

Lane, David, and Atlas, Robert. "The Networked Classroom," Paper presented at the 1996 meeting of Computers and Psychology, York, UK, March 1996. Today this would be called an "Audience Response System."

The Networked Classroom

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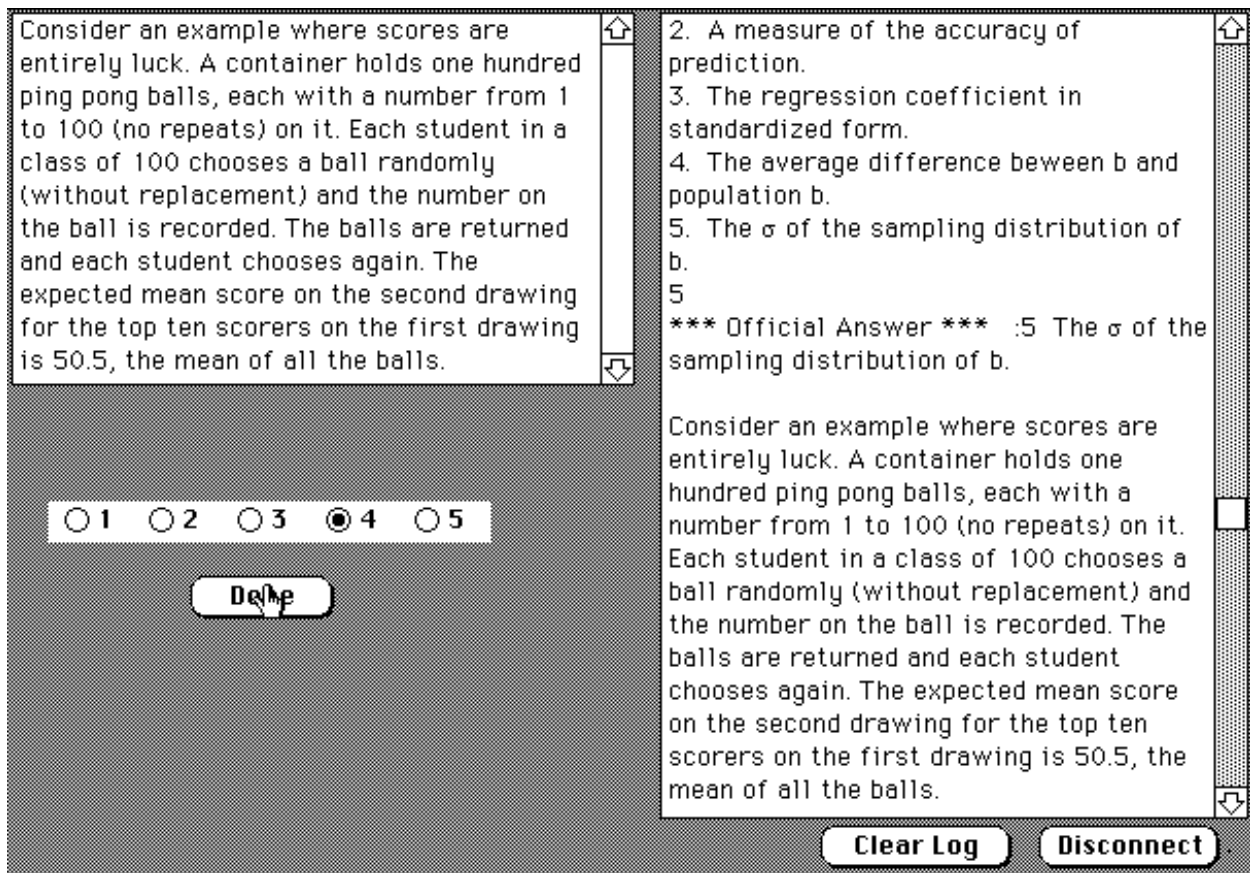
In a typical lecture class, students are relatively passive in their learning activities, and the instructor has few options for obtaining immediate feedback regarding their understanding of the presentation. Providing network nodes for the lecturer and students enables a number of new forms of interaction between them and facilitates the use of multimedia in teaching.

In the networked classroom at Rice University, teaching materials including text, graphics, and Quicktime movies are presented over the network to each student. For example, Quicktime movies developed for a statistics class include a demonstration of changes in the sampling distribution of the mean as a function of sample size.

The software for the networked classroom was written in HyperCard and runs on the Mac OS. It uses the AppleTalk protocol. Shared materials such as graphics and Quicktime movies are typically stored on a file server. The HyperCard stacks run locally. At Rice, the networked classroom was implemented on a Novell network.

Since the spring of 1991, one of us (David Lane) has used the networked classroom to teach a graduate course in statistics. The class size in this course has varied from 4 to 12 students and has been taught in a room with 18 Macintosh computers. The software for the class has gone through many iterations as shortcomings in its design were uncovered and addressed.

At the beginning of class, students run the stack "Network Student", enter a pseudonym and connect to the network. The screen for Network Student is shown below.



When a class begins, students are asked if they have any questions. A question can be asked by either (a) typing it in and sending it over the network to the instructor's computer or (b) in the conventional manner of raising one's hand and asking the question out loud. In the first attempt at using The Networked Classroom, the instructor tried to type out the

answers and send them to each student. This proved to be too slow, so now all questions are answered out loud.

One assumption of the networked classroom is that reading is more effective than the combination of listening and taking notes. Therefore, the instructor prepares for class by writing out the lectures. The lectures are written in a HyperCard stack. A lecture is entered as a series of cards each containing a "bite-sized" portion of the lecture, usually about four or five sentences.

The lecture begins by sending the contents of the first card to the students. The students read the material and then rate how well they understand it. Without a networked classroom, it is difficult for an instructor to gauge how well students are understanding the material being presented. Often the instructor depends on a small number of students who give cues such as nodding their heads or staring blankly. Although this is useful information, it usually does not give accurate information about the whole class and the range of understanding. In the Networked Classroom, students anonymously rate how well they understand the material on the following five point scale:

1. The student has no idea what is going on.
2. The student is lost.
3. The student is confused.
4. The student has a good understanding of the material.
5. The student has an excellent understanding of the material.

The instructor sees the ratings and a plot of the distribution of ratings. The plot can be sent to each student if desired.

If all students rate their understanding with 4's and 5's, then the next card is presented. If a student is having a problem, then the instructor elaborates and further explains the material. As before, students can ask questions either over the network or out loud. Typically a re-rating of understanding is done and, if the confusion is cleared up, the lecture continues.

It is also useful to go over the readings in a similar manner. Students can be instructed to monitor how well they understand each section of their reading and to record a rating. Then, during class, students are be sent brief descriptions of what was covered in a section and asked to rate their understanding of it.

Psychological and educational research has shown that taking a test can be a valuable learning experience. Therefore, in addition to preparing the lecture, the instructor typically prepares a set of questions and answers in a separate HyperCard stack. During class, a question is sent over the network and all students answer (anonymously). The answers appear on the instructor's computer. Typically the instructor sends the correct answer to each student and then has students rate their understanding. When a question calls for written answers (as opposed to multiple choice), it is sometimes valuable to send all of the students' answers to each student and then for the instructor to go over them. Or, to stimulate thought and discussion, the instructor can first ask the students to select the answer they think is best.

Everything sent over the network is placed in a scrolling text field on each students version of Network Student. Students add their own notes during and sometimes after the class.

In the first few years that The Networked Classroom was used, graphical material was prepared and stored on a server where it could be sent to each student's computer. Because of the limitations of screen space, it was decided that the more primitive method of printing, copying, and distributing graphical material before class was more effective. The server and network are still used to present Quicktime movies on each student's computer.

Although no formal evaluations of The Networked Classroom have been done, the reactions to it have been favorable, especially in recent years as its operation has become smoother. The instructor has found the

ability to get feedback about students' levels of understanding to be extremely valuable. The goal of having students be more actively involved during class is normally achieved.

You can obtain a copy of the software by contacting the author, [David Lane](#) directly.

Related Materials

Shneiderman, B., Alavi, M., Norman, K., & Borkowski, E. Y. (1995) Windows of opportunity in electronic classrooms. *Communications of the ACM*, 38, 19-24.

[Norman, K. *The Switched-On Classroom*](#)