

Using Virtual Agents to Deliver Lessons in Reading Comprehension to Struggling Adult Learners

Whitney O. Baer, Qinyu Cheng, Yan Gong, Zhiqiang Cai, Arthur C. Graesser

University of Memphis, 365 Innovation Drive, Institute for Intelligent Systems, University of Memphis, Memphis, TN, 38152

whitney.baer@gmail.com, qinyucheng711@gmail.com,
ygong2@memphis.edu, zhiqiang.cai@gmail.com,
art.graesser@gmail.com

Abstract. The Center for the Study of Adult Literacy (CSAL) seeks to improve our understanding of ways to advance the reading skills of adult learners. Our web-based instructional tutor uses dialogues in the AutoTutor framework to deliver lessons in reading comprehension. We have found a way to manipulate proven comprehension strategies to fit the daily tasks of approaching the written word. With the added demand for digital literacy skills in today's world, it is important that adults with low reading ability experience learning on an online platform.

1 System's Purpose

The Center for the Study of Adult Literacy (CSAL) is a national research center committed to understanding the reading-related characteristics that are critical to helping adult learners reach their reading goals and to developing instructional approaches that are tailored to adult learners' needs and interests. Adults who struggle with reading have an extremely varied set of abilities and experiences. Many of them have difficult life circumstances which dictate their ability to attend classes regularly (Greenberg, 2008). Adopting a web-based instructional tutor allows for individualization of instruction, increased engagement, and the opportunity to acquire digital skills.

2 Significance of the Approach Implemented

Our computer-based program is CSAL AutoTutor, an intelligent tutoring system delivered online. Our web-based series involves two animated conversa-

adfa, p. 1, 2011.

© Springer-Verlag Berlin Heidelberg 2011

tional agents, 35 curriculum scripts, semantic evaluation of student contributions, adaptive conversational dialogues (Graesser, Li, & Forsyth, 2014), and electronic documents to be read. The greatest feature of the CSAL AutoTutor system is using an event-driven approach to build communication with the learner. This feature is different from the conventional Natural Language Processing conversation method. To make the system more entertaining for the learner, we incorporated many interaction options with the system – such as multiple choice, drag and drop, and quiz show-style review. Varied media elements are seamlessly integrated in the system. The learner’s response may trigger diverse media, such as images, diagrams, audio and videos. For example, based on a learner’s response, a specific video may be triggered. While showing the video, the system may pause at a specific frame to interact with the learner by conversation.

The AutoTutor lessons are based on the Adult PACES curriculum developed in conjunction with our collaborators at The University of Toronto. Adult PACES includes the theoretical components of Prediction (characteristics of genre), Acquisition of vocabulary and mental models, Clarification through questioning, Elaboration-explanation-evaluation, and Summarization. PACES has already proven to be a successful program in improving reading comprehension in high school students with reading difficulties (Lovett, et al., 2012), but in this project it is being tailored for adult learners with respect to content and task utility. One of the biggest obstacles that we face is the lack of source material appropriate for an adult population. We want to provide lessons that demonstrate understanding of the reading material most likely to present itself in daily life. Job applications, directions on medicine bottles, and legal agreements are all examples of items that may be complicated for a learner to tackle on their own. In our intervention, the learner is usually presented with a difficult document by the peer agent. The peer agent struggles with the same materials that a typical adult learner might. The learner is then placed in the role of “expert” – and is given the opportunity to help the peer agent to understand the document using the strategies and tools that the learner and peer agent have been given during the lesson.

Another challenge in designing the lessons is determining the level of complexity in computer interaction that is suitable for the learner population

(Graesser et al, in press). We want to provide an experience that allows the learner to practice new digital skills while emphasizing the comprehension strategies that are the focus of our lessons. Early testing has demonstrated that adult learners are eager for the opportunity to use a computer and are capable of successful interactions with text and media – especially when the interactions are modeled by agents (Graesser, McNamara, 2010). As a way to promote learner comfort with digital skills, we have designed four Digital Literacy lessons to allow the learners additional practice with interactions they may experience in daily life. The topics for these lessons are: Online Research, Online Applications, E-mail, and Social Media.

3 Studies

Initial usability sessions revealed that the adult learner population is eager for the opportunity to interact with the computers. From January 2015-June 2015, we conducted a feasibility study with 100 hours of human and computer instruction. 30 lessons were completed on the web-based tutor by 52 adult learners. At the end, we found a mean completion percentage of 71 with 55% of learners getting the correct answer on the first attempt. A post-test for the study on comprehension level tests showed learning gains of .44.

We just completed the first wave of a Pilot study that began in January of 2016 with 72 learners in classes in Atlanta and Toronto and are beginning the second wave of the Pilot study in August 2016.

4 Outline of Demonstration

At present, we have 30 reading comprehension lessons, an Orientation lesson, and 4 Digital Literacy lessons in the CSAL AutoTutor system.

During the conference, an attendee would start on the homepage of CSAL AutoTutor. They could choose whether to go through the Orientation, or they could continue on to the lessons like a returning user. They will select a name with which they would like to be addressed by the system. They can look through the list of lessons and choose any topic that is of interest to them. At this point, they have the option to watch a Review Video of the

skills that are meant to be acquired in that particular lesson, or they can start the Activity. Attendees will also be free to explore the Independent Reading section of the interface which guides learners to resources around the web that are intended to provide additional readings at an appropriate level. Attendees will have the opportunity to view our Teacher's Page which shows learner progress and other information that is collected by our database.

For anyone with additional interest, we are working on an interface which allows instructors to try one of our lessons at random, or to create a class for themselves using our development tool and established content. We can demo this interface as a work-in-progress at the conference.

5 Acknowledgements

CSAL is funded by the Institute of Education Sciences, US Department of Education (Grant R305C120001). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of IES.

6 References

1. Graesser, A.C., Baer, W., Feng, S., Walker, B., Clewley, D., Hays, D., Greenberg, D. (in press). Emotions in Adaptive Computer Technologies for Adults Improving Reading. *Emotions, Technology, Design, and Learning: Communications, for, with, and through Digital Media*. San Diego: Elsevier.
2. Graesser, A. C., Li, H., & Forsyth, C. (2014). Learning by communicating in natural language with conversational agents. *Current Directions in Psychological Science*, 23, 374-380.
3. Graesser, A.C., & McNamara, D.S. (2010). Self-regulated learning in learning environments with pedagogical agents that interact in natural language. *Educational Psychologist*, 45, 234-244.
4. Greenberg, D. (2008). The challenges facing adult literacy programs. *Community Literacy Journal*, 3, 39-54.
5. Lovett, M.W., Lacerenza, L., De Palma, M., & Frijters, J.C. (2012). Evaluating the efficacy of remediation for struggling readers in high school. *Journal of Learning Disabilities*, 45, 151-169.