Investigating Synthetic Web-Based Tutoring: Research on What Works

Chris M. Nakamura, Brian Adrian, Dean A. Zollman, Mike Christel, and Scott Stevens

This work is supported in part by U.S. National Science Foundation under grant numbers REC-0632587 and REC-0632657
Motivation

Student-tutor interaction
- More effective than typical classrooms and mastery learning\(^1\)
- Perceived interaction is known to be important\(^2\)
- Provides direct access to students’ knowledge construction process

Can we simulate this interaction?
- To provide a supplemental learning aid
- To provide insight into students’ learning process

Tutoring Interaction

A view of the tutoring interaction

Tutor

Student
Synthetic Interaction

The Interface

provided by Synthetic Interview Technology

Natural language questions
Answered by a real person
Responses are pre-recorded, but can simulate a real conversation.

3 Stevens (2007)
Synthetic Interaction

The Content Knowledge

Stored in the Informedia Digital Video Library

Multimedia content can be searched by keywords

Complete transcripts are displayed

Can be linked to Synthetic Interview

3 Stevens (2007)
Synthetic Interaction

The Script

What should be taught?

What should a tutor say for effective results?

What do students expect from the interaction?
Synthetic Interaction

The Script

What should be taught? → Our Choice
– Newton’s Laws

Current Research Questions:
What should a tutor say for effective results?\textsuperscript{4,5}

What do students’ expect from the interaction?

\textsuperscript{4} Chi (1996) \hspace{1cm} \textsuperscript{5} Chi (2001)
Creating the Script

- Designed 3 lessons on Newton’s Laws
- Lesson scenarios inspired by FCI questions⁶
- Utilize a 3 stage learning cycle for each lesson⁷
- Implementation combines Web materials, traditional written materials and a live human facilitator
- Lessons focus on empirical observation and task as measure of understanding

⁶ Hestenes (1992) ⁷ Karplus (1977)
Creating the Script

Sample

I. Exploration: Make observations or measurements

II. Formal Introduction/Discussion: Discuss exploration results in context

III. Application: Perform a relevant task and explain solution
Pilot Testing

Summer 2008 Study:

– 7 students in algebra-based and concept-based physics
– 3 female, 4 male
– 2 hour tutoring/interview sessions
– A human tutor facilitated the sessions
Pilot Testing

Preliminary Results:

Confirming the things we (hopefully) already knew

– Questions are the language of tutoring.
– Observed normal student difficulties (Ex: Force moves with objects., Motion implies force. etc…)
– Students believe lessons and tutor are helpful.
– Time per lesson varied 30min to 2hrs.

A detailed analysis is in progress to find what works.
Ongoing Efforts

– Refine scripts based on student & teacher feedback

– Combine scripts with synthetic interview and informedia digital library technologies

– Study relation between available interactions and student learning
References


Thank You!

More info:
http://perg.phys.ksu.edu

Contact:
cnakamur@phys.ksu.edu