Active Learning Goes Interactive

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Teaching and Technology: Can the Two Survive Together? (Michael Lieberman)

The increasing availability of technology in the classroom is spurring discussions concerning the "best" way to teach students. If students have available to them all of the materials that are to be discussed in lecture, is there any point to a student attending class any more? Given the new technology, how can teachers best motivate their students to learn? Has the role of the teacher changed? How can a teacher effectively utilize technology to enhance learning? These are just some of the issues that we will be discussing during our presentation today. We will demonstrate ways in which the new technology can indeed enhance student learning, and then discuss the types of equipment now available to accomplish these electronic wonders in the classroom.

How has the role of the teacher changed over the past twenty years? For many years the teacher would provide information for the student to learn, and the main supplemental information to the lectures was the textbook. The teacher's primary concern was to impart information to the student, primarily in lecture format. The students would sit in class, listen to the words of wisdom, and take notes. For many years the only notes available to students were those they took in class, and those obtained from reading the assigned text. Lectures were frequently given using the high-tech piece of chalk, which allowed faculty to improvise at will and even to have a device for scratching the blackboard, to awaken slumbering students. However, this type of lecture format changed as technology changed.

The introduction of overhead projectors and slide projectors into the classroom changed the way that professors taught. The use of this equipment would tend to reduce spontaneity in the classroom, as faculty would bring prepared materials to the classroom. The faculty would follow this "script" in order to present the lecture. It was sometimes difficult to deviate from the overheads or slides, since frequently the classroom design was such that, when the screen was lowered, the blackboard was covered, and it was too

time-consuming to repeatedly raise and lower the screen during the lecture. The dimming of the lights, required to use this technology, also tended to reduce classroom discussion. These problems persist in today's times, when PowerPoint presentations have replaced slide and overhead presentations. Moreover, having lecture materials in digital format has enabled faculty to make their materials available to students through the Internet. This had led to faculty concerns that students would skip lectures since all lecture material was freely available to the student, and that it would be a disaster if students did not frequently attend lecture.

This leads to a re-evaluation of the job of the teacher. Technology allows professors to post lecture material, problem sets and answers, tutorials, and other supplementary material on the Internet, and now the teacher must determine what the role of the classroom lecture is. Fortunately, the professor controls what he or she posts on the Internet. If the professor believes that lecture is a valuable learning tool, then lecture notes do not have to be posted on the web. We would like to propose that the job of the professor is to enable the students to learn the material, to be able to successfully accomplish the objectives of the course, and to aid all students in reaching that objective. In this light, the use of technology should be to enhance the student's learning experience, and to present the students, many of whom have widely differing learning modes, with enough options to learn such that all students can succeed in the classroom. If many of the materials that are necessary for the student to learn are made available to the student before class begins, then the class must present material that will enhance understanding and application of the material. It allows for more classroom discussion. Viewing the capabilities of technology as a means for enhancing the student experience allows one to prepare classroom materials that complement the online materials.

So what types of materials can be used to enhance student understanding? The ability to show three-dimensional models, which can rotate, as compared to static two-dimensional figures, will be demonstrated. The preparation of on-line tutorials, with instantaneous feedback on the answers, has proven to be very popular with students. The use of independent virtual lectures will also be presented, as will supplemental animations for student learning.

So what is the role of today's professor? Overall, our job is to get the students to learn and apply the material we are teaching. This requires that we design lectures that complement available online materials. Spend time on the big picture, allowing the details to be learned from the on-line materials. Develop methods to integrate different sections of material so that the students will see the big picture, and not get lost in the memorization of details.

Capturing the Results of Student Collaboration (Wayne Hall)

Professor Lieberman's material has shown ways in which teaching and technology can be combined in order to make lectures more a feature of an active-learning classroom. The

following material will consider this same combination within the framework of class discussion.

One technological feature that has transformed class discussion is e-mail as well as the electronic bulletin board in a course platform such as Blackboard. An instructor can provide a prompt for the whole class and then ask for responses either via e-mail or on the electronic discussion board. The electronic environment now allows for what has been called Just In Time Teaching (JITT) – student responses in advance of a class meeting allow for a more strategic plan for that meeting.

The electronic discussion board also more readily allows the instructor to model a piece of writing and a response: What's an "A"-quality quiz? What kind of feedback is useful on the draft of an essay? What are other students in the class considering for their research-paper topics?

If an instructor feels electronically overwhelmed by such assignments, she can help to organize and filter them by organizing students into online groups. With this format, one student might then be asked to generate the prompt, with other students responding. Or students might respond in a five-person sequence, each new posting taking into account all of the previous postings.

There is still, of course, the old-fashioned in-class discussion as an excellent mode of active learning. It does, however, have some problems. An instructor needs to have legible handwriting as well as enough blackboard space to allow for a spirited discussion to be recorded. The instructor often has his back turned to his students.

More importantly, however, the results of this discussion and student collaboration get erased at the end of the class meeting. Students may well feel that "class discussion is fun but finally not very important." How is an instructor to provide a stronger sense of legitimacy to class discussion as a format for learning?

One solution is to use a visual mapping tool as a way to capture class discussions. This kind of tool is also known as a graphic organizer, a visual organizer, a concept map, or a mind map. One web site – at www.graphic.org -- gives an overview, with other resources and links, for visual mapping tools. An example of such a program is available for free (although time-consuming) download at this web site – cmap.coginst.uwf.edu – a program for concept-mapping that has been developed by the University of West Florida.

Another limitation of the above program is that it is too complex – at least for me – to be useful under the in-class pressures of a student discussion. More useful for my purposes has been the program Inspiration 6, with information at this site: www.inspiration.com

This program, designed primarily for use by grades 4 through 12, is available at the above site for a 30-day free trial version. The cost of the whole program is $70, and it runs on a 486 computer and higher. In other words, it is a simple system, easy to use, that does not place heavy demands on a computer.

Inspiration allows an instructor to "map" a discussion in ways that solve the above problems. At the end of the discussion, the results can be saved to a disk and subsequently exported to Blackboard, as a JPEG file (for the visual record) or an MS Word rtf file (for a conventional outline). The results now become a permanent part of the class record, thus acquiring more legitimacy as a product of student learning and student collaboration.

Teaching with Technology in the Classroom: Why Do It, How to Do It, and What Does It Take? (Malcolm Montgomery)

Instructors who are considering adding classroom technology to traditional lecture and chalk must ask three fundamental questions: why do it, how to use it, and what does it require in the classroom. Our experience teaching and observing other teachers who use technology effectively in the classroom forms the basis for the answers we suggest.

Teaching with technology may not be easier (at least at first), but it almost always enhances the learning experience. Here are five effective ways it can be used to augment a traditional lecture:

- you can take students where they have never been before and cannot go (such as to your lab or on a field trip),
- show them something they cannot see (as with a microscope, telescope, or scientific imaging devices),
- prepare them for an individual experience (a lab exercise or site visit – either real or on the web),
- record what you write and draw in class for later posting to the web, and
- accommodate variations in learning styles (especially visual learners).

Note that none of these examples even mentions Powerpoint slides, which everyone knows about but few use well: either they simply replace overhead transparencies to no particular advantage; or worse, they add distracting sound and visual effects and may even lecture facing the screen while they read their lecture outline. Powerpoint users should make sure that what they are doing enhances their lecture and works with their presentation style.

Though effective, these five techniques often tend to follow the same non-interactive approach that lectures often rely on. How else can classroom technology enable interactivity? One key is to use interactive software during the class, and engage the students by having them provide some of the "input." For example, one class in data communications uses software (Neotrace) to generate data packets and trace them through the Internet. Students volunteer destinations to send packets to and observe the path and transit times. When the same destination is repeated a few minutes later and the path turns out not to be the same, it generates class discussion: why is it different? What happens if we try it again? Further experiments and discussion lead to the discovery of a number of key principles of how the Internet works. At the end of the class, everyone

wants to try it themselves at home. (And they can – like a lot of useful classroom software, Neotrace is available in a free demo version.)

What does one need to teach with technology? First, the classroom should have built-in media equipment that is ready to go and easy to operate. If instructors perceive that it is too hard or too risky to try to use these tools, they will not use it. A well-designed electronic classroom provides an easy to use and reliable set of teaching tools. Key elements are: a complete set of equipment (computer, data projector, VCR, document camera) with a smart control system (e.g., AMX or Crestron) that presents an intuitive user interface (control panel, ideally a touch screen) that is consistent throughout the campus. The smart control system is the key to reliability and ease of use. It hides differences in the way various models work, and simplifies operations by combining several steps into one (for example, setting the lights, bringing down the screen, and turning on the projector). Because the system resets all parameters on start-up (much like rebooting a computer), it eliminates the problems caused by previous users changing obscure switches and failing to restore them before leaving.

Second, the space should be appropriate for teaching with media. Lighting must be zoned to permit turning it off near the screen(s) and setting it at a low level over the students to facilitate note-taking and discussion. The screen must be big enough for detailed images to be seen from the farthest seat, high enough that students in the back can see over heads in front, and located where no one is seated too far off to the side. The projector must be bright and clear, of sufficient resolution, and mounted from the ceiling. Digital document cameras are preferred because they produce remarkably clearer images than the analog video models. Computers must be fast, play DVD's and CD-ROM's, have a fast network connection and good protection against viruses and hackers. Monitors must be large. Differences in VCR's tend to be minor. Electronic whiteboards may be useful for recording what is written in class, as well as to enable students in the back of large rooms to see the board by projecting it on the screen.

A set of guidelines for electronic classrooms, providing more specific standards for equipment and room design, will be made available at the conference itself.