

Chapter I

Virtual Schools: A Critical View

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Abstract

This chapter investigates some of the critical issues associated with virtual schools. It reviews historical forms of school education and the different types of virtual schools that are currently emerging. The educational value of virtual schooling is considered in terms of cognitive and affective outcomes, and some of the factors that promote the rise of virtual schools are outlined. The implications of related philosophical viewpoints and communication theory are explored, together with the benefits and disadvantages of virtual schools for society. A number of problems associated with virtual schools are identified and some possible solutions are outlined. Future trends in the growth of virtual schooling and the characteristics of the next generation of virtual schools are discussed in terms of their implications for school education.

Introduction: The Purpose of this Chapter

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The Emergence of the Virtual School

Forms of school education have been with us for around 2,000 years, and perhaps longer. Schools are known to have existed in Plato's time (Marrou, 1956), and histories of many societies refer to the ways in which the young have been educated. Modes of schooling over time have shown diversity that has sometimes been related to the social class and religion of the students and the facilities available to teach them. Until quite recent times, however, they have been characterised by the physical presence of teachers and students together. Usually a building is used for instruction, and teaching materials such as books or blackboards are often in evidence.

During the 19th century, education by correspondence was established in some areas of England, Germany, the U.S. and Sweden (Simonson, Smaldino, Albright, & Zvacek, 2000). The 20th century saw the emergence of additional alternatives to what may be called "bricks-and-mortar" schools. These were forms of distance education where children could learn without attending classes on a regular basis. The technologies used included mail, for correspondence schools, and the 20th century technologies of radio and television. The schools that used these technologies were particularly valuable for students who lived in remote areas, for those whose parents were frequently on the

move, for students who were too ill to attend school, or for those who had been excluded. In Australia, a Correspondence School was established in Melbourne as early as 1914 (Correspondence School, 1978), and the Alice Springs School of the Air commenced radio broadcasts in the Northern Territory in 1951 (School of the Air, 2002).

However, although a number of examples of distance education schools can be identified during the 20th century, they rarely became the principal mode of education. There is little indication that parents wanted to abandon conventional schools in favor of distance education, although criticism of schooling has been constant.

Virtual schools can be seen as a variant of distance education. They emerged in the closing years of the twentieth century, and can be understood as a form of schooling that uses online computers to provide some or all of a student's education. Typically, spatial and temporal distancing is employed, and this results in students being able to use their computers at a convenient time in their homes or elsewhere, rather than being subject to meeting at an agreed time in a school building.

Asynchronous technology is often used for virtual schools. This has the advantage that students are able to interact with web sites and send and receive emails when it is convenient for them. It is also possible to use synchronous technologies, such as electronic chat and desktop video conferencing, but these are sometimes seen as less attractive because the timetabling involved reduces flexibility.

The concept of a virtual school is agreed on only in broad terms, as there are a number of variants. Some virtual schools insist on an agreed minimum of face-to-face contact, while others are so organized that a student might never set foot in a classroom. Indeed, it is possible for a virtual school to have no physical presence at all for students to visit, and an office building in one state or country can be used to deliver virtual school services to interstate or international students.

One way of categorizing virtual schools is by imagining where they might be placed on a scale of face-to-face contact between students and teachers. At the conservative end of this scale there would be conventional schools where students use online computers in classrooms or labs for some of their lessons. A trained teacher in the same subject area might be available to help students, or other teachers, volunteers or parents could supervise them. Isenhour, Carroll, Neale, Rosson, and Dunlap (2000) describe one variation of this type

of virtual school where a collaborative online environment exists between schools.

Towards the middle of such a scale would be found mixed-mode examples, where some subjects are offered in virtual mode, but students are asked to visit the school on a regular basis to monitor their progress or to participate in other face-to-face subjects such as sport, drama or art. At the other end of the scale are virtual schools where the student and teacher never meet, and there is no requirement for the student to enter a school building for the duration of the course. Schools of this type can also be seen as the “Out-of-School Model” (Schnitz & Young, 2002), and they are exemplified by Florida High School. In this school, “there is no Florida High School building and students and teachers can be anywhere in the world” (Florida High School Evaluation, 2002, p. 12).

Virtual school characteristics can be better appreciated by identifying the provider. Figure 1, adapted from Clark (2001), gives examples of different types of virtual schools in the U.S.

Figure 1: Types and Examples of Virtual Schools (Adapted from Data in Clark, 2001)

Virtual school type	School/organization	Web address
Virtual schools consortia	VHS (Virtual High School)	http://www.govhs.org/website.nsf
Virtual schools operated by districts and schools	HISD (Houston Independent School District Virtual School)	http://hs.houstonisd.org/virtualschool/
Virtual charter schools	Pennsylvania Virtual Charter School	http://www.pavcs.org
University-based virtual schools	University of Nebraska-Lincoln College Independent Study	http://extended.unl.edu/cis/
Private virtual schools	Christa McCauliffe Academy	http://www.cmacaemy.org/main.html
Related for-profit providers of curricula and content	Apex Learning	http://www.apexlearning.com/offerings/vs/default.asp
State-sanctioned virtual schools	Florida Virtual School	http://www.flvs.net/splashpage/doors.html

Clearly, the education that a student might receive from each of these types of virtual schools would vary considerably in its nature, and further differences could be identified within each category.

In addition, virtual schools can be seen in terms of their ability to supplement traditional schools when there is a perceived need for remediation, certification or extension. These schools, which Russell and Holkner (2000) refer to as the *coaching* aspect of virtual schools, enable students to complete missed school subjects that might be needed for university entrance, and provide an opportunity for students whose needs are not adequately catered for in conventional schools. In many cases, students can log onto a computer in their home to complete the required work after their day has been spent in a conventional school or in employment.

The Educational Value of Virtual Schools

Because virtual schools are relatively new, and are usually encountered only in cyberspace, there is not yet an extensive tradition of evaluating them. Recent reports (Clark, 2001; California Virtual School Report, 2001; Florida High School Evaluation, 2002; Kozma et al., 2000) have provided insights into their characteristics, and have identified both successes and problems that will have to be faced. However, evaluations of virtual schools are still uncommon. A study by Cavanaugh (2001) illustrates this problem:

Although distance learning is well documented with adults, fewer studies of effectiveness exist that center on the primary and secondary school levels. At a point when all states [in the U.S.A.] offered distance education in schools, very few had conducted formal evaluations (p. 75).

Cavanaugh's meta-analysis concluded that distance education in K-12 could be expected to result in achievement at least comparable to traditional instruction in most academic circumstances. There should be no difference with distance education when compared to face-to-face education. When implemented with the same care as face-to-face instruction, distance education has the potential to expand educational opportunities with intermediate, middle and upper grades.

Reliable longitudinal studies concerning students' socialisation after involvement in online virtual schools, or comparative studies on the affective domain, are currently unavailable. Indeed, it is difficult to think of a situation where such studies would be of real benefit. For example, a study that followed high school students for ten years after they had left their virtual school, in order to determine whether they became well-adjusted citizens, would be of limited value. Communications and information technologies are changing very rapidly. The virtual school and its societal context would have undergone transformative change in this period. An additional interpretation that can be drawn from this realisation is that critics who foresee educational disaster ahead and the strongest proponents of virtual schools are only making informed guesses about what might lie ahead.

Factors Promoting the Rise of Virtual Schools

It is likely that the number of virtual schools will continue to increase. The principal factors that account for the growth of virtual schools include globalisation, technological change, availability of IT technology, economic rationalism, the model provided by higher education, perceptions about traditional schools, and the vested interest of those involved in them.

The first of these factors, globalisation, refers to a process in which traditional geographic boundaries are bypassed by international businesses that use information technology for globally oriented companies. A critical aspect of globalisation is the use of online computer and information technology to access markets, personnel and money. For education, this means that students who would once have used a textbook designed for their educational system can now access web sites from around the world. This enables corporations to provide alternatives that challenge traditional learning materials. It is now possible for curriculum to be delivered remotely from across state and national borders. Educational administrators can purchase online units of work for their school, and parents in developed countries can sometimes choose between a traditional school and its virtual counterpart. As Evans (1997) suggests, communications media allow educators to take their teaching around the globe, and it allows teachers to use global resources to enhance their own teaching. However, globalisation can be seen as both advantage and danger. The same

online technology that permits teachers to locate rich learning materials for their students reveals forms of schooling that challenge existing educational beliefs. As information technology continues to develop, there is a correspondingly increased capacity to deliver relevant curricula online. As broadband connections become more common, students will be less likely to encounter prolonged delays while web pages load or other information is downloaded. Advances in computers and software design have led to developments such as full-motion video clips, animations, desktop video conferencing, and online music. Collectively, what is referred to as the Internet is already very different from the simple slow-loading web pages of the early 1990s.

Around five years ago, it was common for commentators to marvel at the spread of the Internet and cite statistics that indicated what changes might eventuate. What is now apparent is that in developed countries the Internet is becoming commonplace. It is essential for many businesses, and households are adopting the Internet with such enthusiasm that it will eventually become an essential consumer item, along with televisions, refrigerators and mobile phones. As more people connect to the Internet its value increases, as there are more people to communicate with and more web pages with useful information. Segaller (1998) cites Netscape founder Marc Andreessen's interpretation of Metcalfe's Law:

The power of the network is N squared, where N is the number of nodes. So if you double the number of nodes, you actually double square or you quadruple the overall value of the network. The reason is that the network gets more valuable to me if you come on it. Even though I'm already there, the network's getting continually more valuable to me as more people come on, as more contact comes on, as important businesses are connected (p. 283).

Economic rationalism also drives the spread of virtual schools. Economic rationalism, as Smith and Sachs (1995) point out, puts a premium on productivity, efficient use of resources and value for money. The application of economic rationalism to education implies, as Rutherford (1993) suggests, that the collective or government provision of goods and services is a disincentive to private provision, and that deregulation and commercialisation should be encouraged. Consistent with this understanding is the idea that schools, as we know them, are inefficient and should be radically changed. Schools, for Tiffin

and Rajasingham (1995), have been seen as part of a former industrial era, and Perelman (1992) believes that they ought to be replaced with technology:

...the nations that stop trying to “reform” their education and training institutions and choose instead to totally replace them with a brand new high-tech learning system will be the world’s economic powerhouses through the 21st century (p. 20).

In this view, virtual schools provide an opportunity to apply the ideology of economic rationalism to school education. They provide a context where private providers can readily compete with governments, religious groups and local communities in offering educational programs. An added advantage is that the availability of online technology for this purpose parallels its use by business. Collectively, the discussion that relates to the opposition of traditional school education can be referred to as “anti-school discourses” (Bigum & Kenway, 1998). The subsets of this discourse include the argument that multimedia and the Internet are more exciting than school experiences, the conviction that home schooling is preferable to traditional schools, and the belief that conventional school can be physically unsafe or psychologically harmful. The concerns that parents might have for the safety of their children is underscored by research cited by Elliot, Hamburg and Williams (1998) in the U.S., which indicated that 47 percent of all teens believed that their schools were becoming more violent, and one in ten reported a fear of being shot or hurt by classmates who carry weapons to school. A related concern is discussed by Epp (1996), who argues that schools are complicit in the abuse of children through the systematic violence resulting from exclusionary practices, discrimination, tolerance of abuse, and other practices that might prevent students from learning.

The ways in which higher education has adopted online teaching provides an example of how online education can be accepted as an alternative. The online courses provided by universities in recent years have proliferated (Russell & Russell, 2001). The spread of these courses has been so extensive that there have been predictions of a dramatic decline in the number of tertiary institutions in the U.S. (Dunn, 2000), and suggestions that the traditional university will be superseded (Noam, 1995). As increasing numbers of parents complete an online tertiary course, there is a corresponding growth in the conceptual understanding that virtual schooling may also be a viable alternative. The shaping of attitudes by the use of technology resonates with McLuhan’s (1994)

argument that the content of technologies is less important than the changes brought about by the technology itself. If parents are advised that virtual schooling is an option for their children, they would be in a better position to consider it if they had previously experienced online education themselves.

Those who are convinced that existing schools are unsatisfactory can see virtual schools as one alternative. Criticism of schools for not adequately meeting student needs, for providing inadequate skills required for employment, or not preparing students for examinations and entrance tests, are a continuing theme that can be identified in a number of educational systems. Discussions related to school reform can include funding, resourcing, teacher supply, curriculum change, and pedagogy, but they can also include more radical alternatives such as virtual schooling.

A disadvantage, which might follow the adoption of virtual schooling, however, is an exacerbation of existing problems of equity and access. Reports in the U.S. consistently show that people who are identified as belonging to lower-income or minority groups are less likely to have online computer access at home (Bikson & Paris, 1999; *Falling through the Net*, 2000). In the Pew Report (2002), 90 percent of white college students answered “yes” in response to the question “Have you ever gone online?,” while only 74 percent of Blacks also answered “yes” to the same question.

Nevertheless, virtual schooling does offer flexibility in terms of access and curriculum choice for those who are able to use it. Proponents of virtual schooling sometimes refer to the motto of “any place, anytime, any where,” and while this is sometimes an exaggeration, virtual schools are often able to offer a wider range of subjects than their traditional counterparts. They also have the advantage of often being asynchronous. If a student chooses to complete schoolwork at 2:00 a.m., the wait for the next scheduled class that would be required with a traditional school will not apply.

In one respect, virtual schooling builds on antecedent distance education technologies such as print-based materials, radio and telephone. It is not surprising that some virtual schools retain a combination of synchronous audio technologies, printed materials and the Internet. In Victoria, Australia, the curriculum materials available from the Distance Education Centre enable students to “choose to receive materials via CD-ROM, print-based booklets, or by accessing courses online” (DECV, 2002). In Queensland, Australia, the Virtual Schooling Service (2002) explains that its lessons “are delivered via ‘real time’ audio teleconferencing and shared computer graphics (‘audiographics’), as well as activities placed in an online ‘studyroom’.”

Virtual schools can also be promoted because they are profitable, or because they advance the careers of those who promote them. Those involved in the IT industry can identify a market for hardware and software, and for educational modules designed to be used in online environments. A search of the World Wide Web, using the term *Virtual School* will soon reveal a number of targeted commercial products and services. The profit-making opportunities for those involved in virtual schools are potentially considerable. Virtual schools can also enable those involved in school education, administration, and academia and planning to contribute to a growing area.

Implications of Philosophical Viewpoints and Communication Theory for Virtual Schools

When humans use technology in their daily lives, there are usually some disadvantages to be considered. The decision to use a car to drive to work balances the convenience and comfort of privately owned transportation against the risk of being killed or injured in an accident. The electrical power available at the turn of a switch will often come at some cost to the environment, through the burning of fossil fuels or the hazards of nuclear energy. The choice to adopt virtual schools also has advantages and disadvantages.

While virtual schools can also be seen as convenient, there are some grounds for believing that face-to-face instruction can be superior to distance education. When we learn of the world through a computer, it is a mediated experience. It is a representation rather than a direct experience. Understanding and empathy is likely to be increased when the distance between a person and a perceived object is reduced, or when there are minimal changes to the nature of experience through a mediating technology.

Distance can be seen as both spatial and temporal. A student in a virtual school is likely to be physically distant from the teacher, and separated in time by the use of asynchronous technologies such as web pages and email. The affective domain is likely to be influenced by the distancing effect caused by mediating technologies, because the immediacy that accompanies face-to-face human interaction is absent. It follows, then, that students in a virtual school may have reduced opportunities for empathizing with others compared to their counterparts in a traditional school.

Arguments concerning the immediacy of experience are not new, and examples can be identified in antiquity that pre-date the online era by thousands of years. Aristotle (Cooper, 1932) argued in *The Rhetoric* that temporal distancing contributed to a lack of pity, because men could not feel pity for events that were many years off in the past or the future. Similarly, David Hume examined physical distancing in the eighteenth century. In *A Treatise on Human Nature* (1898), Hume argued that:

...where an object is...far remov'd...its idea becomes...fainter and more obscure...The fewer steps we take to arrive at an object, and the smoother the road is, this diminution of vivacity is less vividly felt (2.3.7).

Several writers have examined issues relating to the distancing effect caused by mediating technologies. These include Wellen's (1986) theory that reduction of telecommunication bandwidth leads to a progressive decrease in sensory modalities, and Dede's (1991) discussion of bandwidth and rich learning experience. Some of these arguments were first proposed in the pre-Internet era, and they provide indications that face-to-face teaching has some advantages compared to its mediated counterparts.

Collectively, the implication of theories such as distancing effects, bandwidth and media richness for virtual schools is that the teacher or administrator of a virtual school has a reduced ability to monitor any student behaviours that might result from online learning. In part, this may be because the information that is transmitted to students in a virtual school environment is likely to be less rich than in a traditional classroom.

Information in online schools is related to bandwidth, in that fewer channels are used to transmit the information than when teacher and student are in the same room together. Physical real-life proximity enables the observation of body language, and social and relational cues. Parks (1996) argues that the cues emanating from physical settings are missing in online contexts, and this concept can be related to earlier theories of media richness (Daft & Lengel, 1984). These writers discuss the concept of the potential information-carrying capacity of data, and suggest that wide bandwidth is related to the immediacy and richness of student learning.

Although communication research indicates that there are some grounds for reservations concerning virtual schools, it is important to remember that both traditional and online schools are multi-dimensional learning environments that

cannot be readily explained in terms of theory. If difficulties in communication were inherent in the technology used by virtual schools, it would be reasonable to expect high levels of student dissatisfaction. However, evaluations of virtual schools generally indicate high levels of student satisfaction. Virtual High School students, for example, were interested in their courses and enjoyed them (Kozma et al., 2000).

Problems of Virtual Schools and their Solutions

Virtual schools face a number of challenges related to the way that teaching and learning is implemented in online environments. While similar problems can also be identified in conventional schools, the different nature of virtual schools

Figure 2: Problems of Virtual Schools

Virtual school problem	Example of virtual school problem
Authenticity	Honesty in test taking and completion of assignments
Interactivity	Students directed to passive materials such as lecture notes on web pages
Socialization	Insufficient attention given to the teaching of community norms and values
Experiential learning	Using virtual schooling for activities that usually require face-to-face interaction or synchronous monitoring of physical processes
Responsibility, accountability and discipline	Uncertainty about allocation of responsibilities. Threats or unsuitable materials sent by email. Hacking into administrative computer servers. Unauthorized changes to school websites or posting of websites with offensive materials
Teacher training	Teachers not trained to work in online environments
Teacher certification	Use of unqualified teachers or tutors. Use of teachers not certified or registered for the corresponding school system
Class size	Large virtual classes lead to slower responses to student requests
Accreditation	Varying standards across geographic regions can mean that a course in one area is not recognized in another
Student suitability	Students' learning style and ability may be mismatched to the available course
Equity	Use of virtual schools can exacerbate existing educational disadvantage

serves to highlight these concerns. Some of these problems are outlined in Figure 2.

The first of these problems, authenticity, relates to the verification of the student as the person who has completed the corresponding assignments and tests from a virtual school. Virtual schools may assign students a secure password to use over the Internet, but this procedure would not preclude students from giving their passwords to a parent or tutor who completed the work on their behalf. A possible solution that may have to be considered is for independent testing of students to confirm that they have the understanding, knowledge and skills suggested by their submitted work.

Interactivity describes the relationship between the learner and the educational environment. For virtual school students there is an interactive relationship involving the multimedia, the online materials used and the teacher. Students would typically access materials on the World Wide Web, respond to them, and send completed work electronically to their teacher. The preferred way for students to become involved in online learning is for an active engagement involving a response. If a student is directed to a static web page containing a teacher's lecture notes, learning may be less effective, unless other teaching methods are used to supplement it.

The solution to this problem will be found in both the increased capability of students' online computers to operate in a rich multimedia environment, and the recognition by course designers that virtual schools should take advantage of advances in learning theory and technological capability. In the U.S., the National Education Association's *Guide to Online High School Courses* observes that:

Online courses should be informed by and reflect the most current research on learning theory. They should be designed to take advantage of the special circumstances, requirements and opportunities of the online learning environment and support the development of 21st century learning skills (NEA, 2002, p. 15).

Socialisation continues to be a problem with virtual schools because there is an expectation in conventional schooling that students will learn how to work cooperatively with others, and will internalize the norms and values necessary for living in a civilized community. Moll (1998) is concerned with possible disruption to a 200-year-old tradition of public education as the primary vehicle

for the transference of national narratives, and humanistic and democratic values, while Russell (2002) argues that virtual schools may be less able to socialize students in expected values than their conventional counterparts.

An insight into the socialisation problem was provided recently when the author of this chapter had the opportunity to visit a primary school classroom in Victoria, Australia. The back wall of the classroom contained a large banner with the words “treat others as you would want to be treated.” Posters on another wall urged students to take action against bullying, while a different classroom area advised students to take responsibility for their actions and accept consequences. During the class, boys and girls worked together cooperatively at large tables with the support of their teacher. Although the details might change, similar examples to this could probably be provided from classrooms in many parts of the world.

Clearly, socialization will still occur if students use online learning supplemented by some contact with teachers and opportunities for organized sport. However, students’ ability to relate to others in society is likely to change. It would be challenging for the designers of a virtual school to offer the same opportunities to their students that would have been available in the preceding example.

Nevertheless, a partial solution to this problem is apparent if it is recalled that there is not one agreed variant of virtual schools. A type of virtual school that routinely insists on organized face-to-face learning and social situations, with peers, teachers and other adults will reduce the problems that otherwise are likely to arise. Indeed, there are virtual schools where some provision has been made for student socialization. One example is the Odyssey Charter School (2002) which notes: “students meet weekly with their teacher to review teacher in a one-to-one meeting that takes place in the student’s home or at a designated location.” Odyssey offers a range of extra-curricular activities to supplement its academic program, including field trips, skate nights, holiday events and choir. Children are also required to attend assigned group science class twice per month.

A related concern to that of socialization is the belief that web culture is inherently isolating, and that by encouraging students to pursue their education with a virtual school, an existing trend towards loss of community may be exacerbated. Putnam (1995) has argued that technology is associated with diminished civic engagement and social connectedness, but there is conflicting research evidence regarding social involvement and computers.

Kraut et al. (1998) originally suggested that Internet use could be associated with declines in participants’ communication with family members in the

household, declines in the size of their social circle, and increases in depression and loneliness. However, more recent research (Kraut, Kiesler, Boneva, Cummings, Helgeson, & Crawford, 2002) found that negative effects had largely dissipated. The researchers reported an increase in favorable effects, although there were less satisfactory outcomes for introverts and for those with less support. Support for the positive effects of online computers on society is also found in Katz and Aspden (1997), who maintain that there is no support for pessimistic theories of the effects of cyberspace on community involvement. Similarly, Jansz (2001) believes that there will be increased possibilities of new friendships and a “veritable smorgasbord of new possibilities in education” (p. 53).

There are some teaching activities in conventional schools that may be referred to as experiential. These usually involve some form of hands-on activity or physical interaction with others. Typically, a teacher will provide a demonstration, explanation or modeling of what is to be learned, and activities that follow provide an opportunity for the correction of errors. While virtual schools commonly offer subjects such as mathematics and social studies, the study of physical education, drama, art, and the laboratory component of science is more problematic. Sometimes the problem does not arise, because students will enroll only for subjects that they have missed or are needed for credit towards a qualification.

A common solution to these problems is for the virtual school to provide online or print-based teaching materials, as with other subjects in the range to be offered. Students complete the activities and send evidence of the completed work to the school. The Open School (2002) in British Columbia, Canada, offers art in both elementary and secondary school. The year nine secondary course offers the foundation of drawing and design basics, and introduces students to painting, printmaking, crafts, art appreciation, and photography. The Open School also offers a secondary physical education program, where students plan their own program. At the Fraser Valley Distance Education Centre (2002), students are invited to participate in a science fair by sending in digital pictures and a digital video clip of their project to the supervising teacher. Online movies of student projects can be viewed at the school’s web site. What is apparent from viewing examples of the activities on offer from virtual schools is that the teaching of experiential-based subjects is not impossible. The problem in many cases lies more in the use of appropriate teaching techniques.

Changing notions of responsibility, accountability and student discipline are also likely to arise in virtual school environments. In a traditional school,

teachers accept responsibility for the students in their charge, including the prevention of physical injury, and accountability for using appropriate teaching techniques. When there is a spatial and temporal distance between teacher and student, teachers are unable to exercise some of their accustomed responsibilities. While there is still a requirement to act ethically, and to ensure that appropriate teaching materials and methods are used, much of the responsibility shifts to parents, students, and to the suppliers of the online materials. However, responsibility is still unclear in some areas. When students are below the school-leaving age, and they work from home in a virtual school environment, they will usually be in the care of a parent or guardian. If a student uses his or her home computer to hack into the school's administrative computer, or send offensive emails to a teacher or fellow student, both parents and teachers would expect to be involved in solving the problem.

Teacher training is also emerging as an area of concern. Virtual teachers will find that some new skills are required, while others are less important. Class management skills in a face-to-face environment will differ from their online equivalent, as will many of the teaching practices. There will be an ongoing need to use not only technological skills, but to apply these skills to the appropriate educational context. However, it is unlikely that many teachers' colleges and other providers of trained teachers have modified their courses to reflect these changes. The California Virtual School Report (2002) provides an indication of the direction that teacher training for virtual schools is taking. It reports the use of online modules for teachers at Durham Virtual High School, Canada, a 15-week teacher-training program in Fairfax County School District, and professional development options at Virtual High School. There is also a mentoring program operating at Florida Virtual School, and a training program operating at the Cyber Schoolhouse associated with the Clark County School District in Nevada (USA).

Parents would normally expect that the virtual teacher working with their child would be a competent online teacher and certified or registered with the corresponding school system. Where a student is working from home, and the principal contact with the teacher is by email, the anonymity of the communication mode could conceivably cover the use of unqualified teachers. The necessity for demonstrating that a high quality educational experience is being supplied is, however, likely to reduce this possibility. Florida Virtual High School only uses certified classroom teachers (Schnitz & Young, 2002, p. 4). As the online environment becomes more competitive, it is likely that virtual schools will provide evidence of their teachers' certification.

With conventional schools, the issue of class sizes is a perennial problem. The diversity of virtual schools means that it is not easy to determine corresponding workloads. The evaluation of Virtual High School (Kozma et al., 2000) revealed that some of the teachers involved in the case study had to complete their VHS work at home in addition to their normal teaching load during the day. Where teachers are asked to take responsibility for large groups of students, the time available for individual attention is likely to be reduced, and the quality of the educational service provided may be less satisfactory. Some virtual schools have recognised this problem. Teachers in Odyssey Charter School (2002) have a caseload of 24 students, with visits to students of one hour per week, while Louisiana Virtual School (2002) is limited to 20 students per course.

Accreditation of courses across geographic regions will also become an increasing problem. Varying standards can mean that a course in one area is not recognized in another. In one sense, this problem is not new, as there have been movements of students from one area to another for as long as there has been an organized schooling system. What is different is that students will increasingly be able to choose programs across state and even national borders, and complete their schoolwork by sitting at home with their computer. In tertiary education, administrative systems have evolved to allow students credit for work undertaken at other institutions. It is likely that similar pressures will affect the online component of the school education sector, although response to these pressures may be slow.

An important item relating to the quality of a student's educational experience in a virtual school is the recognition that not all students are suited to online learning. Some virtual schools already try to determine whether the prospective student is suited to online learning. The Louisiana Virtual School (2002) and the Electronic Classroom of Tomorrow (ECOT, 2002) offer online questionnaires for students. Typically, these questionnaires ask students about their independent learning skills, motivation, time management abilities, and comfort with technology. In broad terms, the questions asked of students reflect Del Litke's (1998) conclusions from a case study that examined teacher beliefs about virtual schooling. Teachers in this study thought that student success was related to self-motivation, persistence, intelligence and supportive parents. The implications of studies such as Del Litke's, and of the existence of checklists used by some virtual schools, is that students must be carefully assessed before they commit to online education. Any educational choice should always be made in the best interests of the student involved. Hidden agendas, such as cost-cutting to traditional schools, promotion of the careers of those involved,

or an unthinking commitment to an ideology of technology, should have no place in the decision.

If virtual schools are perceived to be advantageous for those enrolled in them, there are also concerns when the access to them is seen as inequitable. Early research on the use of information technologies by school-age children in the U.S. (Martinez, 1994) indicated that white students had more access to a computer at home than did black or Hispanic students. More recent research on adults' access to the Internet suggests that socio-economic status might also be an important variable. Bikson and Paris (1999) found that there were "highly significant differences in household computer access based on income" (p. 9), in the U.S. It is reasonable to assume that households with children will have less access to computers to use in a virtual school if they are part of a disadvantaged group. Unless there is careful planning, the use of technology-mediated education is likely, in the short term, to entrench further those inequalities that exist in society.

Nevertheless, the long-term prognosis for equitable access to virtual schools in industrialized countries is more hopeful. As online computers become cheap and ubiquitous, they will become as common in homes as telephones. While there may continue to be differences between the computers used by dominant and disadvantaged groups, debate is likely to focus on the comparative quality of the online educational experience for students rather than access.

Collectively, a range of problems related to teaching and learning confront students, teachers, parents, administrators, and educational providers. Some of the solutions to these problems are already being implemented. In other cases, resistance can be expected, either because there are financial or political reasons for not implementing change, or because the problem is not yet adequately recognized.

Future Trends in Virtual Schools

Two broad trends can be identified in the growth of virtual schools. These are the continued expansion in the number of virtual schools, and the trend from virtual high schools to virtual K-12 schools. Research by Clark (2001, p. 3) indicates that more virtual schools began their operations in the U.S. during the period 2000 or 2001 (43 percent) than in the previous four years combined. Fifty-one percent of virtual schools surveyed offered junior high and middle school courses as well as high school courses, and about one in four schools

currently offered courses across the whole K-12 spectrum (Clark, 2001, p. 4). In Canada, there is also evidence of growing demand for virtual schools. The two-year cumulative growth rate for Alberta virtual schools was 125 percent (SAEE, 2002).

Collectively, the implication of these trends is that there will be increased attention devoted to those problems that arise from virtual schooling across the K-12 range. When virtual schools made their first appearance, it would have been possible for some educators to dismiss them because they were experimental, or ignore their existence because they catered only for a niche market of high school students. In some cases, this suggestion may still be valid, but support for virtual schooling is increasing rather decreasing, and the nature of what is offered is becoming more comprehensive.

Virtual schools profoundly reshape the custodial functions of schools. One of the continuing assumptions of school education is that the school accepts responsibility for the students in its charge during school hours, and parents are free to earn a living or pursue their own interests. Where the students are in the post-compulsory years of schooling, the problem of parental supervision is of reduced importance. Students can earn money at a job during the daytime, and learn through a virtual school in the evening. By this means, they can increase their opportunities for University entrance or a better career.

The compulsory years of schooling, however, require a responsible adult to supervise students. If students are to spend much of their time at home, then a parent or guardian must be available to care for them. Not all parents will have the opportunity to work from home, and economic necessity may well mean that some parents are unable to choose virtual schooling for their children. In this sense, they will be disadvantaged in comparison to those families that can afford for one parent to remain home to help with their child's education. The quality of the supervision that parents can offer is also likely to vary. If much of the responsibility for a student's education is returned to parents, then it is important that parents provide appropriate support to enable the timely completion of schoolwork, using an online computer at home or elsewhere.

Virtual Schools: The Next Generation

The characteristics of the next generation of virtual schools will be largely determined by the related imperatives of globalisation and information technology developments. Increasingly, geographic boundaries and physical walls are

becoming less important as markets interact across the world. Information technology makes this process possible, and it shapes cultural meanings, ethical values, and educational perspectives. In the U.S., the Web-Based Education Commission (Kerrey, 2000) has commented that:

The promise of high-quality web-based education is made possible by technological and communication trends that could lead to important applications over the next two to three years. These include greater bandwidth, expansion of broadband and wireless computing opportunities provided by digital convergence and lowering costs of connectivity (p. iii).

Increasingly, students will have access to computers that are more powerful than they are today. By 2007, it is predicted that more than 80 percent of those online in U.S. households will access the Internet through a high bandwidth connection (OECD, 2001). Interactive lessons with movies, sound and access to the Internet will provide an educational experience that will motivate students and increase demand for virtual schooling. Advances in wireless technologies will stimulate the development of mobile computing. This will mean that students who once had to be at home or at school in order to obtain a reliable Internet connection could complete their work wherever they were—including the local shopping centre or the beach. Although such changes might be technically possible, they are likely to be greeted cautiously by parents, because supervision will become more difficult.

As virtual schools become a more attractive option, they will compete with conventional schools for funding, teachers and students. It is likely that there will be heated debates over issues such as teacher training for virtual schools, course certification and accreditation, authentication of student work, and academic rigor and teaching practices. There will be resistance to virtual schools from some schools or interests that see virtual schooling as a threat. The result is likely to be an increased focus on evaluations, and an overall improvement in the choice of education offered to students.

Conclusion

Virtual schools continue the tradition whereby students learn at a distance from their teachers. Students who lived in remote areas or those who have been

unable to attend school because of an illness or disability have been able to use predecessor technologies including mail, telephone, radio, and television in order to complete their education. The availability of online courses through the Internet has simultaneously reduced the emphasis given to older forms of distance education, while increasing the opportunities for students to explore alternatives to traditional school education. It is likely that there will be an increase in the number of virtual schools, and that they will continue to attract students.

The expected increase in the number and type of virtual schools is likely to provide both exciting possibilities and daunting challenges. Changes in technology and society will continue to shape the nature of virtual schools, and it is likely that continued interest in the alternative that they provide to traditional education will help to match them more closely with students' needs. Virtual schools have both advantages and disadvantages, but the radical nature of the alternative that they offer may yet lead to reconsideration of the nature of school education. From this perspective, virtual schools are indeed valuable.

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