Social and Technological Challenges in Creating a Web-Based Tutoring System

Chris M. Nakamura, Sytil K. Murphy, Nasser M. Juma, N. Sanjay Rebello and Dean Zollman
Kansas State University Physics Department

Physics Education Research Group
Kansas State University

Mike Christel and Scott Stevens
Carnegie Mellon University Technology Center

Project Goals:
- Create and test a synthetic tutoring system
- Use pre-recorded video responses (see mock-up below, left)
- Should be as broadly effective and accessible as possible
- Can be used at home to supplement normal instruction

1. SI Persona answers students' Physics content questions.
2. Supporting multimedia is displayed along side SI persona.
3. Lesson materials are displayed on the right. Students can ask for Socratic hints.
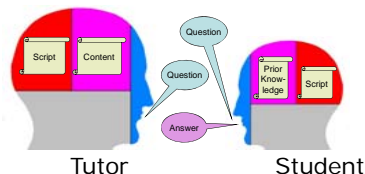
The interface should simulate the real tutoring interaction as much as possible. See conceptualization above, right. To successfully complete our goal we must deal with a number of challenges at the interface between technology and society.

Web-based Implementation: The Internet provides
- A means for students to access our synthetic tutor
- A means for testing on a wide scale
- It also presents technical and social challenges.

Technological Concerns:
- Media must load quickly but be large enough to be clear & effective
- Must work quickly and easily with common web-browsers
- Interface must be intuitive and easy to use with minimum training

Social Concerns: These technological concerns are complicated by the fact that a single solution may not work for every user. Computer and Internet access varies significantly as a function of:
- Geographic location[1]
- Racial demographic[1]
- Household income & highest educational attainment[1]

Implication: Not all students have equivalent access which probably correlates with technical familiarity/competency

[1] "Computer and Internet Use by Students in 2003" published by the National Center for Education Statistics

Multiple Perspectives: We record responses from multiple tutors with prior experience teaching algebra-based physics to obtain different perspectives on each question, and hopefully improve the likelihood of an individual student finding a compatible presentation style.

Optimum Design: Interface layout, lesson structure, support media and tutor responses all need to be subjected to evaluation by students to determine which component combinations are effective. Meaningful testing requires a test population that reflects the many facets of the target population.

Potential Solutions: Problems that manifest themselves in different ways for different people require solutions that are flexible. A few that we are currently investigating:
- High- and low-bandwidth implementations
- Offering materials on DVD for students without Internet access
- Loaner notebook computers for students without computer access
- Research designs that allow in-class use rather than at-home use
- A brief training lesson to build experience prior to learning physics

Conclusions: Despite technological challenges associated with building a web-based tutor and the intersection of those challenges with confounding characteristics of our society, it is possible to work around these challenges and test our system with any interested teacher or group of students.

Contact Information: pathway@phys.ksu.edu