasons in support of these ideas in open-ended texts. Methods of natural language processing were employed and adapted to realize the automated scoring approach. By implementing and evaluating an automated scorer for the debris flow hazard (DFH) idea generation task in the earth science domain (Chang et al., 2007), the automated scoring approach was found to be statistically reliable. The Person's correlation between machine scoring results and human scoring results achieved the level of $r=.8$. The near-human performance of automated scoring may reduce the cost required for processing open-ended answers as well as increase the applicability and utility of open-ended assessments in educational practices. We also see the potential of this approach as a core component for other useful applications such as enabling timely help for self-paced online learning and computer-based tutoring systems.