Implementing the Seven Principles: *Technology as Lever* By Arthur W. Chickering and Stephen C. Ehrmann From the October 1996 AAHE Bulletin.

In March 1987, the *AAHE Bulletin* first published "Seven Principles for Good Practice in Undergraduate Education." With support from Lilly Endowment, that document was followed by a Seven Principles Faculty Inventory and an Institutional Inventory (Johnson Foundation, 1989) and by a Student Inventory (1990). The Principles, created by Art Chickering and Zelda Gamson with help from higher education colleagues, AAHE, and the Education Commission of the States, with support from the Johnson Foundation, distilled findings from decades of research on the undergraduate experience.

Several hundred thousand copies of the Principles and Inventories have been distributed on two- and four-year campuses in the United States and Canada. (Copies are available at cost from the Seven Principles Resource Center, Winona State University, PO Box 5838, Winona, MN 55987-5838; ph 507/457-5020.) — Eds.

Since the Seven Principles of Good Practice were created in 1987, new communication and information technologies have become major resources for teaching and learning in higher education. If the power of the new technologies is to be fully realized, they should be employed in ways consistent with the Seven Principles. Such technologies are tools with multiple capabilities; it is misleading to make assertions like "Microcomputers will empower students" because that is only one way in which computers might be used.

Any given instructional strategy can be supported by a number of contrasting technologies (old and new), just as any given technology might support different instructional strategies. But for any given instructional strategy, some technologies are better than others: Better to turn a screw with a screwdriver than a hammer — a dime may also do the trick, but a screwdriver is usually better.

This essay, then, describes some of the most cost-effective and appropriate ways to use computers, video, and telecommunications technologies to advance the Seven Principles.

1. Good Practice Encourages Contacts Between Students and Faculty*Frequent student-faculty contact in and out of class is a most important factor in student motivation and involvement. Faculty concern helps students get through rough times and keep on working. Knowing a few faculty members well enhances students' intellectual commitment and encourages them to think about their own values and plans.*

Communication technologies that increase access to faculty members, help them share useful resources, and provide for joint problem solving and shared learning

can usefully augment face-to-face contact in and outside of class meetings. By putting in place a more "distant" source of information and guidance for students, such technologies can strengthen faculty interactions with all students, but especially with shy students who are reluctant to ask questions or challenge the teacher directly. It is often easier to discuss values and personal concerns in writing than orally, since inadvertent or ambiguous nonverbal signals are not so dominant. As the number of commuting part-time students and adult learners increases, technologies provide opportunities for interaction not possible when students come to class and leave soon afterward to meet work or family responsibilities.

The biggest success story in this realm has been that of time-delayed (asynchronous) communication. Traditionally, time-delayed communication took place in education through the exchange of homework, either in class or by mail (for more distant learners). Such time-delayed exchange was often a rather impoverished form of conversation, typically limited to three conversational turns:

1. The instructor poses a question (a task).
2. The student responds (with homework).
3. The instructor responds some time later with comments and a grade.

The conversation often ends there; by the time the grade or comment is received, the course and student are off on new topics.

Now, however, electronic mail, computer conferencing, and the World Wide Web increase opportunities for students and faculty to converse and exchange work much more speedily than before, and more thoughtfully and "safely" than when confronting each other in a classroom or faculty office. Total communication increases and, for many students, the result seems more intimate, protected, and convenient than the more intimidating demands of face-to-face communication with faculty.

Professor Norman Coombs reports that, after twelve years of teaching black history at the Rochester Institute of Technology, the first time he used email was the first time a student asked what he, a white man, was doing teaching black history. The literature is full of stories of students from different cultures opening up in and out of class when email became available. Communication also is eased when student or instructor (or both) is not a native speaker of English; each party can take a bit more time to interpret what has been said and compose a response. With the new media, participation and contribution from diverse students become more equitable and widespread.

2. Good Practice Develops Reciprocity and Cooperation Among Students*Learning is enhanced when it is more like a team effort than a solo race. Good learning, like good work, is collaborative and social, not competitive and isolated. Working with others often increases involvement in learning. Sharing*

one's ideas and responding to others' improves thinking and deepens understanding.

The increased opportunities for interaction with faculty noted above apply equally to communication with fellow students. Study groups, collaborative learning, group problem solving, and discussion of assignments can all be dramatically strengthened through communication tools that facilitate such activity.

The extent to which computer-based tools encourage spontaneous student collaboration was one of the earliest surprises about computers. A clear advantage of email for today's busy commuting students is that it opens up communication among classmates even when they are not physically together.

For example: One of us, attempting to learn to navigate the Web, took a course taught entirely by a combination of televised class sessions (seen live or taped) and by work on a course Web page. The hundred students in the course included persons in Germany and the Washington, DC, area.

Learning teams helped themselves "learn the plumbing" and solve problems. These team members never met face-to-face. But they completed and exchanged Myers-Briggs Type Inventories, surveys of their prior experience and level of computer expertise, and brief personal introductions. This material helped teammates size one another up initially; team interactions then built working relationships and encouraged acquaintanceship. This kind of "collaborative learning" would be all but impossible without the presence of the media we were learning about and with.

3. Good Practice Uses Active Learning Techniques*Learning is not a spectator sport. Students do not learn much just sitting in classes listening to teachers, memorizing prepackaged assignments, and spitting out answers. They must talk about what they are learning, write reflectively about it, relate it to past experiences, and apply it to their daily lives. They must make what they learn part of themselves.*

The range of technologies that encourage active learning is staggering. Many fall into one of three categories: tools and resources for learning by doing, time-delayed exchange, and real-time conversation. Today, all three usually can be supported with "worldware," i.e., software (such as word processors) originally developed for other purposes but now used for instruction, too.

We've already discussed communication tools, so here we will focus on learning by doing. Apprentice-like learning has been supported by many traditional technologies: research libraries, laboratories, art and architectural studios, athletic fields. Newer technologies now can enrich and expand these opportunities. For

example:

- Supporting apprentice-like activities in fields that themselves require the use of technology as a tool, such as statistical research and computer-based music, or use of the Internet to gather information not available in the local library.
- Simulating techniques that do not themselves require computers, such as helping chemistry students develop and practice research skills in "dry" simulated laboratories before they use the riskier, more expensive real equipment.
- Helping students develop insight. For example, students can be asked to design a radio antenna. Simulation software displays not only their design but the ordinarily invisible electromagnetic waves the antenna would emit. Students change their designs and instantly see resulting changes in the waves. The aim of this exercise is not to design antennae but to build deeper understanding of electromagnetism.

4. Good Practice Gives Prompt Feedback*Knowing what you know and don't know focuses your learning. In getting started, students need help in assessing their existing knowledge and competence. Then, in classes, students need frequent opportunities to perform and receive feedback on their performance. At various points during college, and at its end, students need chances to reflect on what they have learned, what they still need to know, and how they might assess themselves.*

The ways in which new technologies can provide feedback are many — sometimes obvious, sometimes more subtle. We already have talked about the use of email for supporting person-to-person feedback, for example, and the feedback inherent in simulations. Computers also have a growing role in recording and analyzing personal and professional performances. Teachers can use technology to provide critical observations for an apprentice; for example, video to help a novice teacher, actor, or athlete critique his or her own performance. Faculty (or other students) can react to a writer's draft using the "hidden text" option available in word processors: Turned on, the "hidden" comments spring up; turned off, the comments recede and the writer's prized work is again free of "red ink."

As we move toward portfolio evaluation strategies, computers can provide rich storage and easy access to student products and performances. Computers can keep track of early efforts, so instructors and students can see the extent to which later efforts demonstrate gains in knowledge, competence, or other valued outcomes. Performances that are time-consuming and expensive to record and evaluate — such as leadership skills, group process management, or multicultural interactions — can be elicited and stored, not only for ongoing critique but also as a record of growing capacity.

5. Good Practice Emphasizes Time on Task*Time plus energy equals learning. Learning to use one's time well is critical for students and professionals alike. Allocating realistic amounts of time means effective learning for students and*

effective teaching for faculty.

New technologies can dramatically improve time on task for students and faculty members. Some years ago a faculty member told one of us that he used technology to "steal students' beer time," attracting them to work on course projects instead of goofing off. Technology also can increase time on task by making studying more efficient. Teaching strategies that help students learn at home or work can save hours otherwise spent commuting to and from campus, finding parking places, and so on. Time efficiency also increases when interactions between teacher and students, and among students, fit busy work and home schedules. And students and faculty alike make better use of time when they can get access to important resources for learning without trudging to the library, flipping through card files, scanning microfilm and microfiche, and scrounging the reference room.

For faculty members interested in classroom research, computers can record student participation and interaction and help document student time on task, especially as related to student performance.

6. Good Practice Communicates High Expectations*Expect more and you will get it. High expectations are important for everyone — for the poorly prepared, for those unwilling to exert themselves, and for the bright and well motivated. Expecting students to perform well becomes a self-fulfilling prophecy.*

New technologies can communicate high expectations explicitly and efficiently. Significant real-life problems, conflicting perspectives, or paradoxical data sets can set powerful learning challenges that drive students to not only acquire information but sharpen their cognitive skills of analysis, synthesis, application, and evaluation.

Many faculty report that students feel stimulated by knowing their finished work will be "published" on the World Wide Web.With technology, criteria for evaluating products and performances can be more clearly articulated by the teacher, or generated collaboratively with stu- dents. General criteria can be illustrated with samples of excellent, average, mediocre, and faulty performance. These samples can be shared and modified easily. They provide a basis for peer evaluation, so learning teams can help everyone succeed.

7. Good Practice Respects Diverse Talents and Ways of Learning*Many roads lead to learning. Different students bring different talents and styles to college. Brilliant students in a seminar might be all thumbs in a lab or studio; students rich in hands-on experience may not do so well with theory. Students need opportunities to show their talents and learn in ways that work for them. Then they can be pushed to learn in new ways that do not come so easily.*

Technological resources can ask for different methods of learning through

powerful visuals and well-organized print; through direct, vicarious, and virtual experiences; and through tasks requiring analysis, synthesis, and evaluation, with applications to real-life situations. They can encourage self-reflection and self-evaluation. They can drive collaboration and group problem solving. Technologies can help students learn in ways they find most effective and broaden their repertoires for learning. They can supply structure for students who need it and leave assignments more open-ended for students who don't. Fast, bright students can move quickly through materials they master easily and go on to more difficult tasks; slower students can take more time and get more feedback and direct help from teachers and fellow students. Aided by technologies, students with similar motives and talents can work in cohort study groups without constraints of time and place.

Evaluation and the Seven Principles How are we to know whether given technologies are as useful in promoting the Seven Principles and learning as this article claims? One approach is to look and see, which is the aim of the "Flashlight Project," a three-year effort of the Annenberg/CPB Project to develop and share evaluation procedures. The Flash-light Project is developing a suite of evaluation tools that any campus can use to monitor the usefulness of technology in implementing the Seven Principles and the impacts of such changes on learning outcomes (e.g., the student's ability to apply what was learned in the academic program) and on access (e.g., whether hoped-for gains in time on task and retention are saving money for the institution and its funders).

[For more about the Flashlight Project, see Stephen Ehrmann's "Asking the Right Questions: What Does Research Tell Us About Technology and Higher Learning?" in the March/April 1995 *Change*. Or, check out the Flashlight Project's website at http://www.tltgroup.org/programs/flashlight.html]

Technology Is Not Enough The Seven Principles cannot be implemented by technophiles alone, or even by faculty alone. Students need to become familiar with the Principles and be more assertive with respect to their own learning. When confronted with teaching strategies and course requirements that use technologies in ways contrary to the Principles, students should, if possible, move to alternatives that serve them better. If teaching focuses simply on memorizing and regurgitating prepackaged information, whether delivered by a faculty lecture or computer, students should reach for a different course, search out additional resources or complementary experiences, establish their own study groups, or go to the professor for more substantial activities and feedback.

Faculty members who already work with students in ways consistent with the Principles need to be tough-minded about the software- and technology-assisted interactions they create and buy into. They need to eschew materials that are simply didactic, and search instead for those that are interactive, problem oriented,

relevant to real-world issues, and that evoke student motivation.

Institutional policies concerning learning resources and technology support need to give high priority to user-friendly hardware, software, and communication vehicles that help faculty and students use technologies efficiently and effectively. Investments in professional development for faculty members, plus training and computer lab assistance for students, will be necessary if learning potentials are to be realized.

Finally, it is appropriate for legislators and other benefactors to ask whether institutions are striving to improve educational practice consistent with the Seven Principles. Much depends on the answer.

Note: This article draws on Arthur Chickering's participation in "The Future of Face-to-Face and Distance Learning in Post-Secondary Education," a workgroup chaired by W.L. Renwick as part of a larger effort examining The Future of Post-Secondary Education and the Role of Information and Communication Technology: A Clarifying Report, carried out by the Center for Educational Research and Innovation, Organization for Economic Cooperation and Development. Paris: 1993, 1994.

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When an instructor tries something new in a course, some students may complain, "No c teams (or work on projects like this, or work so hard, or ...)" When can an innovative facu complain that the course isn't 'normal?' My stock advice has been, "Don't be the only one direction. Instead, find like-minded colleagues who teach other courses that these same s changes together." I've recently realized that there is another way to look at the students the complaint into an experiment and enlist the students as co-investigators to study that better) way for you students to learn? One goal of a college education is to 'learn how to l study what (or how) I've asked you to study.

This may seem a time-consuming response, but perhaps this is what's needed. The nee seriously -- intellectually seriously -- was suggested, indirectly, by the 1987 videotape "A to a web page where you can watch this streaming video, free.] As "A Private Universe" Yard for the Class of 1987. Twenty-three seniors, faculty, and alumni are asked one of tw summer than in winter?" or "Why does the moon seem to have a different shape each nig

correctly. Yet they have been taught these ideas repeatedly while still in school. For some their Harvard education. Their teachers "covered" it, but somehow the students never lea shifts to a good high school nearby. Ninth graders, it turns out, share many incorrect belie and faculty. In fact, their beliefs about summers and seasons are rather elaborate, if not i theory. Then we watch as they are taught this material. The teaching looks good: clear le students. But the instructor never tries to understand what each student already believes asking canned questions and getting their canned answers. She probably assumes that c prior beliefs (if they have any) will be irrelevant. Afterward, the students are interviewed a as though they understood the ideas. They'd probably get an "A" on the test. But as the in that their original beliefs are still there, virtually untouched. In some cases, students have the teaching. That's because they have used their hidden preconceptions to (mis)interpre students were never forced to become conscious of their prior beliefs, let alone to test the about that for years, but it has finally hit me that many innovating faculty make the same did. Their error lies in assuming that their students have no theories about how best to le that, once exposed to a new, technology-enabled approach, their students will abandon t and enthusiastically adopt the new approach instead. But what if students come in to cla is the responsibility of the teacher, that good teaching consists of clear lectures plus assig anything that's fun can't be real learning? Will they abandon those ideas simply because approach to teaching? Everything we know from research suggests most of them won't a are supposed to learn in college. Not all faculty make the mistake of letting students be u course. Year ago, I sat in on an interactive video course taught by the late Prof. Guy Ber University. He helped his students actively try fresh theories about how they should think "regular" teaching. The course was not in education or psychology, by the way, but in the Bensusan saw it as part of his job to help his students become college level learners, as process of helping them master the content. Similarly, you may have read several years *Education* about Prof. Jerald Schutte's experiment with his social statistics students at Ca students was randomly divided into two equal groups. One group met face-to-face five ho while the other interacted almost entirely online, with minimal support from Schutte. Stude help. Although Schutte's online students didn't much like the experience, their test scores the on-campus students. The best predictor of test performance, off-campus and on-, wa most was that Schutte and his students were inquiring together into learning. In today's e technologies means no one is an expert -- not senior faculty, not junior faculty, and not st learning seems a good thing to do. There's a lesson in this for local evaluators and resea who you'd like to respond to your surveys and interviews. Will your study treat them the w like objects to be manipulated? Or is this study going to help each of them take more resp own learning? Is this study itself part of the education of the students who respond to it ar

An earlier version of this essay appeared as "The Student as Co-Investigator" in the firs