Online Education: Issues and Research Questions

One of the more startling recent developments in postsecondary education in the United States (U.S.) is the unprecedented growth of online education. Although the exact extent of this growth is unknown, and while some estimates in the past have been controversial, it seems clear that extensive recent growth *has* taken place. An extremely conservative estimate is that at least 3 million U.S. students are currently enrolled, and the field is growing at an annual rate of 41 percent (Primary Research Group, 2002).

This phenomenal growth is not limited to the U.S. alone, and in fact, has been even more extensive in many other countries, especially when all forms of distance education are considered. Debeb (2001) has estimated that as early as 2001 there were 986 distanceteaching institutions in 107 countries, and that 90 million higher education distance learners were enrolled worldwide in 2000. He predicts that this number will reach at least 120 million by the year 2025. Furthermore, phenomenal growth in online education is occurring across extremely diverse disciplines (Hill & Raven, 2000), causing universities to invest "huge resources" in online education (Reid, 2003, p. 17). Extraordinary growth in online offerings is also occurring in teacher education.

Paradoxically, the growth in online education, while startling in its scope, velocity and cost, has directly affected only a minority of students and faculty. According to the National Center for Education Statistics (2003), until recently, only about eight percent of undergraduates and ten percent of graduate students have taken a distance education class. Furthermore, Saba (2005) estimates that only between two and twelve percent of faculty are involved in "teaching via technology beyond the campus proper." These numbers, humbling as they are, include all fields of study; online teacher education experiences make up an even smaller subset.

This suggests that so-called "early adopters" of technology may have made up the majority of faculty and students who have so far been involved in the online education phenomenon. However, because of several conditions in higher education, we believe this is about to change. In fact, we would suggest that we may be at the cusp of a revolution in higher education instruction brought on by several recent developments, some of which are societal in nature while others are more directly related to changes in technology. The societal factors include, but are not limited to the following:

1. rapid growth in the number of for-profit institutions offering increasing numbers of online courses, programs, and degrees to compete with the face-to-face offerings at traditional institutions;

2. increasing numbers of public institutions suffering from financial difficulties coupled with the growing reluctance or inability of many state legislatures to fully fund these institutions;

3. increasing entry into higher education of nontraditional students whose life circumstances lead them to demand the flexibility and convenience of online courses and programs.

4. the increasing popularity of virtual classes and schools in K-12 education (Ferdig, Papanastasiou, & DiPietro, 2005). This has led to the belief that for K-12 teachers to be effective in teaching in virtual environments they need to have experience with learning in them during their professional preparation.

5. the continued publication of scathing reports on today's teacher education programs. Levine (2006) argued that "too often teacher education programs cling to an outdated, historically flawed vision of teacher education that is at odds with a society remade by economic, demographic, technological, and global change" (p.1.).

The first three of the above five societal developments are powerful, and they have been the driving forces behind the recent rapid growth of online education. The degree to which K-12 education is making use of online strategies has also been going on for some time, but there has been a very recent surge in this trend. Finally, even Levine (2006) points to technology as a component of successful teacher education programs; others have gone one step further and suggested that online education could address some of the past critiques (e.g. King, 2002). What is new, however, are several developments that are primarily technical in nature, and that are likely to greatly accelerate the alreadyphenomenal growth of online offerings. These technical developments include the following:

1. Recent rapid growth of broadband Internet connections in private homes. A study by the Pew Internet Project (Horrigan, 2006) found that by March of 2006, 42 percent of Americans had a home broadband connection. Further, the report states that home broadband users in the U.S. increased by 40% between March 2005 and March 2006, and that this represented growth fully twice that of the year before. Furthermore, broadband is penetrating many other countries even more rapidly than in the United States, as illustrated by the fact that the U.S. currently ranks about 12th in broadband penetration among industrialized nations (Krapf, 2006). Such growth allows more people to participate in the convenience of online education.

2. Recent widespread availability of free or inexpensive programs that make use of voice over Internet protocol and video over Internet protocol. Voice and video over Internet protocol has been available to individuals for some time through Websites such as Skype (skype.com), which claims 113 million users speaking 27 different languages. Additionally, companies such as Horizon Wimba and others are offering voice and video tools that integrate with popular course management software packages such as Angel, Blackboard, Moodle, and WebCT. Proper functioning of these voice and video applications require broadband connections, which are becoming widely available as mentioned above.

3. Transition of the World Wide Web from a space where users search for and read information to an environment for collaboration. The original development of the Web was driven by a desire to promote collaboration among researchers and the first Web browser was also an editor (Berners-Lee, 1999). Something of that vision was lost in the first decade of popularization but more recently there has been rapid growth in what is described as the "read/write" Web or Web 2.0. Many tools exist for hosting web sites that enable content to be generated from a browser as easily as it can be read. Blogs, wikis and social networking tools like MySpace and Facebook are among the most widely known tools but there are many others that are beginning to find application in education, allowing near ubiquitous access to data and tools for collaborative work (Bull & Ferster, 2005).

4. We believe there is much wider and currently rapidly increasing availability of high quality educational websites. The Internet has grown at breakneck speed, but the availability of educational Websites making excellent use of interactive capabilities has

lagged far behind, partly because of inadequate funding for needed research and development (Tinker, 2006). These increasingly available Websites could be termed "Type II" Websites.

The concept of Type I and Type II educational applications of technology was first proposed more than 20 years ago in an article by one of the current authors (Maddux, 1984). Type I applications of technology simply make it quicker, easier, or otherwise more convenient to continue teaching in traditional ways. Type II applications, on the other hand, employ user interaction and make new and better ways of teaching and learning available - ways that were not possible or practical without technology. Since 1984, the concept has been expanded in a series of articles by a variety of authors (Maddux, 1986; Maddux & Cummings, 1986, 1987; Maddux, Johnson & Willis, 1992, 1997, 2001). Most recently, three special, double issues of *Computers in the Schools* have been devoted to articles by various authors addressing the concept, and all three were published a few months later as edited books of readings (Maddux & Johnson, 2005a, 2005b, & 2006). These authors assert that while there is nothing wrong with using good Type I applications in schools, technology consumes so much time, money, and enthusiasm that the cost to schools cannot be justified by Type I uses alone.

Some of the characteristics of Type II applications include the following: (a) there is a high degree of interaction between the user and the program, (b) the user rather than the program is in charge of this interaction and most of what happens on the screen, (c) problem solving and thinking skills are emphasized, and (d) the computer is a tool to stimulate and augment cognitive processes.

An excellent example of a Type II educational website is a page entitled the Correlation and Regression Interactive Learning Tool. The site can be found at http://www.people.vcu.edu/~rjohnson/regression/index.html. Users point and click in a blank scatterplot to enter or erase pairs of scores. The program calculates the correlation coefficient on the fly as well as related statistics such as the root mean square error, the regression equation, and residuals. The line of best fit is obtained at any point with the click of the mouse, and is updated on the fly as each data point is entered or removed. Concepts that could only be described in an abstract way are made visually clear in a way that can only be described as stunning, often after only a few minutes of guided use of the site. For example, students can enter scores that fall close to the regression line to obtain a high correlation, then see the catastrophic downward distortion of the correlation coefficient when a single outlier is added to the scatterplot. Students, even graduate students in university statistics courses sometimes comment that they learned more about correlation and regression in a twenty-minute visit to the site than they had learned in all their previous reading on the topics. At first glance, the tool may appear to be deceptively simple. As with all teaching and learning tools, its effectiveness depends on the skill with which teachers make use of it.

The first two of the technical developments (growth in numbers of private homes with broadband connections to the Internet, and increasing availability of free or inexpensive programs for voice and video over the Internet) are making it possible for online courses to incorporate voice and video lectures, real-time instructor-student conferences, class discussions, voicemail from students to instructors and vice versa, and other peer and instructor interaction. We believe the absence of such voice and video interaction has been partly responsible for preventing online education from achieving widespread student and instructor acceptance outside the ranks of student and faculty technology early adopters. The third technical development, the read/write Web, is making it possible for teachers and learners to collaborate on the development of a variety of projects despite being separated in time and space. The fourth technical development, wider availability of Type II websites that make use of interaction and result in new and better ways of teaching and learning has the potential to make it easier to develop quality online or blended experiences for students without the need to continually produce one's own high-quality Websites. The fourth of the previously mentioned societal developments, increasing popularity of online strategies in K-12 education has led to an increasing awareness on the part of teacher educators that proper preparation of tomorrow's teachers must include such experiences in undergraduate and graduate preparation programs. In other words, more teacher educators must include more and better virtual experiences in their courses.

On most campuses, these developments are likely to greatly increase pressure on individual faculty members to develop and conduct online courses. The demand for online offerings is almost certain to be so great that it will very soon be impossible to meet it through exclusive participation of the small group of faculty members on every campus who are friendly toward, and competent in the use of online technology and online teaching. The two to twelve percent of faculty who have participated to this point are unlikely to be adequate to meet the future need for new online courses. How faculty members who are not technology early-adopters will react to what may become increasingly coercive attempts to recruit them into the ranks of online course developers and online instructors remains to be seen.

The developments outlined above beg many research questions. One of the more interesting ones is whether or not it will become possible to provide online students with a total immersion in the *subculture* of a discipline or a profession - the one area in which face-to-face degree programs have, to this point, held a distinctly clear advantage over online programs. Without voice and video over the Internet and without a sufficient quantity of high-quality Type II, educational Websites, the potential of distance education seemed to some faculty members to be limited to the teaching of skills and factual information. The subtler and subjective aspects of a discipline or a profession such as teaching seemed as out of reach on the Internet as they were solely through books and articles. Then too, until now, the motivation to attempt to dramatically improve online courses and programs was largely missing. However, times are changing. Technology is improving rapidly and the goal of every student having the ability to view and speak with the instructor and with every other student in an online class no longer seems like science fiction. Excellent Type II educational Websites are becoming much more common, and the motivation to improve distance offerings may be that such improvement is a prerequisite for survival for many traditional institutions.

There are many other questions for which research is needed. The following are only a few that may be particularly acute in teacher education. They are listed in no particular order of importance:

1. To what extent have online offerings begun to erode enrollments in traditional teacher education programs? The number of online education courses offered by a variety of traditional and emerging institutions continues to grow by leaps and bounds. Many

teacher educators suggest that enrollments in traditional master's degree programs in education are being especially hard-hit by online competition, but this is anecdotal information and real data are needed.

2. Everyone knows that *retention* and *completion* are critical problems for all postsecondary programs and they are especially acute for programs delivered by distance education (Abel, 2005; Bowen, Kurzweil, Tobin, & Pichler, 2005; Newman, Couturier, & Scurry, 2004). Research is needed to determine the extent of the problem of noncompletion in online teacher education courses and programs and how it compares to courses and programs in other disciplines. Then, research is needed to address how best to minimize the problem of nonfinishers, particularly in online education courses and programs.

3. Another, related problem that demands research is the need to identify and then minimize the many factors that frustrate students and cause them to become dropouts from online teacher education courses and programs (Hara & Kling, 1999). A related question is how to determine which online students are not suited to become teachers, and should be counseled into another career path.

4. Research is also badly needed into all aspects of how best to evaluate online courses and programs (Chapman, 2006). This is particularly important in the helping professions such as education, since there are almost certain to be specific courses and programs that are better suited to online education than are others. We need research to help us determine which courses are best suited to online delivery and which are best left to faceto-face or hybrid delivery.

5. Student isolation and lack of community is another problem that demands research (Hill,2000). This is a problem that probably contributes to noncompletion in online courses and programs. We need research on how best to minimize isolation and build a sense of community in online teacher education courses and programs.

6. Research is needed to determine the extent to which teacher education students experience online education and virtual environments in their teacher preparation programs.

7. Research is needed to determine the best ways to assist education professors who are not expert in the use of technology as they move to convert their courses to online formats. Very little research has been devoted to comparing various support models in specific programs.

8. Research is needed to help identify the skills that k-12 teachers will need to function as instructors in virtual schools of the future. This must include innovative teacher education programs that provide online practicum experiences.

9. As Teacher Education programs continue to go online, research and development will need to examine tools to monitor and provide feedback on teaching internships. This may range from sites to share recorded classroom video to live web-based video interaction.

10. The broader teacher education community needs to explore statewide teacher certification in online programs and the standards that accompany that practice. As these programs grow and enrollment district lines blur, teaching certification reciprocity will also need to be addressed.

11. Finally, we have addressed online and face-to-face programs as two ends of a spectrum; however, 21st century tools technologies in the classroom help blur the

distinction between the two. Research conversations also need to address the concept of blended learning rather than simply accepting this dichotomy.

The above are only a few of many questions that should be addressed by researchers. The journal would welcome literature reviews or research reports on these or any other topics related to online teacher education courses and programs.

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