



CONNEXIONS

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Alternatives

President's Message: Teaching with Technology

By Bruce Saulnier
Quinnipiac University

In September of 1967 I was a junior at Defiance College in Ohio working as a student assistant for the Mathematics Department. Our department chair, Dr. Fallon, had just received a grant to purchase the first computer on our campus, and it was delivered to our department. My job was to help Dr. Fallon set up that wonderful machine, an IBM 1130 that worked on stand-alone punch card technology.

When the time came to apply to graduate school, I was seriously considering applying for graduate study in philosophy. But my judgment told me there was probably not much of a market for out-of-work philosophers. So instead I applied to graduate programs in the fledgling field of computer science. The rest, as they say, is history.

Now some 35 years into the computer field, I gasp in awe at how far we have come. Students and faculty are computer literate far beyond our most optimistic predictions. Increasingly large shares of college and university budgets are being devoted to the technological infrastructure of our campuses. And the pressure to "keep up with the Jones's" and employ the latest in technological tools and distance education in our courses are being felt by all in higher education.

But in our rush to employ the latest technology in our classes, to give the impression to our audiences/clients (students, alumni, donors, the public, etc.) that we are on the "cutting edge" of technology, are we sometimes guilty of "letting the tail wag the dog?" Are we using the technology consistent with the research base of what constitutes sound pedagogy? Are we merely automating existing course delivery processes, or are we truly re-engineering our processes to make the best use of the technology? How do we "separate the wheat from the chaff?"

Please join me in digesting the contents of this issue of *Connexions* as we continue to learn from each other how we may best employ technology in our classes and continue on our journey of discovery of what it means to be a teacher.

Pioneers in Applying Media Technologies in Teaching and Learning

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Dr. Habowsky is a founding member and Distinguished Fellow of ISETA. He was also the twenty-fifth year historian. He has won numerous awards, not only for research in his discipline, but also for his innovative and engaging teaching strategies.

INTRODUCTION

When I attended elementary school in Germany more than sixty years ago, the medium of communication in the lecture was the "chalk-board," a technology which still exists. As a pupil then I possessed a miniature slate board and chalk, which was the current technology, to practice writing letters from the alphabet. When I made a mistake, I erased the letter using a sponge. With time, additional media were incorporated in the lecture method such as printed hand-outs, projected slides, films, overhead projection and others. When television and reel to reel audio machines became commercially available, some educators thought to use them effectively to improve the delivery of information. In the lecture system, students play a passive role in acquiring knowledge, whereas media technologies can enable the learner to become actively involved in the teaching and learning process. Another problem is that students vary in background, in their ability to acquire knowledge, perform and solve problems; appropriate media can accommodate these variations.

THE USE OF THE MONITOR

Toward the end of the fifties some reasonably priced combinations of TV cameras and monitors became commercially available. It is more than likely that not only the

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Submit articles of 250-1000 words on alternative teaching methods to the editor via regular or e-mail. All articles are peer-reviewed.

Zoologist Prof. W.E. Beckel thought of the idea to put such technological devices into teaching. In 1961 he introduced a closed-circuit TV system into the laboratory portion of the first year zoology course, Department of Zoology, University of Toronto, Ontario, Canada. Since I was a Ph.D. student of Dr. Beckel and assisted in the course, I also got involved in the use of this teaching aid at that time. The success of this introduction of media technology led to its adoption by other Universities. A similar system of instruction was introduced in the laboratory portion of the first year biology course in the Biology Department of Queen's University, Kingston, Ontario; it was technologically improved by the use of a "feed-back-system," by means of which the student was able to communicate with the centre desk. In 1964 Scarborough College, a satellite campus of the University of Toronto, was in the planning stages. Professor Beckel, future Dean of this College, incorporated the closed-circuit TV system as an integral part in the teaching and learning process (Habowsky, 1983).

THE USE OF THE AUDIO PLAYBACK

In the Department of Biological Sciences, Purdue University, Lafayette, Indiana, USA, Botanist Professor S.N. Postlethwait was concerned about the high failure rate in his basic Plant Science course; he thought that three factors seem to relate to this problem: high enrolments, the variable levels of knowledge of incoming students, and individual differences in learning ability. To assist those less successful students, he initially had his lectures recorded and provided the tapes to students who wanted this extra help in a botany course in 1961. This possibility of repetition of the lecture became so popular that a majority of students in his course requested the opportunity of listening to the recorded lectures. Based on the positive results, he fully implemented and developed the use of the audio tape in the laboratory portion of the first year biology course for 380 students in 1962.

The Learning Centre at Purdue University was frequently visited by scientists and teachers from all levels of education throughout the world; visitors were interested in studying and assessing implementations of this system at their own institutions. This instructional system, known as Audio Tutorial (Postlethwait et al. 1964, 1969, 1972, 1989) was used in many countries including Australia, Canada, France, Germany, Japan, South Africa and several Latin American countries.

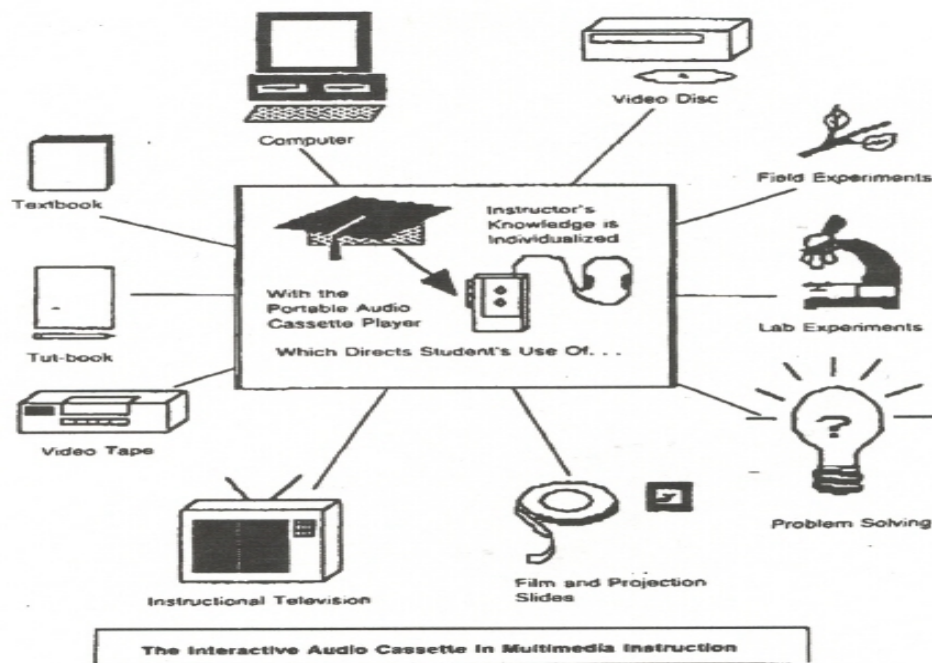
MULTIPLE USE OF A LEARNING CENTRE AND MULTI-MEDIA INSTRUCTION

In 1969 we developed the first multi-media learning facility in Canada, in the Department of Biology, University of Windsor, Ontario. Due to increasing enrolment not only were we limited in space, equipment and even scheduling of the laboratory portions of certain courses (e.g., cytology and histology) but also faced

declining quality in the "hands on" learning activities. In the planning we combined the laboratory portions of the courses cytology, histology, plant anatomy, mycology, and electron microscopy into a single learning facility (Habowsky, 1983).

Based on this experience we designed an enlarged learning centre in 1976; in addition the laboratory of the first year biology course was included. The number of students using this facility corresponds to approximately 700 course units annually distributed among seven different laboratory portions of courses and scheduled concurrently within the year; a total of 53 study stations was sufficient.

In 1985 the Joint Effort Agreement between the Department of Biological Sciences and IBM of Canada, Limited, provided both computer hardware and software for teaching and learning. From the beginning it was clear to us that the microcomputer was another medium with unique features. Based on our findings in multi-media instruction we were not satisfied simply to replace proven audio programmes and hands-on activities with either simulations or printed words on the screen, components in computer assisted instruction. Instead, the audio tape was used to integrate computer software by means of commentaries necessary for a proper understanding. We optimized inter-active audio by using portable play-back machines (Walkman). The attached chart indicates the use of the audio tape in multi-media instruction, involving a wide variety of media (Habowsky, 1983; Habowsky et al, 1990a, 1990b).



The multimedia system was adopted by the Department of Zoology, University of Toronto, Toronto, Ontario, Canada; (Habowsky, 1983); Department of Biology, University of New Brunswick, New Brunswick, Canada; Biologie für Mediziner, Universität Köln, Deutschland; (Hoffman und Eickhoff, 1977) Lehrstuhl für Physik, Lehrstuhl für Mathematik und Statistik, Technische Universität München, Deutschland (Precht, 1987).

DISCUSSION

In summary, over the past 40 years the evolution of media technology has provided education with exciting new electronic technologies for the delivery of information. The notable applications were Instructional Television (ITV) in the late fifties (Habowsky, 1983), Audio-Tutorial (A-T) in the early sixties (Postlethwait, 1964, 1969, 1972, 1989), Multi-media Instruction (Habowsky, 1983, 1989) and Computer-Assisted Instruction (CAI) in the early eighties (Bork, 1981). Such applications have brought forth new instructional paradigms and each in turn was praised as the ultimate in teaching and learning.

The success is based on one's ability and desire to both modularly and meaningful implement these technologies (Habowsky, 1983). A co-requisite in this approach is to also provide the "personal attention"

which students need, as advocated by the proponents of the "Personalized Systems of Instruction" (Keller, Sherman, 1974).

There has been a flurry of activities to explore the potential of these communication tools for enhancing the teaching and learning process, especially in schools at the high school level and below. There appears to be less interest by teachers at the college and university level. Why is this true? Perhaps it is because many college teachers perceive teaching as a secondary activity to their other professional tasks. Perhaps it is because a commitment to a major change in instructional procedures requires so much effort. Perhaps the risk of failure is so great that it makes no sense to leave the security of conventional instruction. Perhaps since the rate of change in communication technologies is so rapid, an obligation to one kind of equipment may be outdated by the time it is installed and is a scary thing to do. Whatever the reasons, the potential for better education through the use of these communication tools must not be ignored. Teachers at all levels must play a role in determining the ways technology is used in the development of instructional designs.

It has been demonstrated that instruction can be enhanced through the use of technology and that it enables the teacher to provide new dimensions to the instruction/learning process that are not possible under the more conventional approaches. Despite the value of these new technologies, the teacher remains as the most important component of the classroom. Quick access to extensive quantities of information is tremendously helpful but it is not the only requirement for helping students grow intellectually. Learning occurs through a great variety of experiences and interactions with subject matter and peers. The organization and planning for "helping students learn" must take into account a vast array of human factors and acknowledge that "students are a lot like people."

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Searching for "Truth" in an IT World

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and

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In the mid 1980s Naisbitt (1982) predicted "a mammoth communication revolution... an integrated information and communication system that transmits data and permits instantaneous interactions between persons and computers.... We have for the first time an economy based on a key resource that is not only renewable, but self-generating. Running out of it is not a problem, but drowning in it is (23-24)." Naisbitt further portended that this megatrend would cause us to re-examine our preconceptions and values, to drastically alter our lifestyles, and to re-conceive our educational institutions.

During the early 1980's, many of us were just beginning to explore personal computers. Ubiquitous, graphically enhanced Web sites were, for the most part, merely figments of select imaginations. Ten years later, multimedia communication technologies were being employed in instructional materials (Tannenbaum, 1998). By the year 2000, needless to say, Naisbitt's interconnected, global world had approached warp speed, whirling most of us wirelessly into a new frontier of communication, connection, and proliferation of information.

Today, interactive Web sites, CD-ROMs, DVDs, and numerous wireless hand-held devices that connect to the Web are used for entertainment, business communications/transactions, advertisements, educational materials, health information, simulations, virtual reality, research, the gathering and exchange of an array of information, the enabling of the disabled, and so forth. Applications for communication technologies continue to grow about as quickly as they can be conceived. During this unprecedented transformation in information technology, many of us have only partially undergone a comparable psychological transformation in our worldview and/or paradigm shift in how we approach teaching and learning. Observations about how to combine learning theories, instructional design, and specific communication technology to attain specific learning outcomes are not widely disseminated or replicated in educational settings.

John Seely Brown's (2000) observations about communication characteristics in the digital age can be employed and refined by faculty seeking to support the learning of students. Brown affirms that communication technologies are connecting us to the expertise of others (faculty, practitioners, etc.) The community mind is comprised of diverse groups of persons with diverse perspectives and diverse levels of knowledge. Individuals learn through dynamic dialogue. They share information, tell stories, critique each other, and monitor the dialogue of others based on their levels of understanding, perspectives, cultural backgrounds, and values. Fluid Web groups or special interest communities might be located in geographically different places. Solutions to problems or the development of new knowledge (e. g., a group of scientists or sociologists discussing cures or paradigms) commonly reflect conversations and collaborations from numerous individuals around the world. The global nature of these conversations and collaborations maximizes the benefits of knowledge in ways that would be nearly impossible without the communication technologies. As Naisbitt (1982) predicted networking is replacing hierarchical (and traditional) sources of knowledge. People are connecting to other people to solve problems and create solutions.

Within this framework, we argue that the digital age provides opportunities for faculty to expand the classroom conversations to include flexible learning environments with options that appeal to diverse learning styles and intelligences (Gardner, 1983). As we continue to learn more about how we learn, we will be able to employ an abundance of technological options in different curriculum areas from kindergarten to post baccalaureate instruction for specific learning outcomes. A combination of technological tools and knowledge about the learning process should improve traditional teaching and learning (such as individualizing instruction to appeal to numerous students' intelligences).

However, similar to the printed versions of texts like history, information transmitted through communication technologies is created from specific perspectives or frame of references that might not be apparent or easily examined. Even if faculty members do not employ technological tools for attaining student outcomes, digital age students will be progressively more inclined to seek, to exchange, and to be influenced by an abundance of information gathered quickly from the Web, the community mind, and other such sources. Faculty members are no longer, and will no longer be, the dominant sources of information;

students have, and will continue to have, easy access to information from kindergarten to post baccalaureate instruction.

Now for the not-so-good reality of the community mind and dissemination of information through the Web. In "Anatomy of an Urban Legend," Callahan (2001) aptly chronicles how incorrect information can be quickly disseminated through the Internet, without the scrutiny or critiques commonly associated with printed versions of "truth." Shortly after the September 11th attacks in the United States, a graduate student sent an e-mail from Brazil to a mailing list declaring that the television footage of Palestinians who appeared to be celebrating was old television footage shot nearly a decade earlier during the Persian Gulf War. The graduate student also shared a definite point of view about American foreign policy that did not seem to circulate with claims about the false footage. Twenty-four hours later, the contents of the graduate student's e-mail, with various embellishments, had circulated the world. Callahan affirms that the television footage was actually shot only hours after the attacks, but the story of the old footage continued to be circulated around the world, even after the author of the original e-mail retracted it. Because of its speed and the ability to connect millions, the Web makes it easier to spread unsubstantiated information and rumors, and it makes it more likely that the original authors (and their value systems) will be separated from subsequent transmittals. Callahan offers that recipients of e-mails could possibly connect their relationship with the sender to the trustworthiness of the contents of the e-mail.

The September 11th email event punctuates the need for paradigms focusing on the communication/analysis of information on the Web. We affirm that anyone who participates in the fluid community mind, need tools to analyze the wealth of information. Without these tools, our students (and our citizens) are in danger of being victims of uncorroborated truths, similar to the September 11th emails that generated a mass delusion. Even more subtly, our students could be steered by the perspectives of certain groups who gather and enhance information, tell their stories, critique information from their particular value perspectives, and disseminate solutions or innovations to solve problems. Likewise, students should acknowledge that their value systems influence their selection of preferred answers from numerous options. No matter how information is collected or disseminated, it is critical to note that it is not without an underlying point of view or implicit value system or systems. There are multiple and complex constructs involved in selecting and disseminating print and graphic information on the Web. We proffer that it is the responsibility of faculty to help students develop cognitive strategies to analyze complex information, judge its value, and to interpret it. Analysis, from some perspectives, assumes that there are reasons for seeking information (sometimes named objectives), pathways to pursuing objectives (sometimes called means or alternatives), uses for the information (sometimes called solutions to problems), and ways to communicate the results or observations (sometimes called findings and discoveries).

Observing students explore the Web for answers illuminates how susceptible many are in their searches . . . for value, for truth. Armed with unclear objectives and developing worldviews, they wander from site to site, vulnerable to the agendas of others. Similar to the need for analytical tools in analyzing problems and making choices (Nelson, 1977), analytical tools are needed to approach the abundant print and graphic information on the Web. Frameworks (possibly discipline specific ones) for analysis of information are needed to guide students as they maneuver the maze of information, searching for truth.

The development of any framework for analysis should possibly commence with a cognizance that a search for answers or solutions generally involves some preconceived notions or assumptions about what constitutes answers, where answers can be found, and the advantages and limitations involving the entire investigative process (Nelson, 1977). Thus, a student searching for information about oral communication theories might seek information on the Web because he/she believes that he/she can identify such information quickly (search through library and ERIC indices), and the information found will be current including research in progress, journals, and so forth.

An awareness that these preconceptions exist in an important first step in understanding the context in which information will be sought, reviewed, judged and ultimately adapted in a knowledge base. Fairhurst & Sarr (1996) affirm that the acceptance of preconceived mental models is essential in learning how to manage meaning and "frame" information when interpreting it to others. The Web provides abundant opportunities to compile information and interpret it to others. When framing information to communicate it to others the person communicating the information chooses a specific interpretation over another and thus "manages" how others receive the information. Of course, the act of framing information involves the preconceived notions and the worldview of the person(s) framing the information.

(continued on p. 9)

Just-in-Time Teaching: Using Web Technology To Increase Student Learning

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Just-in-Time Teaching or JiTT (Novak, Patterson, Gowin, & Christian, 1999) is a pedagogical technique that combines the best features of traditional in-class instruction with the exciting new communication channels opened by the World Wide Web technologies. This article describes specific JiTT components that take advantage of student-learning principles crucial to success.

Unfortunately, there is no proof that mere investment in technology produces significant gains in learning outcomes. But by examining which learning strategies are most beneficial and which technologies best support those forms of learning, technology can be harnessed not just for technology's sake, but to promote learning (Ehrmann²). Three strategies have been found to make a positive difference in learning at the college level: increased time on assignments, student-student interaction, and faculty-student interaction, (Astin, 1993).

JiTT promotes student learning by fostering these three learning strategies:

1. Out-of-class assignments increase student study time and structure student learning for maximum benefit.
2. Students work together in teams to solve problems and teach each other.
3. Faculty gather insights into student thinking and feelings that they can use to adapt lectures and exercises to better meet student needs.

Although Just-in-Time Teaching makes heavy use of the web it is not to be confused with either distance learning (DL) or with computer-aided instruction (CAI.) Virtually all JiTT instruction occurs in a classroom with human instructors. The web materials, added as a pedagogical resource, act primarily as a communication tool and secondarily as content provider and organizer.

While JiTT web pages cover a lot of ground (Novak, 2002), the heart of the method is the use of short exercises dubbed WarmUps. These prompt the student to think about an upcoming topic and to answer a few simple questions prior to class. WarmUps demand a great deal of thinking on the part of students because they must read and understand concepts in the text in order to compose brief answers to the WarmUp exercises on the course web page. A key JiTT component is the time spent studying out of class for WarmUps. The assignments are due just a few hours before class time. They become the framework for the classroom activities that follow.

Classroom research has shown superior results from collaborative learning compared to traditional lecturing. JiTT's collaborative recitations (Novak, Patterson, Gowin, & Christian, 1999, p. 17) foster student-student interaction through increased student involvement. As students prepare for class, they know that peers will see their work and that they will have to be able to explain things in their own words. When students discuss course concepts and problem sets in small groups, they teach each other and learn more themselves. At IUPUI where 60 to 70 students meet in a large room, groups of 2 to 4 students work at whiteboards installed around the periphery of the room. Teachers assign them fresh problem sets selected on the basis of what students have found difficult in WarmUps and lectures.

Faculty-student interactions are enhanced primarily by the efforts of the teacher, who reads student WarmUp assignments and adjusts the lecture based on what students have understood and what they found difficult. But getting feedback on students' grasp of the content through WarmUps is not enough. Astin³ found that personal contact between students and the teacher is a crucial factor. Therefore, every assignment page provides space for spontaneous student thoughts and comments. Faculty gauge student reactions to gain insights into the affective side of student learning. These prove to be a remarkably rich resource for the teacher and a bridge builder between students and teachers.

Students typically comment on:

The course: I know I learned most of this in high school, but for some reason it seems totally foreign to me - and a lot more complicated. I'm starting to get a little frustrated b/c I feel like I should understand easily, but I don't."

The assignment: ". hmm...the force equation does not seem to fit here. so, how about $r=mv/qB$...then $v=rqB/m$...which I can't solve w/o the radius of the earth, in this case, but that's the equation anyway (I think)"

The student's own performance: "Feels oddly like I'm guessing on these questions. I don't want to guess, but I can't find any of this in the book, and the good Lord knows I'm too old to think this hard anymore," or, "As frustrating as these assignments can be, I've actually realized that they do help me prepare mentally for the next lesson and spark my curiosity about what we're learning. In short, I've come to think that these are pretty valuable - at least for someone w/my learning style."

Such comments, arriving daily and frequently shared with the class contribute immensely to the learning environment. As Astin (1993) notes, "...it appears that how the students *approach* general education (and how the faculty actually *deliver* the curriculum) is far more important than the formal curricular content and structure" (p. 425).

Planning for instruction can be derailed by debates about the content to be covered. A substantial part of course development ought to be spent on the method and the delivery of instruction. JiTT provides a blueprint for structuring out-of-class assignments for maximum learning benefit, creating and sustaining in-class collaborative learning, and maximizing instructors' understanding of student learning. Students and instructors work as a team toward the same objective, to help all students pass the course with the maximum amount of retainable knowledge.

For more information, examples of JiTT materials from many academic disciplines, and a partial list of JiTT adapters and courses please visit our web site <http://jitt.org>.

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(continued from page 6)

We believe that it is essential for faculty members in all disciplines to augment students' awareness as they interpret an enormous amount of graphic and print information and attempt to manage its meaning (Fairhurst & Sarr, 1996.) Faculty in media communications, for example, can highlight approaches to analyzing pictures and graphics employed on the Web. All faculty should demonstrate analytical tools for understanding and interpreting multiple and complex forms of communication made possible by the Web and other communication technologies (e. g. movies, pictures, graphics, print, and combinations, etc.). Successful students would use analytical tools to research, critique, associate new information with previous knowledge, and create new ideas/innovations. In our digital world, the ability to search, retrieve, make sense of information, consider it from diverse perspectives, interpret it to others, utilize it, manage its meaning, and evaluate its overall usefulness and accuracy will be an essential tool, possibly for maintaining our democracy.

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EDITOR'S POSTSCRIPT

By Susan Copeland Henry

One of the most interesting sessions I attended at the ISETA 2000 conference was Carolyn Johnson's session entitled, "Web-Based Instruction: What's Holding You Back?" As she indicated in the presentation and in her abstract, Carolyn Johnson (2000) has done extensive research in order to identify the reasons why college and university instructors have been more hesitant about using the Internet for instructional purposes, while K-12 teachers have "embrac[ed] the web as a powerful resource" (p. 99). The various concerns that she cited among higher-level instructors were issues regarding traditional tenure tracks, anxiety about the web replacing classroom instructors, copyright problems, the rapid pace of changes in hardware and software, confusion about the pedagogy of teaching on the web or using the web, etc. Her ultimate purpose was to encourage instructors both to address these issues from various perspectives and "[t]o practice using the web as a component of student learning rather than a means of delivering instruction" (p. 99).

I do not think that technology should be ISETA's singular focus. However, since ISETA has a history of developing pedagogical principles vis-à-vis technology, and since, as our Mission Statement indicates, ISETA is composed of members across the disciplines who "share a commitment to improving the quality of their teaching and the quality of their students' learning" (Watson, 2001), I think that we should address the issues that Carolyn introduced and expand upon them. We need to recognize that the advent of the Internet is not unlike the advent of the printing press: the printing press allowed for more active and constructive modes of interpreting and learning for new readers who had been more passive learners through listening to others' readings of texts and interpretative offerings. We as educators now accept these text-enhanced learning strategies as the norm. With the Internet, methods of learning are bound to change, and if we want to be effective educators, we need not to hang back and worry, but to be on the cutting edge, helping to shape the pedagogy of web-enhanced instruction so that the quality of learning improves in the multimedia environment.

What can we do to address this era of change with all its incumbent issues? As this and the next issue of Connexions seek to do, one move is to talk more openly about the concerns Carolyn brought up. The second move is to encourage more conference presentations that employ effective cutting-edge ideas using technology. In connection with this, the third move we should make is to insure Internet access at conferences so that presenters can "take us" to their sites and show the kinds of web-enhanced methods they have developed. Let's really connect.

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COLLEGE**

CALL FOR PRESENTATIONS

The International Society for Exploring Teaching Alternatives encourages college and university faculty and practitioners from all disciplines to develop, study, and apply learner-centered principles of teaching, learning, and assessment in innovative, yet effective and practical ways. The program committee invites proposals for 60 minute presentations that reflect these goals. We are especially interested in presentations and workshops that demonstrate practical creative teaching alternatives, based on personal experiences and/or research, which will appeal to colleagues in several disciplines. We will also consider presentations on other topics relevant to the mission of ISETA. Preference will be given to presentations that promise to model teaching alternatives and engage their audiences in activity and dialogue. For our mission statement and other information, visit our site at <http://www.iseta.org>.

To be considered for review, a proposal must be postmarked on or before April 1, 2002, and consist of the following:

- A cover page containing the title of the presentation or workshop, the name and title of the author(s), complete institutional address(es), and telephone number(s), summer address (if different), FAX number, e-mail address, and special audio-visual needs;
- Three copies of a two-page summary of the content of the presentation, including its objectives and format, and a brief profile of the intended audience (**Do not include the author's name on the summary pages**);
- Two stamped, self-addressed envelopes except if the proposal is e-mailed.

Submit the above to:

**Dr. Christina Shorall, Chair of the ISETA Review Committee
Dept of Education and Community Services/Point Park College
201 Wood Street/Pittsburgh, PA 15222
Telephone (412) 392-3976/Fax (412) 392-3927/Email: cshorall@ppc.edu
(Please e-mail proposals with the information required above).**

