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Barriers to Online Teaching in Elementary, Secondary, and Teacher Education

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A review of the literature regarding the barriers to the use of educational technology in primary and secondary education was done. An emphasis was placed on the diffusion of computers in the schools, since the focus of this study is to determine what should be expected as computer-mediated communication (CMC) is used in schools to teach in online environments. A categorical framework, similar to one used by the first author for analysis of barriers to the use of CMC in higher education, was used (Berge, 1998). The nine categories of barriers are: academic, fiscal, geographic, governance, labor-management, legal, student support, technical, and cultural. The literature review of barriers to the use of educational technology in K- 12 using this framework suggested the primary areas of concern are academic, cultural, and technical. Secondary areas of concern are labor-management and fiscal issues, with little or no mention of geographic, governance, student support, or legal aspects of diffusion of technology. To test whether the use of CMC as one important area of educational technology entering K- 12 teaching and learning, a recently published four volume series of books titled, *"Wired Together: Computer-Mediated Communication in K-12"* was analyzed. Taken together, the seventy-two (72) chapters in these four books, mostly case studies, represent a considerable body of experience in online teaching and learning in K-12, pre- and in-service teacher training. The content analysis was done 1) to determine how many different barriers to online teaching were mentioned across all the contributors, i.e., to indicate the range of the obstacles, and, 2) to determine how often each particular category of barriers was mentioned, i.e., to indicate the perceived severity of these issues. The results are quite consistent when compared to the more general review of literature regarding educational technology.

Une étude de la documentation sur les obstacles à l'utilisation des technologies éducatives aux niveaux élémentaire et secondaire a été effectuée. On a mis l'accent sur la diffusion des ordinateurs dans les écoles, puisque le but de cette étude est de déterminer à quoi il faut s'attendre suite à l'usage de la communication par ordinateur dans les environnements d'enseignement en direct. On a utilisé un cadre catégorique analogue à celui qui a été utilisé par le premier auteur pour l'analyse des obstacles à la communication par ordinateur en éducation supérieur (Berge, 1998). Les neuf catégories d'obstacles sont les suivantes : académique, fiscal, géographique, administratif, patronal-syndical, juridique, aide aux étudiants, technique, culturel. Cette étude de la

documentation sur les obstacles à l'utilisation de la technologie éducative dans l'enseignement primaire et secondaire indique que les principaux problèmes sont d'ordre académique, culturel et technique. En deuxième lieu viennent les problèmes patronaux-syndicaux et fiscaux. Il y a peu ou pas de problèmes d'ordre géographique, administratif, aide aux étudiants, juridique quant à la diffusion de la technologie. Pour vérifier si l'utilisation de la communication par ordinateur constitue un volet important de la technologie éducative dans l'enseignement et l'apprentissage aux niveaux élémentaires et secondaires, une série de quatre livres publiés récemment sous le titre « Wired Together : Computer-Mediated Communication in K – 12 » a été analysée. Globalement, les 72 chapitres de ces quatre livres (ces études de cas, en majorité) constituent une somme d'expériences en matière de télé-enseignement et de formation des maîtres avant et pendant leur carrière. Une analyse de contenu a été effectuée pour 1) déterminer combien d'obstacles au télé-enseignement ont été mentionnés par les personnes (pour préciser l'étendue des obstacles), et 2) pour déterminer à quelle fréquence apparaissait chaque catégorie d'obstacles (pour préciser la gravité subjective de ces problèmes. Les résultats se comparent à ceux que donne une étude plus vaste de la documentation relative à la technologie éducative.

To prepare for success in the workplace, children need to become independent, critical thinkers while also learning to work collaboratively in teams (CCSSO, 1992). They must learn to find information, manipulate it, and effectively express their own ideas and the ideas of other people (Haddad, n.d.). The use of educational technology, particularly for online teaching and learning, has been recognized as helping people, young and old, in these areas of their learning.

Despite increasing acceptance of online teaching and learning there are still significant barriers to be overcome.. The pur-pose of this article is review selected literature regarding inhibitors to the use of educational technology in K-12. Further, we will identify barriers to online teaching in elementary, secondary, and teacher education environments and compare these results with what we would expect from the more general literature review.

Computer-mediated Communication in the K12 Classroom

The Argument for Using Educational Technology

Over the past two decades, computer technology has been credited with higher achievement by students, motivating students to learn, aiding

instruction for special needs students, improving student attitudes toward learning, and motivating teachers while freeing them from some routine instructional tasks (Software Publishers Association, 1996). Additionally, an increase in the effective utilization of computers, networking, and other technologies has been a common element in many of the proposals made in support of a broad program of systemic and curricular reform in K-12 education (PET, 1997). Far reaching policy decisions, such as the passing into law of the *Goals 2000: Educate American Act* in 1994, means a significant increase in a number of provisions designed to promote the application of technology within K-12 schools.

The Argument for Using Computer-Mediated Communication

The use of computers, standing alone and connected to the Internet is growing in K-12 education. At least one study provided evidence that students with online access perform better in certain intellectual skills. In 1996, CAST (Center for Applied Special Technology) conducted a study that isolated the impact of online use and measured its effect on student learning in the classroom.

"The Role of Online Communications in Schools: A National Study," compared the work of 500 students in fourth-grade and sixth-grade classes in 7 urban school districts (Chicago, Dayton, Detroit, Memphis, Miami, Oakland, and Washington DC)--half of the students had online access and half did not. The results showed significantly higher scores on measurements of information management, communication, and presentation of ideas for experimental groups with online access than for control groups with no online access. Therefore, under the conditions found in this study, online learning was determined to "help students become independent, critical thinkers, able to find information, organize and evaluate it, and then effectively express their new knowledge and ideas in compelling ways" (CAST, 1996, n.p.).

Inhibitors of the Use of Educational Technology in Primary and Secondary Schools

A review of literature indicates one historical approach is to present the large picture of technology from its earliest days to the present use of personal computers in the classroom. (Merrill et al., 1992; Poole, 1997). This basic chronological approach places the beginning of computing with the use of the abacus in 4000 BCE, called the beginning of "mechanical

computing." An even earlier period is described as "pre-mechanical computing" during which people counted on their fingers and made marks on cave walls and animal bones to keep count. After the abacus, the mechanical computing period featured such highlights as the creation of the slide rule in 1621 and the invention of Boolean Logic in 1854. Developments in counting problem-solving machines in the first half of the twentieth century led to the creation of the first computers. Although the first computers were developed in the late 1940s, they were too large and expensive for use in the schools. The revolution for school computing occurred in 1976 with the creation of the personal computer system.

Technology continues to change and affect children. Throughout history, there have been significant barriers perceived by persons who believe the infusion of technology in the classroom can help teaching and learning. The following examples of barriers mentioned in the educational technology literature serve as a starting point in developing a comprehensive list of such obstacles. Leggett and Persichitte (1998) examined the history of barriers and determined that the same basic four barriers are consistently sited by teachers: time, access, resources, and expertise. They provided a detailed description of each barrier and added a fifth one: support.

A review of the literature supports Leggett and Persichitte's contention that those five factors are very important. Viewed historically, the barriers occur repeatedly. Loughary (1966) mentions limited resources and lack of support as potential barriers to the implementation of computers in the classroom. O'Shea and Self (1983) examine the factors that affect the teachers as they try to grapple with new technology. These factors included poorly designed materials and lack of technical support, teachers' anxiety and resentment concerning the new technology, and the lack of administrative support.

Schofield (1995) provided a detailed look into the barriers of technology use. One important factor was the belief by teachers that computer use would add little of value to current practice. Another belief that she reported was that existing educational software was not useful in the classroom. Computer anxiety based on the teachers' unfamiliarity with computers was a major barrier since this fear affected the teachers' sense of competence and authority in the classroom. The lack of incentives and the presence of disincentives played a role, as did the infrastructure problems, such as repairs, trouble-shooting, and maintenance. Finally, a lack of adequate training was an important barrier, especially the lack of coordination and timing between training and hardware purchase, the inability to match training to the teachers'

level of knowledge and instructional concerns, and the lack of concentrated experiential training.

Merrill et al. (1992) breaks the barriers into three basic categories: ethical issues, legal issues, and cultural issues, This approach is a departure from the earlier focus on the nuts and bolts issues of poorly designed equipment, lack of support and confusion. In the 1990s, the literature reflects a deeper analysis of the types of barriers that exist for teachers, schools, and students. Collis et al. (1996) also focuses on the possible negative side effects across cultures that are caused by computer use. The equity issue of the disparity of use between boys and girls in the classroom is mentioned. Collis notes that there is a lack of knowledge about the future negative impacts of technology on students.

Starr (1996) provides a similar assessment of barriers in the classroom. The barriers include inequality for minorities and low-income students, lack of high-end uses of technology for primary and secondary education, as compared to higher education, and the need for inexpensive connectivity and low-cost access to content that are provided on many websites for a fee.

Fisher, Dwyer, and Yocam (1996) focus on the equity issue as a barrier to technology infusion. In addition to the barriers of lack of technical support, limited funds and resources, lack of time for preparation, implementation, and review, the authors also highlight the issue of lack of access to computers by all students, as well as access to the Internet. Montgomery (1996) also addresses the issue of access and inequality for minorities and low-income students. The author also note that concern regarding the quality of the new media culture and the effect of a media that is highly commercialized and unregulated.

Sandholtz, Ringstaff, and Dwyer (1997) report somewhat similar results. The main barriers include limited access, lack of equity, potential for jealousy or greed among teachers, and a large number of technical problems. Poole (1997) noted that the barriers of inequities, such as rich versus poor, girls versus boys, whites versus minorities, and lack of equal access to information based on disparities in funding and management of different school systems were of great concern to educators.

Turkle (1997) provided a different approach to the barrier issue. Her analysis of the problem focused less on the logistics and obvious causes of difficulties. Rather, she discussed the actual role of the computer in the classroom and its impact on learning. This interesting perspective provided three inherent concerns. The first is the "seduction of simulation" and the possibility that the computer activities might lessen the students' desire to question and think through problems carefully. Also, she wonders if the attraction for using simulations is based on the

fact that it may be easier to buy a software package that allows students to conduct virtual experiments than hire and fund an additional science teacher. The second problem is the resentment felt by teachers for computer applications that serve as "overblown video games." The third potential barrier is that the computer may be creating students that are "fluent users" of technology rather than "fluent thinkers" of technology. Turkle observed a student who could use a particular software package correctly, and boasted to Turkle of her prowess. However, the student could not explain why a particular situation occurred, what the repercussions might be, or criticize or judge what she is learning. Turkle describes her as a "someone who can pronounce a word in a book but does not understand what they mean."

The slow pace of successful implementation of computer technology in the classroom is discussed by Sulla (1998). Sulla argues that it takes from three to seven years to successfully infuse technology by teachers. The stages are defined as "dynamic disequilibrium, contrived equilibrium, and reflective practitioner." The difficulty and length of time involved in the implementation of technology appears to have remained consistent over the past few decades. As computers become more and more popular in the classroom, the need for a long-term perspective is critical.

Using a framework I developed elsewhere (Berge, 1998) (see Table l), the literature reviewed above along with others (e.g., Abdal-Haqq, 1995; Evans-Andris, 1996; Oppenheimer, 1997; Rice, 1995), suggests barriers to the use of technology in the primary and secondary classroom as falling generally into these categories: academic, cultural, and technical. Secondary areas of concern indicated in the literature involve labor-management and fiscal. Very little or no mention is made in the literature discussing barriers to the use of technology in K-12 regarding student services, legal, governance, or geographic areas.

Barriers to Online Education

Although technologically-mediated learning holds many advantages and promises for educators and learners, it is not well suited, nor available for all learners or in all learning situations. Social, economic, physical, or learning barriers exist and schools lack the resources to make computer/telecommunication systems available, thus denying them the advantages that technology may offer.

While the technological infrastructure is improving and access to the internet is increasing in elementary and secondary schools, there are still significant hurdles to such teaching and learning. Lack of computer

access, increased time demands, differences in individual preferences, student and teacher resistance to new methods, and lack of student and faculty support services, and the lack of adequate training and technical support are all common problems faced by both students and teachers (e.g., DoIT, 1996; Furst-Bowe, 1996; Galusha, 1997; Morrison & Lauzon, 1992).

The Study

Recently a four volume series was published entitled *"Wired Together: Computer-Mediated Communication in K-12"* (Berge & Collins, 1998a, b, c, d). Taken together, the seventy-two (72) chapters in these four books represent a considerable body of experience in online teaching and learning in K-12, pre- and in-service teacher training. Online teaching and learning is one major type f technologically-mediated learning. The content of these books was analyzed: 1) to determine how many different barriers to online teaching were mentioned in these books, i.e., to indicate the range of the obstacles, and, 2) to determine how often a particular barrier was mentioned, i.e., to indicate the perceived severity of each barrier.

Methodology

Best and Kahn (1989) stated that document analysis serves to describe prevalent conditions and to discover the relative importance of, or interest in, certain issues (p. 91). The *Wired Together* books were first read to find keywords that indicated barriers to online teaching. The following list of keywords were found and later used to electronically search the text of all four books: *barrier, limitation, difficult, inhibitor; impede; hamper; obstruct; roadblock; thwart; delay; encumber; foil; restrain; retard; arrest; obstacle; hurdle; hinder; reticence;* and *lack of*. Upon each occurrence of these words, the context (sentence or several sentences around the word), was read to determine if it indeed was used to indicate a barrier to online teaching and learning. This was done independently by the two authors and any discrepancies were discussed and agree upon. "Barriers," as indicated by the list of keywords above, is used here to mean "any perceived problem standing in the way of an online teachers work."

Limitations and Research Issues

When selecting from a list of items or recalling items that have previously been heard or read, it has been shown that individuals often select the items at the beginning or end of the list. In this literature this is called *primacy and recency effects* (Weiner, 1985). A different phenomenon that is often an issue in studies similar to this is *attribution.* Attribution theory suggests that people tend to explain the causes of their own behavior in a manner that is self-promoting (Bar-Tal, 1978; Nisbett and Ross, 1980). For instance, an individual may want to avoid attributing a performance problem in the workplace to their own behavior, and instead falsely tell themselves or others that the cause is an environmental issue out of their control (Dean, 1996; Weiner, 1980). Reports on behavior may also be significantly different simply depending upon whether the individual is self-reporting his/her behavior leading to the performance, or is an observer reporting upon others behaviors. Jones and Nisbett, (1971) suggest that actors attribute the cause of their poor performance on the environment, whereas observers focus on the people they are observing and their behaviors. Since subjects in this study were not given a list of barriers from which to react, the potential problem of primacy and recency effects are not an issue. This issue was mentioned here main with regard to issues that may threaten validity to further research. With regard to attribution effects, the reader is cautioned that this effect may account for some of the weightings found in this study. Some of the contributors to the *Wired Together* books were online teachers themselves while others were more or less observers (i.e., researchers; teacher educators).

While the findings herein may be interesting and useful as a start for further research, the reader is cautioned about some additional threats to both validity and reliability. An exhaustive literature review was conducted regarding barriers to distance education in primary and secondary teaching and learning in preparation for this study. Still, the current study itself reports on contributions in only the four books in the *Wired Together* series. With the scope being limited, these findings should be considered exploratory and generalizability is not possible.

Secondly, the categories that were derived were done so by the researcher and are based on work done in policy for higher education and the review of literature. Additionally, the study is based on the *perceptions* of the contributors to both the literature reviewed and those writing for *Wired Together.* No independent observers or other means were used to attempt to verify what was reported by these authors.

Finally, each of the barriers mentioned by the subjects were forced into one category by the researchers. While we may agree on the category, it is certainly recognized by us that many barriers could be listed in multiple categories. As one example only, it is hard to conceive that the barrier listed as "intellectual property rights/ownership" and placed here in the "Labor-Management" category, could not be placed as in the "Legal" category with as much justification by someone else. Our purposes here are not to split hairs in categorizing, but rather to explore and identify as comprehensively as possible all barriers to online teaching as one significant form of distance education.

Findings and Discussion

Of the 72 chapters examined, 52 (72.2%) mentioned barriers using the search terms listed above. This is significant in itself. While the instructions from the editors to the authors did not specifically ask authors to include barriers, there were suggestions that they discuss "lessons learned" and provide "tips to online teachers" based on their experiences. Most chapters that mentioned limitations to online teaching contained only a couple of the keywords. In fact, 49 of the 72 chapters (68.1%) indicated no more than four barriers. The chapters containing the highest number of "barrier" terms appear to be overview chapters written by the editors, or chapters written by teacher educators; it does not seem that online teachers ordinarily write about widespread barriers to online teaching.

Table 1 lists the barriers and their frequencies as identified in the *Wired Together* book series. The teachers and teacher educators authoring 52 chapters used at least one barrier term, with a total of 261 throughout the 4 books. The barriers seemed to cluster in in mainly the following areas: academic (n = 30, 11.5%), labor-management (n = 29, 11. l%), technical (n = 67, 25.7%), and cultural (n = 89, 34.1%). As expected from the review of literature, little mention of barriers were found in these books in the areas of legal, student support, and geographical.

The barriers mentioned most often by the authors of the chapters in *Wired Together* were:

- Concerns about the cultural change process necessary for the successful implementation of distance education.
- Concerns about the pedagogical changes necessary for the effective implementation of distance education.
- Lack of support for teachers/faculty members (including technical training), or mention of the lack of experience teachers/faculty have in distance education methodologies.

Table 1. Barriers to Using CMC in the Online K- 12 Classroom.

Policy Area	Key Issues	#
Academic	Academic calendar; inadequate course integrity/design; transferability; transcripts; evaluation process; curriculum approval process; accreditation; inequality (e.g., disabilities; gender; race); questioning the value added by technology/software; ethical issues; lack of student time; large class size; lack of teacher support for student learning to use technology	30
Fiscal	Tuition rate; technology fee; FTE's; consortia contracts; state fiscal regulations; business model; marketing; lack of hardware/software/people; sustainability and reliance on business and community support; revenue sharing with departments; competition with other business entities	1.5
Geographic	Service area limitations; different time zones; local versus out-of-state tuition; consortia agreements; cross-cultural issues	**9**
Governance	Single versus multiple board oversight; staffing; existing structure versus emerging structure (e.g., forming subsidiaries for distance education); administrative support/issues; strategic planning; school scheduling; admission standards	14
Labor-Management	Compensation and workload; promotion and tenure; development incentives; intellectual property rights/ownership; faculty training; congruence with existing union contracts; lack of teacher/faculty time	**29**
Legal	Fair use; copyright; faculty, student and institutional liability; computer crime, hackers, software piracy, computer viruses	4
Student Support	Advisement; counseling; library access; materials services delivery; student training; test proctoring	4
Technical	Lack of systems reliability; lack of connectivity/access; inadequate amount/type hardware/software; setup problems; inadequate infrastructure; inadequate technical support; inadequate maintenance of hardware/software	67
Cultural [1]	Faculty or student resistance to innovation/new methods; resistance to change; difficulty recruiting faculty or students; lack understanding of distance education and what works at a distance; lack of shared vision/mission; cross-cultural issues; slow pace of change; lack of teachers who can model effective use; information overload	89

[1] The cultural barriers are included in this table for the convenience of the reader. However, change to organizational culture is not an area that policy can be directly applied. Rather organizational culture is changed by changing such things as the structure, practices, communication systems and reward systems within the

- Lack of access (connectivity) for students or teachers/faculty members.
- High cost to the district or institution, or lack of the necessary infrastructure for delivering or receiving education at a distance.

For Further Research

One purpose of this study was to determine indicators to future research areas. Some of those discovered by this research are:

- Overall, the barriers listed by K12 online teachers and teacher educators are very similar to those described by online teachers in higher education (Berge, 1998). The weighting may be different, however. For instance, it seems that K-12 educators mention fiscal issues somewhat more than higher education.
- The barriers mentioned may change depending upon the level of the experience of the individual teacher has with teaching online.
- While different perceptions based on the experience level of an individual may not be surprising, it can also be hypothesized that barriers are perceived differently depending upon the level of experience with online teaching found within the institution or school. An instructor working in a district in which online teaching has never occurred may often perceive different barriers than that teacher she he/she be in a district that has a long history of delivering or receiving online courses (such as infrastructure issues).
- The subject area being taught may also affect the barriers experienced.
- This study involved online teachers and teacher educators using technology. Other types of participants, (i.e., important stakeholders such as school administrators; parents; students), exist and may have significantly different perceptions about the barriers to online teaching and learning within their institution.

References

Abdal-Haqq, I. (1995). Infusing technology into preservice teacher education. ERIC Clearinghouse on Teacher Education, Washington DC. ED389699.

Bar-Tal, D. (1978). Attribution analysis of achievement-related behavior. *Review of Educational Research,* 259-271.

Berge, Z.L. (1998). Barriers to online teaching in post-secondary institutions. *Online Journal of Distance Learning Administration.* l(2). Summer. [Online.] http://www.westga.edu/~distance/Berge12.html

Berge, Z.L. & Collins, M.P. (Eds.) (1998a). *Wired Together: Computer-Mediated Communication in K-12, Volume 1 Perspectives and Instructional Design.* Cresskill, NJ: Hampton Press.

Berge, Z.L. & Collins, M.P. (Eds.) (1998b). *Wired Together: Computer-Mediated Communication in K-12, Volume 2 Case Studies*. Cresskill, NJ: Hampton Press.

Berge, Z.L. & Collins, M.P. (Eds.) (1998c). *Wired Together: Computer-Mediated Communication in K-12, Volume 3 Teacher Education and Professional Development.* Cresskill, NJ: Hampton Press.

Berge, Z.L. & Collins, M.P. (Eds.) (1998d). *Wired Together: Computer-Mediated Communication in K-12, Volume 4 Writing, Reading and Language Acquisition.* Cresskill, NJ: Hampton Press.

Best, J.W. & Kahn, J.V. (1989). *Research in education (6th Ed.)* Englewood Cliffs, NJ: Prentice Hall.

CAST (Center for Applied Special Technology). (1996). The Role of Online Communications in Schools: A National Study. [Online.] http://www.cast.org/stsstudy.html

CCSSO (Council of Chief State School Officers) (1992). Student Success Through Collaboration: A Policy Statement of the Council of Chief State School Officers. [Online.] http://develop.ccsso.cybercentral.com/colabpol.htm

Collis, B.A., Knezek, G.A., Lai, K. W., Miyashita, K.T., Pelgrum, W .J., Plomp, T., & Sakamoto, T. (1996). *Children and computers in school.* Mahwah: NJ. Lawrence Erlbaum Associates, Publishers.

Dean, P.J., Dean, M.R., and Rebalsky, R.M. (1996). Employee perceptions of workplace factors that will most improve their performance. *Performance Improvement Quarterly, 9*(2), *75-89.*

DoIT. (1996). Common problems & possible solutions for teaching with computer conferencing. [Online.] http://www.wisc.edu/learntech/grp/tips.html

Evans-Andris, M. (1996). *An apple for the teacher: Computers and work in elementary schools.* Thousand Oaks: CA. Corwin Press, Inc.

Fisher, C., Dwyer, D.C., Yocam, *K.*, eds. (1996). *Education and technology: Reflections on computing in classrooms.* San Francisco: CA. Apple Computer, Inc., Jossey-Bass Publishers.

Furst-Bowe, J.A. (1996). An analysis of the competencies needed by trainers to use computer-based technologies and distance learning systems. *Performance Improvement Quarterly, 9*(4): *57-78.*

Galusha, J.M. (1997). Barriers to Learning in Distance Education. *Interpersonal Computing and Technology: An Electronic Journal for the 2Ist Century*. 5(3/4): 6-14.

Haddad, W. (n.d.) Technology and the Environment for Learning. [Online.] http://www.education.unesco.org/unesco/uducprog/lwf/doc/portfolio/opinion5.htm

Jones, E. E. and R. E. Nisbett. (197 1). "The actor and the observer: Divergent perceptions of the causes of behavior." in Attribution: Perceiving the causes of behavior. edited by E. E. Jones, D. E. Kanouse, H. H. Kelly et al.

Legget, W.P. & K.A. Persichitte. 1998. Blood, sweat, and TEARS: 50 years of technology implementation obstacles. *Techtrends, 43*(3), pp. 33-36.

Loughary, J.W. (1966). *Man-machine systems in education. New* York: NY. Harper & Row, Publishers, Inc.

Merrill, P.F., Hammons, IS., Tolman, M.N., Christensen, L., Vincent, B.R., Reynolds, P.L. (1992). *Computers in Education, 2nd ed.* Needham Heights: MA, Allyn and Bacon.

Montgomery, K.C. (1996). Children in the digital age. *The American Prospect.* No. 27. (July-August 1996), pp. 69-74. [Online.] http://epn.org/prospect/27/27mont.html

Morrison, D. & Lauzon, A.C. (1992). Reflection on some technical issues of "connecting" learners in online education. *Research in Distance Education. 4*(3): *6-9.*

Nisbett, R. and Ross, L. (1980). *Human inference: Strategies and shortcomings ofsocialjudgement.* Englewood Cliffs, NJ: Prentice-Hall.

O'Shea, T. & Self, J. (1983). *Learning and teaching with computers: Artificial intelligence in education.* Englewood Cliffs: NJ. Prentice-Hall, Inc.

Oppenheimer, T. (1997). The computer delusion. *The Atlantic Monthly,* July 1997, 280(l), pp. 45-62.

PCAST (President's Committee of Advisors on Science and Technology). (1997). Report to the President on the use of technology to strengthen K-12 education in the United States. Washington DC.

Poole, B.J. (1997). *Education for an information age: Teaching in the Computerized classroom. 2nd ed.* Boston: MA. The McGraw-Hill Companies, Inc.

Rice, M. (1995). Issues surrounding the integration of technology into the K-12 classroom: Notes from the field. *Interpersonal Computer and Technology.* Jan. 1995, 3 (l), pp. 67-81. [Online.]

Sandholtz, J.H., Ringstaff, *C.*, & Dwyer, D.C. (1997). *Teaching with technology: Creating student-centered classrooms. New* York: NY. Teachers College Press.

Schofield, J.W. (1995). *Computers and classroom culture.* "Chap. 4: Computers in the closet: Attitudinal and organizational barriers to computer use in classrooms." Cambridge: NY. Cambridge University Press.

Software Publishers Association. (1996). Report on the effectiveness of technology in schools, 95-96: Executive Summary. [Online.} http://www.spa.org/project/edu_pub/summary.htm

Starr, P. (1996). Computing our way to educational reform. *The American Prospect.* No. 27. (July-August 1996), pp. 50-60. [Online.] http://epn.org/prospect/27/27star.html

Sulla, N. 1998. Winning teachers over: How you can battle resistance to technology-and win. *Electronic School,* Mar. [Online.] http://www.electronic-school.com/0398f2.html

Turkle, S. (1997). Seeing through computers: Education in a culture of simulation. *The American Prospect. No.* 3 1 (March-April 1997), pp. 76-82. [Online.] http://epn.org/prospect/31/31turkfs.html

Weiner, B. (1980). *Human motivation.* New York: Springer-Verlag.