

Computers and Overheads vs. Multimedia in the Classroom

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Abstract

In spite of the availability of computer hardware and software of ever increasing sophistication, blackboard and chalk still is the visual aid of choice in most lectures. Reasons for the gap between the availability of technology and its utilization in the classroom, and how this technology can be employed to renew the lecture system are explored.

Introduction

Nearly twenty years have elapsed since Apple, Radio Shack, and Commodore launched the personal computer revolution by making computers widely available. During this period computers have become increasingly powerful and affordable. Hardware and software innovations are announced with constantly increasing rapidity. While a considerable amount of this technology could be employed to reform the lecture system, most lectures still use blackboard and chalk, with the principal change being in the color of the board. Lectures still consist of the professor speaking and writing while the students dutifully copy every written and spoken word, at the expense of comprehension.

Reasons for the lack of widespread employment of technology are discussed. Methods of overcoming impediments to the use of computers in the classroom are suggested. The desirability of using multimedia systems versus small widely available systems is explored. In addition, pedagogical strategies for effectively using computers in the classroom are studied.

Impediments to the Employment of Technology

There are a variety of reasons that technology is not more widely employed in the classroom. Some of these reasons are related to reluctance on the part of faculty members to change. While a certain amount of this can be attributed to inertia, there are legitimate faculty concerns. Principal among these is the fear that lectures will deteriorate into high-tech displays of the professor's notes with students assuming a completely passive role⁵. Another is that malfunctioning or poorly performing equipment will focus attention on the equipment rather than on the subject matter. For example, a barely visible projection of a computer display would cause a rapid retreat to the tried and true chalkboard.

The principal impediment to bringing technology into the classroom is not its availability; but rather, its availability in the classroom. An instructor who must carry an overhead projector, a computer, a display panel, or a multimedia system to an other building is unlikely to take the initiative to integrate this equipment into the



lectures. Conversely, if the availability of certain equipment in the classroom is a given, then the professor is encouraged to employ this equipment in a creative manner. As an illustration, if the author of this paper knows that an overhead projector and dry erase board will be available, he will project and annotate transparencies on the board.

A seldom-mentioned, yet a significant problem is scheduling. Unlike blackboards and chalk, equipment requires setup and takedown time. Teaching back-to-back classes in different buildings results in class time being devoted to the equipment. The simplest solution is not to schedule a professor with back-to-back classes in different rooms. Other possibilities include lengthening the time between classes, having assistants deal with the equipment, and leaving the equipment in place if it is going to be used in the next period.

Encouraging Reform of the Lecture Systems

The first step in reforming the lecture system is to set a goal; namely, to increase the efficiency of the teaching and learning process; i.e., to improve comprehension while increasing the quantity of material covered. This can be accomplished by reducing the amount of writing by the professor and copying by the students. Specifically, it is recognized that copying complex diagrams, computer programs, and lengthy equations and text diverts both the professor and the student from the task of teaching and learning. Therefore, technology should be employed to eliminate this copying, while retaining the type of note taking that is vital to learning and the retention of knowledge.

Secondly, what is expected in the classroom should be changed by modifying the classroom environment. If every classroom has only a blackboard, it is not surprising that most instructors will use the blackboard. On the other hand, if every classroom is equipped with an overhead projector, computer, and display panel, an increasing number of faculty members will prepare their lectures with these resources in mind.

Support services should be available outside of the classroom to assist in preparing lectures. As minimum each professor should have a computer with the necessary software and facilities for reproducing course materials. If it is not possible to provide released time to prepare new course materials, then these materials must be developed as the course is being taught. In this case the students should be supplied with copies of course notes free of charge as they become available. The next time the course is taught these notes could be sold in the same manner textbooks are sold.

The Role of Multimedia

The most recent innovation in computer systems is multimedia which integrates several display and presentation technologies. Sound, graphics, animation, text, and video from CD-ROM drives are available to greatly enhance presentations. While multimedia originally required large bulky equipment, first rate performance now can be obtained from desk top computers. In fact, notebook computers are providing multimedia capability that is increasingly competitive.⁶

Considering of the availability of multimedia systems, the issue is what should be their role in reforming the lecture system. This is part of a larger question; namely, what should be standard in the average classroom? In terms of cost of equipment and required preparation time, multimedia should be restricted to a number of large lecture halls and special-purpose classrooms. The average classroom should be equipped with a modest system that will facilitate modernization of the lecture system. By way of contrast, multimedia should be employed for demonstrations and lectures. For example, multimedia could be successfully employed to deliver



physics lectures to a large group and the modest setup could be used in small recitation sections.

The Universal System

The key to reforming the lecture system is to replace the blackboard with a new standard visual aid system. This system should consist of a computer, overhead projector,⁴ display panel, screen, and dry erase board. Exactly how this is implemented may vary from institution to institution and even from classroom to classroom. For example, it might be more efficient not to place a computer in each classroom; but instead, to supply each professor with a notebook computer whose screen doubles as a display panel. This would be cost effective, especially if the notebook computer is used to replace the professor's desktop system. Another possibility is to use a combination overhead projector-display panel.⁷ This has the advantage of substituting one unit for two units, but precludes the use of transparencies. If providing security for the equipment in the classroom is a problem, this can be handled by using hall closets, each of which is accessible to number of classrooms.

As an illustration, the author of this paper has employed a computer-based system to present the Electrical Engineering lecture course in microprocessors. The system consists of a notebook computer and combination overhead projector-display panel. Lecture notes were prepared using Microsoft Word 6.0 for Windows with simple diagrams being drawn in Word and complex diagrams being imported from a scanner. These notes in Word were displayed and annotated on a dry erase board. Word instead of a hypercard³ facility was used for the display to avoid involving another piece of software and to take advantage of the continuous scrolling capability of Word. In addition, Word can be employed to randomly access material in response to student reaction.

To keep costs down, the display was in black and white, instead of color. In addition, this facilitated making the annotations in color. Students were supplied with copies of the displayed notes, which they were encouraged to customize with their own comments. This was facilitated by darkening only the part of room with the dry erase board. Since a non-reflective board was not available, students were asked to adjust their positions to compensate for any glare.

Pedagogical Strategies

The basic strategy in employing technology in the classroom is to display materials that have been distributed to the students. While this technique can be effective in increasing the amount of material covered, there is a serious risk that it will cause the students to lose interest in short order. Therefore, it is important that the use of technology be accompanied by an effective strategy for holding student interest while increasing the efficiency of the learning process.

Relieving students and the professor of the burden of copying materials that can effectively be displayed, frees the professor to teach and the students to learn. One technique to hold student interest is to supply them with what are termed semi-notes.² These notes have certain parts omitted, requiring students to maintain attention in order to insert the missing material. While this scheme has some merit, it seems contrived to arbitrarily omit portions of the class notes. In teaching the above microprocessor course, the author found it more effective to distribute complete notes that required some amplification. As an illustration, listings of assembly language programs included both the source and object programs, with the comments being presented in class.



The manner in which materials are distributed to the students influences how they make use of these materials. It has been found that students make more effective use of notes that are distributed on the day they are used. Notes that are passed out at the beginning of the semester or are sold in the bookstore are not brought to class by some students. A far more serious problem occurs when the lectures are based on the textbook. In this case a majority of students have been observed copying displayed complex diagrams and equations that were readily available in the text.

Conclusions

With the objective of increasing learning efficiency, the time has come to make the employment of technology in the classroom the norm rather than the exception. While elaborate multimedia systems are suitable for a limited number of locations, faculty should be encouraged to reform the lecture system by employing modest computer-based systems that should be available in all classrooms. Furthermore, strategies must be devised so technology is used to foster learning instead of transforming classes into high-tech displays of lecture notes.

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