1 Proven Strategies for Teaching and Learning[1]

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Abstract

50 technology-using professors at 50 of America's most-wired campuses were asked to explain how their teaching strategies have been augmented by the use of computers. From their responses emerges a pattern. Most professors are using computers in teaching in order to enable more controversy and debate in their classrooms, to promote more collaboration among students, to facilitate more and more timely interaction between professor and student, to differentiate tasks and assignments according to student interests and capacities, and to involve practitioners as well as colleague scholars with their students.

In this paper, these five "newly popular" teaching strategies are elaborated. Specific examples from many different disciplines are cited. Materials from the author's economics course are used to illustrate each of the concepts.

A goal of this paper is to suggest trends in pedagogical styles that are likely to dominate the next decade, to enable participants to lead faculty workshops around these five principles, to start participants toward their own incorporation of time-effective computer exercises in their own courses, and to disseminate information about these important research findings.

The paper is an outgrowth of work published in 2002 with Gordon McCray, Craig Runde, and Heidi Schweizer by Allyn Bacon/Longman under the title Using Technology in Learner-Centered Education: Proven Strategies for Teaching and Learning (http://vig.abacon.com/product/0,2371,0205355803,00.html).

Paper

My thesis is that the future of teaching and learning, at least over the next decade, will be largely shaped by what the computer is newly allowing us to do. During the decade between 2000 and 2010, professors throughout the world will be experimenting with and evaluating the new teaching tools enabled by the Internet.

I carry the thesis one step further. No only will twenty-first century professors be using these new methods in their teaching; they will also be penalizing their colleagues, at promotion and tenure time, for *not* trying out these new methods. In other words, the conventional wisdom of this first decade in the new millennium will be that the teaching methods best supported by the computer are also the most effective pedagogical methods.

History provides many instances that reinforce the thesis that the new and novel receive disproportionate attention. During the latter half of the 20th century, trends in teaching methods emphasized textbooks and bound collections of readings, both innovations contributed by the publishing industry earlier in the century. Another example: for the last three decades, many doctoral dissertations have explored the role of gender, nationality, ethnicity, age, and other personal characteristics in assigning meaning to an author's creations and discoveries. New doctoral students have to rush toward dissertation topics that are newly fashionable. During the same years, a major criterion for judging scholars has been whether they have accounted for the personal characteristics of the subjects studied. During the previous half-decade (1920s-60s) the prevailing orthodoxy, New Criticism, preached the opposite: that the author and his/her intentions were outside the critics' purview?

So if the emerging decade's trends in teaching and learning will be shaped by the teaching strategies that are best supported by the computer and the associated Internet, it behooves us to ask, "What pedagogies are best supported by the computer?"

Fortunately, the early adopters of computer-enhanced teaching provide a rather clear roadmap. In 1997, I wrote to the chief academic officers of America's 100 Most Wired Campuses, according to the annual survey by Yahoo Magazine. Letters went to Harvard, Stanford, MIT, Michigan, Berkeley: names most of us recognize. Each officer was asked to name three professors, from any discipline or profession, who were successfully using technology in their teaching. The nominees were contacted. Eventually, professors from 36 universities in 27 disciplines wrote 93 essays.

They were all asked to explain why they incorporated computers as teaching tools. What tenets of their educational philosophy did they have in mind when they decided to supplement the old with the new? I was frankly surprised at how often these professors spoke of the same things, how much they were chasing after the same objectives.

Over 90 percent of them said that when teaching, before using computers, they found that students seemed to learn more when they engaged in dialog with their professors, when they were applying the theories they were studying, when they were interacting with the material. Therefore, these professors said, they were incorporating computers in their teaching,

because computers and the Internet offered the prospect of more interaction, of interactive learning.

The essayists proceeded with examples. Between lecture sessions, students could email them questions. Before a particular lecture, they could ask their students to share, by email, any confusion over the "muddiest point", and the class session could be restructured to help students over these hurdles. When coached on how to build a profit-and-loss statement, students could experiment on their own computers by building their own statements and then sending them to the professor for immediate feedback. Immediately upon completing a lecture, the professor could ask the students to enter their own versions of the lecture's basic concept into a chat session, and the professor could immediately respond.

The early adopters say they have embraced computers to support interactive learning. We can expect that the hiring panels and promotion and tenure committees of 2008 will be looking for "interactive learning" in the teaching of prospective and current colleagues.

Similarly, over 90 percent of the 93 essayists emphasized collaborative learning— students teaching other students—as their new strategy of preference. They had found that students working together in teams tend to learn more. Even in the humanities and social sciences, they found that the project team approach—so common in scientific doctoral education—is very effective. They incorporated computers in their teaching, because they believed that they facilitate certain types of collaboration.

Again, the essayists provided many rich examples. Rough drafts of student essays are shared with two or three other students, who are expected to suggest improvements in time for the original author to incorporate them into the final draft. Students are paired to locate and to annotate Internet sites where the "topic of the day" is explained in an alternative and effective way. Team assignments—to make a presentation in class, to create a public web page, to pursue a joint research project—are all facilitated by Internet-supported communication.

Another example: Student A is asked to answer to a question related to the reading assignment and to send a rough draft to Student B for endorsement or revision. The consensus answer by A-B is then sent to Student C for endorsement or revision. Finally, the A-B-C answer is submitted for grading. In the process, all three students are forced to articulate their positions and benefit from the knowledge of others.

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A third motive for adopting computers emerged from the essays. Professors recognize the need to provide "different strokes for different folks." They assign projects to match up with student interests; for example, a statistical problem using biological data for biology majors or 18th-century British cultural data for English literature majors.

Each student has different abilities, learning styles, and interests. A physics professor who designs and videotapes all in-class experiments and then makes those tapes available at a course site on the Internet allows each student to repeat the experiment as many times as necessary. Some will grasp the concept during class. Others will have to rerun the experiment a dozen times before they feel they have mastered the material.

Customization also includes providing many different methodologies for learning the same material. For example, a finance professor can create a cybershow (a videotape) of his lecture and also provide a transcript for those students who learn best from reading.

At Virginia Tech's Math Emporium, student failure rates in beginning calculus have more than halved, because students are now provided multiple ways to complete the material. They may take the course by computer in the laboratory, where professional advice is always available, work through the material with a student learning team, attend the weekly lecture given by Professor A, attend the weekly lecture on the same topic by Professor B, or do all of the above.

An analysis of the 93 essays reveals two other strategies that atttracted the early adopters of computer in teaching. They sought an opportunity to add controversy and debate to their teaching. The Internet made it easier to connect students with experts whose opinion differed from the instructor's. Student teams could be asked to prepare competitive presentations, using the resources of the Internet to bolster their capacities.

Closely related is the final strategy: using adjuncts and consultants in teaching. The computer allows students to be in touch with more people, at greater distances. Moreover, by transferring many activities that previously took class time to interactions with the computer, visiting lecturers could be invited lead discussions. Students could be sent out to remote learning sites, even other countries, and still keep in touch with their professor and fellow students.

From a study of these early adopters of technology, we gain a clearer picture of trends in teaching and learning. Teaching is to become more interactive and more collaborative. Students will respond to individually designed curricula. Professors and students will join in project and learning teams. Courses will blend assignments that are pursued face-to-face with exercises that are completed outside of class time, in both teams and individually. The clear lines between "learning years" and "practicing years" will become blurred, as students spend more time in the real world, and practitioners spend more time with students.

The magic of our new tool, the computer, is in the rich communication system that it supports. There are some gains from fancier presentations. More gains come from the access to information provided by the Internet. But the giant steps

that are to be taken during the next decade will be enabled by robust communication systems enabled by computing. The computer allows us to break a number of barriers. Messages may be one to one, one to many, or many to many. They may be simultaneous or asynchronous. They can be archived, indexed, and searched with minimal effort. They can be linked to elaborations and more detailed explanations.

The emerging profession of teaching will be focusing on new communication methodologies and enriched by them for decades to come.

Notes

[1.] Many more examples of effective teaching strategies are provided in David G. Brown, Gordon McCray, Craig Runde, and Heidi Schweizer, eds., *Using Technology in Learner-Centered Education* (London: Allyn and Bacon, 2002).

[2.] The author is closely associated with the Ubiquitous Computing Movement in the United States. At Wake Forest, every student and every faculty member is supplied with a powerful laptop computer. More information is provided at www.wfu.edu/~brown.