Online Math Tutoring for Blind Students: Adding Audio Hints to Support Effective Problem Solving

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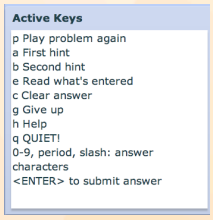
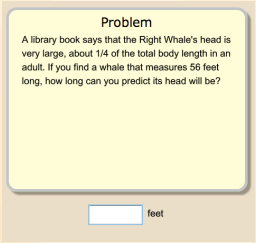
Project background. Students who are blind have low rates of STEM participation. Mathematics proficiency is a "critical filter" for STEM access, yet mathematics can be especially challenging for blind students. Audio narration has been identified as a "promising practice" to support math learning by blind students.

Project strategy. We are adapting an existing web-based tutoring system for algebra readiness for use by blind students. In the original AnimalWatch system, students solve colorful word problems about endangered species, connecting math with science. In the adapted "AnimalWatch-VI" version, blind students can access the word problems and hints in audio format. The system is self-voicing and does not require screen reader software. Key features include:

- a brief tutorial about the simple key commands used for navigation
- a replay command to let students listen to a word problem as often as they wish
- immediate audio feedback on answer accuracy
- two audio hints for each word problem to guide students to the appropriate solution path





Evaluation. The AnimalWatch-VI tutoring system was field tested with 14 blind students who each solved 12 word problems. Problems included arithmetic (4 items), fraction formation (4 items) and fraction operations (4 items).

Data sources. Blind students' answers were recorded, along with problem replays and use of hints. For each word problem, similar data were located for 20 sighted students who had previously solved the problem. Also, data were available from 12 blind students who had previously solved the word problems without the integrated audio hints.

Results. The addition of hints reduced the number of problem replays, and increased the probability of correct solutions, relative to earlier data from blind students who did not have access to hints. Benefits of hints were most apparent on the most difficult math items, and for students whose teachers had indicated were struggling with math. Students reported that they liked the connection of math with science, and that they liked being able to direct their own learning by using the program.

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