center for the study of adult literacy

Studies on AutoTutor for CSAL

Overview

AutoTutor is an intelligent tutoring system developed by researchers in the Institute for Intelligent Systems at the University of Memphis. AutoTutor lessons were aligned with a teacher-led curriculum for training comprehension strategies. As adult learners worked through AutoTutor lessons, they interacted with a computer tutor agent and a computer peer agent. These agents appeared as "talking heads" at the top of the screen. The adult learner engaged with the two computer agents in conversation ***trialogues*** that both trained and assessed comprehension strategies. These conversations included engaging real-world activities, such as the adult learner helping the peer agent solve a problem or a game competition between the adult and peer agent. The lessons have texts that adult learners would find interesting or useful, such as understanding a job application, a rental agreement, or a cooking recipe. AutoTutor currently has 30 lessons that take between 20 minutes and 60 minutes to complete.

Comprehension Performance

Comprehension is assessed by the accuracy and time the adult learner takes to answer questions asked by the agents in the conversational trialogues. An answer is counted as correct if the adult learner answers a question when initially asked, or partial credit is given when the adult learner correctly responds to an agent's follow-up hint. The tutor agent gives feedback on the answers and explains why answers are or are not correct. Many of the lessons adapt to the adult learner's performance by assigning more difficult texts to higher performers and easier texts to lower performers.

The performance profiles of the adult learners in the lessons allow for the classification of them into different clusters (Fang et al., in press), such as those who are higher performing (fast and accurate), conscientious (slow and accurate), under-engaged (fast, with medium accuracy), and struggling (slow and inaccurate). The first three clusters showed improvement on reading comprehension tests after completing AutoTutor lessons. In addition, algorithms have been developed for detecting where students are disengaged when they answer questions asked by AutoTutor computer agents (Chen et al., 2021). These algorithms identify observations in which the adult learner responds too quickly (a signal of impulsive responding or gaming the system) or too slowly (a signal of mind wandering) and have low accuracy in answering adjacent questions. As expected, disengagement predicted performance accuracy on AutoTutor lessons and also learning gains on standardized assessments of comprehension.

Formal Academic Vs. Informal Conversational Style

The two computer agents in AutoTutor, representing a tutor and a peer, can be programmed to converse with the adult learner in a formal academic style or an informal conversational style. It is debatable which style will best help students who are having difficulties in English language and discourse. Li and Graesser (2021) conducted a study that manipulated conversational style in AutoTutor lessons through three conditions: (1) a formal condition in which both the tutor agent and the student agent spoke with a formal communication style, (2) an informal condition in which both agents spoke informally, and (3) a mixed condition in which the tutor agent spoke formally, whereas the student agent spoke informally. The formality of language style was computed using an automated tool on

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The research reported here is supported by the Institute of Education Sciences, U.S. Department of Education, through grant R305C120001 Georgia State University. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

analyses of language and discourse (Graesser et al., 2014). The participants were adult English language learners who wanted to improve their summarization skills. The participants were randomly assigned to one of the three research conditions. The AutoTutor lessons focused on summarization skills in two informational text genres (compare-contrast and cause-effect). Learners' summaries were scored both by humans and by several automated measures of assessing summary quality that were systematically compared in a study by Li, Cai, and Graesser (2018). The results showed that participants improved the quality of summary writing, spent less time writing summaries, and had lower syntactic complexity and more expository summaries on posttest than pretest. However, this difference was not affected by the discourse formality that agents used during instruction.

References

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