The Web's Impact On Student Learning

A Review of Recent Research Reveals Three Areas That Can Enlighten Current Online Learning Practices

Katrina A. Meyer, Ph.D., University of North Dakota

Recently, I set out to find an answer to the question of what current research was saying about how, if at all, the Web impacted student learning. My recently released monograph, *Quality in Distance Education: Focus on Online Learning*, is a compilation of more than 100 studies drawn from several online journals, conference Web sites, as well as some interesting sites maintained by associations and institutions. (The one maintained by the Asynchronous Learning Networks organization at www.aln.org/ is an especially rich source of studies.) One of the unintended lessons learned from this project was discovering how easy it is to locate good research on the Web and how many studies there actually are. My search focused on current research and studies—usually no earlier than the mid-1990s—completed on college students. I think many of the findings also will be applicable to K-12 students. In any case, the search sent me on a circuitous route to a number of answers, some of which I think are very sound and will stand up over time, while others are more tentative, although intriguing.

Anyone who has been around distance education for a while is familiar with the compilation of 355 research studies by Thomas L. Russell of North Carolina State University (1999), who coined the phrase, "no significant differences phenomenon." Many of the studies in Russell's report were comparison studies, comparing the new mode of education—be it telecourse, interactive video or satellite—with traditional education. Subsequent writers have faulted these studies for poor research design and inadequate controls, a naive understanding of what affects learning, and a lack of recognition that online students are different from their on-campus counterparts.

Therefore, it may surprise you to know that more than 30 of the studies I found were a comparison of Web-based courses against traditional ones. Better studies have been done, of course, some of them attempting to repair the deficiencies of earlier research, while others opt for a case study approach to Web-based learning. While it is difficult to summarize all of the findings, there are three areas of the studies worth mentioning:

- The role of individual differences;
- Instructional design; and
- Specific skills that are enhanced by online environments.

INDIVIDUAL DIFFERENCES

No educator will be especially surprised to learn that success in a Web-based learning environment is heavily influenced by what the student brings to the learning situation. There is evidence that students with certain learning styles (e.g., visual) or behavioral types (e.g., independent) do learn better in the Web environment. Conversely, aural, dependent and more passive learners may not do as well. It is this sort of insight that leads some to propose that the potential for maximal learning results when instructional approaches are matched to student learning styles and are supported by appropriate technologies.

Furthermore, students with a high motivation to learn, greater self-regulating behavior, and the belief they can learn online do better; as do students with the necessary

computer skills. These are not particularly profound insights, although they do tend to explain why online learning will work as well as other forms of education for good students, but may not work as well for students who struggle because of a lack of motivation or self-confidence.

Interestingly, gender differences appear in online exchanges just as they would in regular situations. Based on content analyses of exchanges in Asynchronous Learning Network (ALN) courses, Blum (1999) found differences in male and female messages that mirror traditional face to-face communication. Males were more likely to control online discussions, post more questions, express more certainty in their opinions and were more concrete. Whereas females were more empathetic, polite and agreeable. The females also supplied the niceties that maintain relationships such as "please" and "thank you." This finding may only indicate that we take our normal personalities, judgments and beliefs about others into the online setting. In other words, we are consistent in our online interactions, despite expressing ourselves in a different form.

There is another interesting development along generational lines. Now, it's true that students are arriving at college with greater abilities in online learning and an expectation to learn that way. But, what is even more intriguing is that these students also arrive with brains that are more likely to have been shaped by very visual, rapid movement, hypertexted environments (Healy 1998). This has led some to suggest that these younger brains are different from those of faculty, who are more likely to have brains formed by reading—a largely linear and slow activity.

Our brains may also be the reason why we can become so involved with our computers. As a result of 35 laboratory studies, Reeves and Nass (1996) concluded that it is the psychology of the relationship between us and the computer that is important, not the fact that one member of this so-called relationship is a piece of technology. They came to this conclusion after experiments where subjects were asked by the computer to critique its work. Subjects responded politely and seemed not to want to hurt the computer's feelings. But, when asked by one computer to critique another's work, subjects were more likely to offer criticism.

Asked to explain their behavior, subjects said they knew the difference between a computer and a person, and argued vehemently that technology is a mere tool without feelings. Yet, their responses belied an underlying belief that the computer is real, implying that the relationship of humans to media may be unconscious and perhaps innate. The authors hypothesize that this relationship may be due to the brain's slow evolution over the ages, as well as its inability to distinguish between rapidly advancing media and real life.

In addition, if humans cannot distinguish between computers and real people, then this might imply that technology could not independently influence the quality or quantity of learning. It would also argue that failures of learning are more likely to be due to other factors, such as inadequate instruction or a poor match between the individual and the learning situation.

INSTRUCTIONAL DESIGN

If there is one major boon resulting from the advent of online learning in colleges and universities, it is the renewed focus on pedagogy and instructional design. Higher education faculty, who are hired and trained for expertise in a discipline, are not trained in these matters, and often adopt a teaching style that is either modeled on how they were taught or how they prefer to learn. In any case, introducing the Web into college teaching has generated an enormous upswell of attention on the aims and various methods for achieving student learning. I can say this without hesitation, having read several articles by faculty who write about what they learned by using the Web, what they learned about instruction and student learning, and how they are translating their newfound knowledge to on-campus courses.

Much of the early research on Web-based learning focused on the technology and ignored the instructional design imbedded in the course. This is unfortunate, and has given people the impression that the Web produced learning, when it is more likely to have resulted from the instructional design and the pedagogies chosen to help students learn. Smith and Dillon (1999) call this the "media/method confound," and it continues to confuse researchers and practitioners alike. This is not to say that unraveling the media and method—separating the effects of the Web from its instructional uses—can be done; in fact, I found no such research attempting to do this. Regardless, to say the Web affected learning may be inappropriate unless the powerful effect of instructional design has been isolated from the technology used to deliver it.

However, if there is one strong area where the Web is used to consistent effect, it is by making ample interaction feasible, including students interacting with the course material, faculty or other experts, as well as other students. This interaction, if consciously programmed into the course, allows students to discuss ideas online, ask questions, share information, tackle group projects, develop joint understandings and even forge friendships. If someone complains that online learning is passive, the problem isn't the Web, it is the use that is made of it.

There is growing work around whether e-learning communities can be achieved and how. Palloff and Pratt

(1999) provide an excellent primer on how community may be defined and created online. And research about online learning communities has followed. Wegerif (1998) found that the ALN model increased interaction, self-discipline, a sense of community, communication, reflection and shared space among students. Brown (2001) describes a three-stage process by which a community is formed in a computer-mediated asynchronous distance learning class:

- Stage 1: Making friends
- Stage 2: Community conferment or acceptance
- Stage 3: Camaraderie

Each stage represents a greater degree of engagement "in both the class and the dialogue" over the previous stages, and greater levels of interpersonal bonding or affiliation.

The consequences for students of building community include improved confidence expressing oneself, learning from others, and feeling connected and accepted.

IMPROVED SKILLS

The research conducted so far on Web-based learning has focused on evidence of critical thinking and writing skills. While these two skills are not solely or uniquely the result of Web environments (since you can improve these skills by various means), it is good to know that the Web supports the acquisition of these important skills. To do this research, one method that may be especially useful for analyzing online exchanges—be it a threaded discussion or chat—is content analysis. Newman, Webb and Cochrane (1995) used content analysis of online messages to look for critical thinking indicators in computer conferences. They found that online students were more likely to make important statements and link ideas, although they contributed fewer novel ideas than to face-to-face comparison group. This may indicate that online conversations are less suited to functions like brainstorming, or that working online encourages respondents to work in a more linear fashion by linking comments to earlier ideas. Garrison, Anderson and Archer (2001) also looked at critical thinking in computer mediated communications using a four-stage analysis of the critical-thinking process:

1. Triggering—posing the problem
2. Exploration—searching for information
3. Integration—construction of a possible solution
4. Resolution—critical assessment of the solution

Transcripts of online discussions were coded, resulting in 8% of the responses coded as triggers, 42% as exploration, 13% as integration and 4% as resolution. The authors hypothesize that the low numbers for integration and resolution were due to the need for students to take more time to reflect on the problem, and that individuals were reluctant to offer solutions that would be scorned by others in the class. The opportunity for reflection is especially suited to asynchronous learning environments, as well as for students whose learning styles require some time and reflection to make sense of information.

There is also ample evidence from a variety of sources that suggests having students work online improves writing skills. Wegerif's (1998) study found that the ALN model improved writing skills by having students write more and more often, as well as by increasing the public visibility of student writing. (It is there for others—espe-cially their peers—to see and, presumably, critique.)

Being able to express one's personality, or "presence," is another intriguing skill that may impact the creation of satisfactory learning communities, and could become a necessary new skill for online conversations. Certainly, with the loss of facial expressions, voice intonations and gestures, important nonverbal meaning and shadings of meaning are lost. Yet, there is evidence that a personal presence—as captured by one's written expression—is important in Web-based classes.

Gunawardena and Zittle (1997) found that "social presence" (i.e., the degree to which a person is perceived as real in an online conversation) is a strong predictor of satisfaction with computer mediated communications. Arbaugh (2001) calls this skill the production of "immediacy behaviors," since they reduce the "social distance" between teachers and students. In this study, these types of behaviors were positive predictors of student learning and course satisfaction.

The issue of presence was also addressed in a study by Anderson et al. (2001) that reviewed transcripts of course discussions held over computer conferencing systems. The authors developed the concept of "teaching presence," expressed by faculty comments, in three categories:

- Design and organization ("This week we will discuss…");
- Facilitating discourse ("I think we are getting off track"); and
- Direct instruction ("Bates says…").

Faculty who are adept at expressing their unique personalities through e-mail or other Web-based communications may be at an advantage in connecting with students, which may help students bond to the instructor or learning environment. This idea of presence may soon be a skill not only well-suited to Web-based exchanges, but also a requirement for student and faculty success in online coursework.

LOOKING FOR ANSWERS

This is a good start on the research that is needed to ensure that the Web is used effectively for student learning. However, there are some holes in our understanding; not least of which is determining whether and how the Web might have an independent effect on learning, separate and apart from the instructional method imbedded in the application. The focus of those who criticize using the Web in education—worrying that technology may affect us negatively—is worth addressing with well-designed research studies.

And if there are differences in effectiveness, can we determine as Barbules and Callister (2000) put the challenge: "Which technologies have educational potential for which students, for which subject matters, and for which purposes?" In other words, is there an optimal match possible between student, learning and technology? Furthermore, we need to continue to collect good information on what works and why. This is because answers to these questions will likely be more helpful to educators than asking whether or not the Web affects learning, which presumes that it can and does, and initiates a search for answers to the wrong question.

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