

The University of Pennsylvania

TeleMentoring: A Novel Approach to Teaching Undergraduate Computer Science

Principal Investigators:

Jonathan Smith
Susan Davidson
David Farber
Insup Lee
Ira Winston.

1. The basic idea was to use the 2.4 gigabit/second AURORA gigabit testbed infrastructure connecting Penn and Bellcore to try full-fidelity interactive distance learning, specifically the interaction of engineers at Bellcore with undergraduate students doing independent laboratories for a digital design class. The display technology was an experimental prototype provided by Bellcore called the "Video Window" consisting of two concatenated widescreen televisions.

2. TeleMentoring resulted in a number of useful technologies, in particular the Audio-Video ATM Transmit AND Receive (AVATAR) card which allowed direct connection between analog TV equipment and the ATM components of the AURORA testbed. Interestingly, the AVATAR cards were used to help with the design of the rest of the TeleMentoring experiments - pulling the project up by its own bootstraps! The experiments included joint meetings with MIT as well as the mentoring of undergraduates. A rather unfortunate consequence of the discontinuation of the HPCC gigabit testbed program terminating at the end of 1994 (the AURORA link to MIT was turned off Dec. 1994) was that only a small population of students were ever Telementored with the testbed setup; far too small to make a "clinical" study of its effectiveness.

3. TeleMentoring requires a VERY careful choice of educational context. It was only useful late in the semester in the CSE371 course, as the gap between the students expertise and the engineer expectations had to be bridged before the students could articulate their requests for advice appropriately. We now feel that seminars, senior theses and graduate work are more appropriate for whole-semester TeleMentoring exercises.

4. Much remote teaching does not require full-fidelity interaction. Prof. Farber has experimented extensively with remote speakerphone interactions in his courses, especially "Computers, Ethics and Society". We also used the speakerphone technology effectively for Ph.D. defenses, with the proviso that the student's slides had been made available to the remote person in advance. Examples include Dr. Les Vadacz at Brendan Traw's Ph.D. defense, Prof. Smith at Joe Touch's Ph.D. defense, and Dr. Paul Mockapetris at Ivan Tam's Ph.D. defense.

5. During the research period there has been a growth in the capability of the Internet (although full-fidelity interaction remains bandwidth- challenged). We have tried remote meetings and advising with InPerson, an SGI (Silicon Graphics) system, where a workstation is set up in the conference room where the VideoWindow resides. Other technologies such as RealAudio, WWW and MBONE are helpful, provided that the quality of interaction due to inadequate capacity does not detract from the educational experience.

6. The work is getting a much larger-scale trial in the context of the DARPA-supported CADETT project, in which we are collaborating with the Franklin Institute in Philadelphia to provide interactive distance learning support technologies with the eventual target of worker retraining for better jobs. This work was directly based on TeleMentoring, and is supported by a ca. \$9M grant to an industry, museum and academia consortium to really push these ideas into the mainstream. It is notable that a major mission of

the Franklin Institute as a science museum has been to train science teachers in the greater Philadelphia region.