Project LISTEN's Reading Tutor: Interactive Event Description

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Abstract. This interactive event demonstrates various aspects of Project LISTEN's Reading Tutor, which listens to children read aloud, and helps them learn to read.

1. Brief General Description of the Event

Project LISTEN's Reading Tutor (Mostow & Aist, 1999, 2001) uses automated speech recognition to listen to children read aloud (Mostow *et al.*, 1994), and helps them learn to read (Mostow *et al.*, 2003a). During the 2002-2003 school year, hundreds of children in grades K-4 used the Reading Tutor regularly on 216 computers in 9 schools in six districts in two states.

Project LISTEN's research goals include evaluating and improving both the Reading Tutor's efficacy in improving the reading skills of children who use it, and the amount of its usage in elementary school classrooms, labs, and specialists' rooms.

The "interactive event" described here is a live demonstration of the Reading Tutor, including audience participation and running commentary, at the Tenth International Conference on Artificial Intelligence in Education (AIED2003), in Sydney, Australia, in July 2003. The event illustrates several attributes that distinguish the Reading Tutor from most intelligent tutors:

Listening: Participants can witness and experience several features of the Reading Tutor's real-time, two-way, open-microphone spoken dialogue, such as backchannelling, interruption, response to hesitation, and consequences of recognition errors (Aist, 1998).

Interface: Unlike tutors designed for fluent readers, the Reading Tutor is used by children with low reading ability and metacognitive skills. Its interface is designed to keep the interaction simple and to focus attention on the text.

Scope: Effective intelligent tutors may teach a few dozen rules. In contrast, reading acquisition involves hundreds of grapheme-phoneme mappings and thousands of word meanings, as well as phonemic awareness, the alphabetic principle, world knowledge, and

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general comprehension skills. The event illustrates how the Reading Tutor scaffolds this diverse range of skills.

Coherence: An intelligent tutor may choose problems crafted to exercise specific rules. In contrast, coherent, high-interest text cannot readily be restricted to a specific set of target skills to exercise. Reading tutoring situated in authentic, connected text must therefore scaffold whatever skills are required to read the text, and its tutorial interventions must fit the context. We illustrate how the Reading Tutor applies generic tutorial interventions to any given text.

2. Script for the Event

The Interactive Event consists primarily of a "projector demonstration." An audience volunteer plays the role of the student. We provide running commentary and answer questions. Audience members often ask, "what happens if the student does X?" We reply, "Try it and see!" In such cases we observe and discuss the Reading Tutor's response to X.

A Reading Tutor demonstration includes the following steps.

Enrollment (1-2 minutes): At the start of the year, the Reading Tutor enrolls the student, with the teacher's help if necessary.

Login (0-1 minute): When a session starts, the Reading Tutor logs in the student. The login interface must accommodate non-readers, yet keep one student from logging in as another.

Tutorial (5-10 minutes): The first session starts with an automated tutorial on how to use the Reading Tutor.

Activities (~30-40 minutes): The Reading Tutor takes turns with the student picking which story to read next. Stories are composed of a few types of steps:

- *Assisted oral reading*: the Reading Tutor displays text and helps the student read it.
- *Tutor read-aloud*: the Reading Tutor displays text and reads it aloud to the student.
- *Oral spelling*: the student spells a word aloud.
- *Narration*: the student adds his or her voice to a story he or she has created.
- *Picking*: the Reading Tutor presents a "talking menu" of items to click on.
- *Typing*: the Reading Tutor prompts the student to type in a word or longer piece of text.

Interventions: The Reading Tutor intervenes to assist the student, to assess the student, and/or to evaluate the efficacy of its own assistance. It may intervene before a story (e.g, to preview new vocabulary), before a sentence (e.g, to insert an automatically generated comprehension question), during a sentence (e.g, to give help on a word), and/or after a story (e.g, to review or post-test words from the story). It selects randomly from its repertoire of interventions, constrained by which interventions are feasible and felicitous in a given context.

Experiments: Automated experiments embedded in the Reading Tutor use within-subject randomized trials to evaluate alternative tutorial interventions. Examples include:

- *Word identification*: evaluate different ways to preview new words before the story, post-testing them after the story (Mostow, to appear).

- *Word comprehension*: evaluate different ways to explain new words before the story, post-testing them after the story (Mostow *et al.*, 2003b).
- *Emotional scaffolding*: test whether emotional scaffolding affects student persistence in terms of how long they choose to spend on spelling tasks (Mostow *et al.*, 2003c).
- *Generic questions*: randomly insert a generic *wh-* question to try to scaffold comprehension, and see if it helps the student answer the next automatically inserted comprehension question (Mostow *et al.*, 2002). **Our AIED2003 poster (Beck *et al.*, 2003b)** focuses on the design and analysis of this experiment. In contrast, the interactive event demonstrates the overall observable behavior of the Reading Tutor.

Reports (5-10 minutes): The Reading Tutor records student behavior in a database and uses this data to generate usage and progress reports for teachers on demand. It continually updates its estimate of students' reading ability based on how long they hesitate before each word they read (Beck *et al.*, 2003a), and uses this data to adjust the level of stories it chooses on its turn.

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