VOLUME XVI, NUMBER 18

INNOVATION ABSTRACTS

PUBLISHED BY THE NATIONAL INSTITUTE FOR STAFF AND ORGANIZATIONAL DEVELOPMENT (NISOD), COLLEGE OF EDUCATION, THE UNIVERSITY OF TEXAS AT AUSTIN • WITH SUPPORT FROM THE W. K. KELLOGG FOUNDATION AND THE SID W. RICHARDSON FOUNDATION

Does All This Technology Make a Difference?

Computer use in the "real world" has grown at a dizzying pace. We encounter computers and computer technology everywhere—at the check-out stand in point-of-sale terminals, in our cars, in our televisions, even in our toasters and coffeepots. Few jobs have not been impacted by the advances in technology. Community college students expect to see technology put to extensive use in their colleges as well; by and large, colleges have accommodated them. While not every college can boast a computer on every faculty desk, or a campus-wide network or information system, virtually every community college has dozens, if not hundreds, of computers. Computer labs and classrooms are found on almost every campus, and they are increasingly being devoted to teaching subject matter having little to do with programming or computer literacy. A staggering number of educational software titles are available, and hundreds of faculty hours have been devoted to searching through these titles to find the right "fit" for their curricula.

As the technology has advanced, more faculty have been excited by the possibilities. Words and phrases like "interactivity," "multi-media," the "virtual classroom," and "electronic learning communities" have entered the teaching vocabulary. Nationally, evidence suggests that the application of technology to instruction in community colleges is growing rapidly. Faculty development centers, training programs, and instructional computing labs are proliferating.

Unfortunately, in an era of flat or declining overall resources, technology spending comes at the expense of other possible initiatives, and community colleges must ask, "Are we doing the right thing here? Are the dollars we are putting into computers and software making a difference where it counts—with students?" Teachers and program administrators are trying to provide answers to these questions, and they are not easy to answer. Computer-aided instruction (CAI) is complex; many factors impact the learning process and can affect its outcomes.

The Traditional Experimental Model

Despite these complexities, the predominate approach used in most studies of CAI is the classic experimental design that compares a treatment and control group on gain scores or pre/post measures of learning or achievement. Even when sophisticated statistical techniques are used, the results are often inconclusive, hard to interpret, and of little value to decision makers. The problem is that the effect of CAI (or any teaching strategy) is difficult to isolate—and isolating the variable of interest is integral to using an experimental design.

Such isolation is difficult because other variables, which exist in any learning situation, interact with and confound the effect of the teaching strategy. These variables are difficult to control across groups, especially groups large enough to ensure sufficient statistical power. They include, but are not limited to, such diverse factors as the lab aesthetics and environment, the appropriateness of the hardware, the training of the teacher and staff, the involvement of the teacher, quality and content of the orientations, student attendance, the fit between the computer activities and the learning objectives, time on task—the list goes on and on. Reasonable questions a reader might ask of a study concluding that a CAI approach was not significantly different from traditional teaching approaches include: "Is the reason for these findings that the software is not terribly useful or effective? Or is it that student keyboarding skills or insufficient lab time inhibited the class from making use of the full power of the software?" The reality is that, despite the proliferation of computers and computer technology in the worlds of work and commerce, educators are still learning how to effectively apply computer technology to learning. Because the use of technology is still in a formative stage, evaluations of CAI need to address process-oriented, formative concerns—and the traditional experimental pre/post design is not well-suited to that task. The question evaluators should ask is not "Does CAI work?" but "*How* does CAI work?" And that kind of question requires a different approach.

A Different View

Community colleges need evaluation models that will help them understand how to most effectively use CAI by asking the kinds of questions that will illuminate how its use may constrain or augment the myriad of factors affecting the *process* of learning. Evaluation of CAI should involve all of the many stakeholders in its use—faculty, students, and lab staff—in a way that will provide formative insight into how all aspects of technology use can be improved.

The key difference between a broad-scope evaluation and the traditional research model is in the number of questions asked. CAI evaluation should pose many

questions. Some of these questions may require sophisticated statistics to answer, but many will not. Begin by listing as many of the factors that may influence the effective use of the technology as possible. Then, in everyday English, write a question (or several questions) for each that, when answered, will provide some insight into that particular piece of the puzzle. Once the questions are written, the steps necessary to answer it are often intuitive. Many times a sufficiently detailed and useful answer to a question can be found by simply asking it of the right person. Other times, simple data collection techniques, such as student surveys or automated time-on-task tracking, can be built into the class activities. Typically, some of the most useful information for decision makers will not require sophisticated analysis. Taken as a whole, however, even an informal set of evaluation questions can provide an objective perspective on what is working well and what is not for a particular CAI application. Some samples of possible evaluation questions are listed in the following sections.

Evaluating the Implementation

- Were the training sessions beneficial for faculty? Was there sufficient/too much detail in the orientation?
- Were the teachers given enough preparation to adequately handle computer-related problems?
- Were the computers adequate for the software?
- What kinds of unanticipated problems did the classes encounter that hindered their effectiveness?
- Were the labs located conveniently for students?
- Was there sufficient space around the terminals for students to work efficiently?
- Was the noise level in the labs a problem?
- Were there sufficient terminals/printers for student use?

Evaluating Teaching and Learning

- Could the students and teachers using the software be considered computer literate when they began using the product?
- Did students have a computer at home? Did the faculty?
- Were entry-level computer skills a factor in the time it took a student to begin achieving course objectives?
- What kinds of training did the students require to become self-sufficient on the software? How much time did it take for students to become comfortable with the system?
- Were computer skills a factor in the amount of preparation time required of faculty?
- Did faculty using the lab feel it required more or less preparation time than traditional instructional methods?
- Were some computer-based activities weaker or less appropriate than others?
- Did the computer-aided classes require any special supplemental materials or activities in order to meet the learning objectives of the courses?
- Did student attitudes about the method of instruction, their teacher, or their own preparedness change as a result of using the program?
- How did student performance in classes using the software compare with students taught with traditional methods?
- Do some levels of students benefit more from using the software than others?
- Did the software benefit the students most in need?
- Was computer-aided instruction worthwhile from the student point of view?
- Did study time outside of class appear to increase in classes using the software?
- Were the students in the computer-aided classes comparable to students in traditional classes in terms of entry-level basic skills? In terms of demographic characteristics?
- Was the system reporting and tracking sufficient to meet faculty needs? Student needs?
- Did the teacher interact with students as they used the software? Individually, or with the class as a whole?

A broad-based CAI evaluation of the kind described here implicitly recognizes that CAI is both evolving and complex. The outcomes for students may be impacted by a variety of constraining factors. Often, the simple act of posing questions like these can stimulate insight leading to creative improvements in a CAI application. And, as in many evaluation processes, the answers obtained to some of these questions will raise additional questions.

The continued application of technology to instruction may change in form, even substance, but it is not going to go away. Colleges must embrace technology and make it relevant and useful in teaching. The first step in that process is to begin asking the right questions.

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September 9, 1994, Vol. XVI, No. 18

INNOVATION ABSTRACTS is a publication of the National Institute for Staff and Organizational Development (NISOD), Department of Educational Administration, College of Education, EDB 348, The University of Texas at Austin, Austin, Texas 78712, (512) 471-7545. Funding in part by the W. K. Kellogg Foundation and the Sid W. Richardson Foundation. Issued weekly when classes are in session during fall and spring terms. ISSN 0199-106X.