Human Tutor and Computer Tutor Story Choice in Listening to Children Read Aloud

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Abstract. A preliminary report on a comparison of human tutor story choice and mixed-initiative computer tutor story choice in Project LISTEN's Reading Tutor.

1 Introduction

Choosing the next problem for a student to solve is a critical aspect of a computerized learning environment. Possible solutions vary: decisions may be pre-specified or made just in time. Also, task choices may be made by the student, by the computer, or by the author. For example:

1. A student working through problems in a textbook. Here, the textbook's authors made the task choices beforehand.
2. A student performing a Web search and then selecting web pages to read. Here, the student is making his or her own task choices just in time.
3. A student using an intelligent tutoring system (e.g. Anderson et al. 1995.) Here, the set of activities and the prerequisite structure may be specified in advance; activity choices are typically made just in time, either by the computer or by some combination of the student and the computer.

Project LISTEN's Reading Tutor listens to children read aloud and helps them learn to read. One important task choice in the Reading Tutor is choosing the next story to read. In this paper, we describe learner-controlled story choice in the Reading Tutor, modifications to allow for mixed-initiative story choice, and some preliminary observations of human tutor story choice patterns. Finally we offer some implications for computerized instructions.

2 Learner-controlled story choice in the Reading Tutor

Project LISTEN is developing a Reading Tutor that listens to children read aloud, and helps them learn to read [Mostow & Aist CALICO 1999]. The Reading Tutor displays one sentence at a time to the student, and listens to the student read all or part of the sentence aloud, and responds expressively using recorded human voices. Reading Tutor responses include speaking a word, speaking all or part of the sentence, sound-

ing out a word one phoneme at a time, sounding out a word one syllable at a time, and showing and saying a rhyming word. The Reading Tutor lets children read stories from a variety of genres, including nonfiction, fictional narratives, and poems. Part of helping children learn to read is helping them pick stories that are interesting and challenging, and making sure each student reads plenty of new material while still being able to occasionally re-read a favorite story. Any such design will have to both ensure the educational goal of leaming to read, and address motivational factors such as confidence, challenge, curiosity, and control [Lepper et al. 1993].

2.1 Children's story choices under close supervision

How do children choose stories when closely supervised? In a 1996-97 pilot study, eight low-reading third graders used the 1996 version of the Reading Tutor under one-on-one supervision by a Title I-funded school aide [Mostow & Aist PUI 97]. The six students available for post-testing gained over 2 years in fluency over their pretest scores, as measured by an informal reading inventory (IRI). Our conversations with the school aide, plus the fact that the story menu in the 1996 version was adult-operable but not really kid-operable, led us to two conclusions. First, the aide encouraged kids to read material challenging enough for them. Second, she encouraged kids to try new stories from time to time rather than just read the same material time and time again.

2.2 Children's story choices under classroom conditions

How do children choose stories when using the Reading Tutor under classroom supervision, where the attention of the teacher is divided among the student using the Reading Tutor and students engaged in other activities? The 1997-1998 version of the Reading Tutor allowed students free choice, from a more kid-friendly menu, of any story to read at any time. We found that some kids would read the same story many times when supervised in a classroom setting. We also found that some students would spend their time reading stories that were obviously too easy for them, despite spoken feedback from the Reading Tutor about how hard or easy a story might be to read. As this shows, kids' goals and software instructional goals differ [Hanna, Risden, Czerwinsky, and Alexander 1999].

Allowing a child totally free choice of what to read sometimes resulted in poor choices under classroom conditions. Therefore, we designed a revised story choice policy as follows:

1. The student and the Reading Tutor take turns picking stories to read. The Reading Tutor chooses new stories when possible. The student chooses from a kid-friendly list designed by the Project LISTEN team. The Reading Tutor speaks each story title in the list to let the student hear the titles before making a selection.
2. The Reading Tutor adjusts the student's recommended reading level based on the student's performance at reading a new story aloud. Recommended reading level is the

level of the story that the Reading Tutor will choose when it picks a story, and the level it recommends that the student choose from.

3 Human tutors' story choices

How do Reading Tutor story choices compare to human tutor story choices? In this paper, we utilize data collected as a byproduct of a separate experiment conducted over the course of the 1999-2000 school year where some students received extensive computer tutoring from the Reading Tutor and others received extensive one-on-one human tutoring. (The main experiment is not the focus of this paper, so we defer a detailed description.) The human tutors have access to paper versions of the same stories that are used in the computer Reading Tutor, but do not use computers in their tutoring.

In the Reading Tutor, students may read stories or write stories of their own. Human tutors may engage the student in reading or writing, likewise. Both the Reading Tutor and the human tutors have the same set of stories to choose from. This enables us to directly compare how different story choice policies -- human and computer -- affect what children read.

We collected human tutoring records as digital photographs of tutor log sheets. These tutor logs contain detailed records of what each student read or wrote for each day he or she received human tutoring.

We describe here some qualitative aspects of two human tutors' story choice policies, and discuss common features and striking differences between the two human tutors and also with the computer Reading Tutor.

3.1 Human tutor story choices

Human tutor LN (we use initials for anonymity) seems to have started out having all kids doing the same thing -- writing "All About Me" -- and then after a few sessions started having different kids reading different material. LN's decisions appear to be made more on a "low end"/"high end" basis than on an individualized basis. For example, even months after the study started there are kids reading the same story on the same day. Students reading with LN generally finish stories they start reading, except for the last story of a day.

Human tutor ME also had every student start out doing the same thing -- in this case, reading the level A story "A dog had a frog." However, ME seems to interrupt a student when a story is too hard and picks a different, easier story for the student to try. We inferred this pattern from multiple cases where a story was not finished, rated as "too hard", and an easier story was selected next. By the beginning of October 1999, ME was having every student do something different.

4 Implications for computerized instruction

What are the implications of LN and ME's behavior for the Reading Tutor? LN's story choices, while less individualized, may be much easier to implement because they seem to be based on just identifying kids as low or high performing and then waiting until the end of the story to pick a new story. ME's story choices include a behavior we had discussed internally but decided not to include in the computer Reading Tutor -- interrupting a student who is reading a story that's way too hard, and picking an easier story. ME's individualized story choices may prove to be more effective but implementing them would increase the complexity of the Reading Tutor. Analyzing human tutors' story choices has exposed differences between the human tutors' behavior, and identified potential areas of improvement for the computer Reading Tutor.

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