

Preparing for an Interconnected Future: Policy Options for Telecommunications in Education

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Finding the most effective balance between change and stability is an ongoing dilemma for educational policy-makers. Stimulating innovation and preparing for future trends in society are often difficult to harmonize with the ongoing needs and demands present in the educational system. This dilemma becomes particularly challenging with respect to educational policy in regard to telecommunications. Should this policy be future-directed, or is the future with respect to telecommunications both in education and society still too much in a state of evolution to serve as a useful guide?

In this article, we look at two general possibilities for present-day policy with respect to telecommunications in education: "take the initiative" or "wait and see"; we consider the short- and long-term implications of each. Both approaches have their benefits and risks.

Interconnectivity in Society

The world is changing very rapidly. One of the most remarkable of these changes is that from an industrial to an information society. Information and fast access to it have become critical commodities not only for businesses and governments but also more and more generally in our personal expectations of how society should operate (Ohmae, 1990, gives an interesting perspective on this).

Interconnectivity with information has become critical and is stimulating new commercial and

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occupational growth areas. In North America, Europe, and Japan especially the demand for rapid increases in individual and selective access on request to all kinds of programs, information, and services has led to the development of big businesses, offering to more and more individuals the sort of information services that until recently had been available only to large companies. In Europe, these types of information services available on-line and on-request are often called "Teleinformatics" (Eraut, 1990, gives a good perspective from the European Community level).

Related to this, being able to participate in the Information Age means being able to communicate efficiently and effectively in a broad variety of different contexts, as resources will increasingly come from different sources or countries and will be expressed and organized in many different ways. It also means being able to find and select and correctly interpret information from many available sources offering an explosive quantity of often undifferentiated facts and opinions. Skills for "learning to live in a networked information environment" will replace the now out-of-date idea of computer literacy skills as "critical to enable the future adult to be an effective self-directed learner in the electronic workplace." (Romiszowski, 1990, p. 236)

Powerful trends such as interconnectivity, however, often are accompanied by counter-balancing reactions. Thus, at the same time as there are more and more impulses toward internationalism and interconnectivity, there is an increasing awareness of associated problems, such as can be seen in environmental and cultural conflicts. Thus, another powerful trend, in reaction to so much irresistible interconnectivity, is the urge to maintain some kind of local control, to keep one's identity and sense of personal decision-making. There is also the undeniable human tendency to resist change, to want to maintain one's own standards and traditions, to want to be reasonably able to plan for the next day and year. How do all these balance with the increasing interconnectivity in society? And, what should education be doing about this information society-interconnectivity context?

The Educational System and Interconnectivity

Interconnectivity is, of course, not a new phenomenon for education. What happens in education has always been a product of the interaction among many interconnected components—teachers, students, administrators, resources, community, culture, country. However, telecommunications, the technology of communication by electronic transmissions, is increasingly being used to establish new connections between educators, students,

and resources. Ely, in his analysis of trends in educational technology in 1991, cites as one of the major trends for 1991 the observation that "telecommunications is the link that is connecting education to the world" (Ely, 1992). This is not only true in North America, but throughout Europe and increasingly in other countries throughout the world (Collis & De Vries, 1991). Clearly, various kinds of policy decisions are already being made with respect to the investment in and management of telecommunications in education.

At high levels, significant initiatives are underway. In the United States, development of the National Research and Education Network (NREN) will accelerate interconnectiveness among educators and resources.

The vision of the National Research and Education Network (NREN) is of an interconnection of the nation's educational infrastructure to its knowledge and information centers. In this system, elementary schools, two- and four-year colleges and universities will be linked with research centers and laboratories so that all may share access to: libraries, databases, and diverse scientific instruments, such as superconductors, telescopes, and particle accelerators. (FCCSET, 1991, p. 18)

Also in the United States, the Office of Educational Research and Improvement of the Department of Education is developing an electronic information system called SMARTLINE (Sources of Materials and Research About Teaching and Learning for Improving Nationwide Education) that, it hopes, will eventually connect the nation's 75,000 school libraries and 15,000 public libraries (OERI *Bulletin*, 1992). In the European Community, similar major efforts are underway to implement the "Trans-European Network for Education and Training," where "the major role of the Network is to run a broad spectrum of activities supporting and stimulating the involvement of all those in the educational and training processes, across Europe, in a common effort to increase their knowledge and understanding of those processes." (Figueiredo and Steele, 1992, p. 13)

Even before having the benefit of large-scale support as will be available from such major initiatives as those mentioned above, there are already hundreds of projects and thousands of teachers and students throughout the world making use of telecommunications for educational purposes (Collis, 1992; Collis and De Vries, 1991; Hunter, 1992). Thus, policy-makers at different educational levels are being called on now to make decisions about support and guidance for the educational use of telecommunications in their jurisdictions, even while the following problems exist:

- There does not exist any consensus among stakeholders as to the overall network architecture, governance, and financing.
- There is very little at present in the way of school district communications infrastructure.
- Teachers and students in very few schools have Internet access and functionality.
- Computer software enabling people to interact on the network is relatively difficult to learn and use.
- Few people with expertise in networking have an understanding of educational applications. (Hunter, 1992, p. 29)

As the area is new and emerging, not only are there these sorts of problems confronting implementation, but also guidelines for educational policy-makers concerning telecommunications have not yet emerged.

The purpose of this article, therefore, is to help educational managers consider options with regard to planning and support for telecommunications in school. At the present time, what are some of the considerations that educational policy-makers at the school or regional level should examine when making decisions about support of telecommunications? What are some alternatives for educational policy with respect to telecommunications in education? And what are the most likely implications of those alternatives? We suggest a simple four-cell framework to help consider these alternatives and their consequences.

"Taking the Initiative" Versus "Wait and See": Four Scenarios for Telecommunications Policy in Schools

There are many variations of policy or impulse with respect to an innovation such as telecommunications in education; to keep this analysis short, we will consider just four possibilities. The possibilities can be visualized in a simple 2 x 2 matrix, in which one dimension relates to actor and the other to type of action. By actor, we focus on teachers and policy makers. (By educational policy maker, we mean a policy maker at a central level pertinent to school. In some countries this is the Ministry of Education, in others with decentralized education systems, this would be the state or provincial or district or even school decision maker.) Many other actors, of course, could be considered, such as those who deliver on-line services. By type of action we will consider two basic modes: "Taking the Initiative" or "Wait and See" although, again, many permutations are possible. Thus for the four combinations of actor and action suggested by these dimensions, we can make some speculations relating to possible short- and long-term implications. In each case, we can contrast previous

experiences with computers in education with the new situation of telecommunications in education.

Possibility 1: Teachers Enthusiastic; But No Central Initiative

Initiative	Teacher	Policy-Maker
Take Initiative	X	
Wait and See		X

Pioneer teachers and computers in education. This is a familiar combination with respect to technological innovations in education. A few teachers—pioneers—become enthusiastic about an innovation. Often, as was clear in the early days of computers in education, these few pioneers can make a significant impact on eventual change (Fullan, 1991; Rogers, 1986). As “early adopters” they can lead the way in demonstrating some of the potential of the innovation and in pushing for support.

The pioneers give freely of their time and energy; they believe in and are excited by the new technology. In the case of computers, they often quickly bought their own machines for home use, or even supplied a computer for their classrooms, if this is what it took to bring the computer experience to their students. The pioneers often found each other rather than being aroused by policy-related support. When support did occur, it was appreciated but not seen as critical for the pioneers’ explorations and personal skill development. They got great pleasure and insight from trying things out with their students, from carrying out small-scale, personally organized projects where they worked with their students as discoverers and problem-solvers. The pioneers in terms of computer use in schools have made a considerable contribution in opening up awareness of the potential of computers in education and by being the engines by which subsequent changes often got propelled.

But, without central initiatives for support, the pioneers have not generally been successful in transferring their enthusiasm to their colleagues, even when opportunities to make use of computers in practice increased significantly. Pioneers get tired, or get moved out of the classroom into coordinator or managerial positions. As a consequence, it may be that we are not seeing as many computer-using enthusiasts willing to supply the fuel and enthusiasm with respect to general computer use in schools that the computer-using pioneer teachers gave a decade ago.

Pioneer teachers and telecommunications in education. It is with respect to telecommunications applications in education that we are most likely today to see some of the old pioneer spirit and enthusiasm, the belief that despite all difficulties telecommunications (in particular, computer-mediated communication) can make a powerful change for students. Recent research in Europe, for example, found the enthusiastic individual educator a central feature in most of the existing telecommunications activities in secondary schools (Collis and De Vries, 1991). In the US, Hamilton and Thompson (1992) found teachers who were frequent users of an electronic communications system to have the behavior characteristics of “early adopters” (in Rogers’ terminology, 1986) and recommended that those developing electronic on-line services specifically seek out individuals with personal characteristics like those of other early adopters of innovations in order to increase the system’s likelihood of diffusion of use.

However, it is more difficult to be a pioneer or early adopter with respect to telecommunications than it was in respect to the microcomputer. There is no easy way to be a pioneer if you want to try things on your own; you must have first an infrastructure in place and available—access to an external network, to an internal telephone connection, extra equipment and software for your computer, extra money to handle telephone line and network costs, sometimes extra training, and something or someone rewarding to connect with once you make everything else work.

The difficulties the computer-using pioneers had ten years ago in getting access to a computer and adequate software are now considerably increased by the difficulties involved for today’s pioneers “trying something out” with telecommunications. Informal exploration is not practically available for most teachers, unless a more centrally organized project is already in place; it is so difficult as an individual to get even a first on-line experience (see Van Doorn, 1991) that very little grass-roots exploration occurs. The majority of telecommunications use in schools occurs in the framework of a special project, with an accompanying investment of funds, time, and outside expertise. When the special projects end, the complexities of handling an “on-line learning environment” seem to daunt even the enthusiastic teacher, because very little use of telecommunications goes on once special support is withdrawn (Collis and De Vries, 1991).

Thus, with telecommunications, relatively little can happen through the grass-roots enthusiasm of the pioneering teacher; the major difference between getting started with telecommunications

and getting started with computers is that with telecommunications, at the current time at least, someone else has to make a highway before the teacher can begin a first exploratory journey. That "someone," when there is no central policy support, is usually a research team from a nearby university or a representative of an initiative supported by a telecommunications or computer vendor. And, what these sources can offer in terms of range of resources available on-line is still very limited in much of the world, given the lack at the present time of a critical mass making use of on-line services in education. Even those teachers who do get telecommunications experience through an externally supported project often have no opportunity to experience the major benefits of on-line information access that are developing in business and industry, and instead do little more than fragmented CMC (computer-mediated communication) activities.

The analogy of these fragmentary CMC activities in terms of computers is that it is like giving a teacher a computer but with only one primitive piece of word-processing software available. Without being able to access a wide range of materials and timely information, a major value of real-world interconnectivity is never experienced. We predict that grass-roots demand will not develop beyond the enthusiastic pioneer without a broad base of attractive educationally relevant resources becoming available on-line at realistic cost. Cost relates not only to money but also to time and effort.

**Possibility 2: Teachers Disinterested;
But Central Policy Initiative**

Initiative	Teacher	Policy-Maker
Take Initiative		X
Wait and See	X	

Top-down policy and computers in education. Despite the "efficiency" of top-down policy directives, we have much evidence that central policies, at least in cultures with a tradition of democracy, implemented without teacher commitment and involvement have little effect on actual classroom practice (Fullan, 1991). In some countries, the government has attempted to initiate computer use in education through top-down strategies. For example, with respect to computers themselves, in many settings the government or other educational decision-makers have taken the initiative to facilitate the presence of a particular type of

hardware in schools. This can be seen in terms of small-scale activities, such as projects where a local business donates some computers to a school, and with national policies, which often include specific arrangements made with a hardware vendor for large-scale subsidized computer standardization. However, a definite risk with the top-down approach is that computers may arrive as a "solution in search of a problem" (Railsback, 1983).

These sorts of top-down initiatives with regard to getting computer hardware (and, to a lesser degree, software) into schools have been the case in many countries throughout the world (Collis and Oliveira, 1990). A typical finding, however, is that these sorts of initiatives have not generally transferred well into teacher acceptance and implementation in the classroom or curriculum. Despite the fact that in many educational systems, most schools have acquired computer equipment, meaningful integration into instruction is still limited, and there are "not yet clear signs" that hoped-for outcomes of computer use such as more problem-solving and greater educational productivity are taking place, at least at a fast or consistent rate (see, for example, Pelgrum and Plomp, 1991, p. 104, summarizing results from a survey of computer use in education in 19 countries).

Top-down policy and telecommunications in education. This is currently the great dilemma with respect to telecommunications in education; without central support and adequate and effectively organized information sources and services, non-pioneer teachers cannot easily get some initial experiences and cannot do much that most would perceive as educationally meaningful. Given the "practicality ethic of teacher decision making" (Doyle and Ponder, 1977/78) most teachers will be reluctant to invest time and effort. Yet central initiatives before teachers are ready for or see the value of an innovation are also likely to have little impact, other than perhaps to fuel resentment that areas considered by the teachers to be much more important were not given the extra time and money spent on the unwanted innovation.

Thus, it would seem from one perspective that central subsidy of telecommunications, through subsidized infrastructure, local equipment, software, and provision for attractive on-line learning resources—before teachers feel a need for them or have an interest in them—may be unproductive and incautious, given competing demands for money and attention in the educational system. However, to use the highway analogy again, one cannot know the pleasure of driving down an open road in a new automobile if there are not first roads. The roads may not be immediately used, but if well

located they will be discovered eventually. Until they are there, no one can discover them or learn highway driving skills.

**Possibility 3: Teachers Enthusiastic;
Also Central Policy Initiative**

Initiative	Teacher	Policy-Maker
Take Initiative	X	X
Wait and See		

Mutually supportive policy and practice with computers in education. This scenario appears ideal, with teachers wanting an innovation, and policy-makers stimulating activities relative to the innovation. In such a scenario, teacher training and ongoing support are more likely to occur; subsidized rates for software and support services can be negotiated; and teachers will have better opportunity to share experiences and feel a sense of personal valuation for their efforts with computers because of the fit between their own ideas and those of their leadership. This happy state of affairs may be approaching reality in some school regions with respect to computers in schools, but finding the balance between support and wants is difficult in the best of situations, particularly as computer technology is always changing.

Mutually supportive policy and practice with telecommunication in education. However, with telecommunications, there may well become danger in too-quick commitment. Not only are the technological possibilities for interconnectivity still changing rapidly (see Sawyer, for example, for a January 1992 prediction of a "virtual computer" and "a new paradigm for educational computing" that have already come a large step closer to availability with new-product announcements made at the June 1992 National Educational Computing Conference in Dallas), but the experience of society in general with telecommunications will soon begin to escalate at a much higher level than is now occurring, made necessary by increasing interconnectivity and internationalization in society. Before this social escalation occurs, much time and effort will have to be spent on "telecommunications literacy" training for teachers and students, and much money could be spent on setting up infrastructure and resources which society may naturally evolve for itself in a few years' time.

We have already had this experience from the first computer-in-education decade; much time and

money was spent on "building an educational computer" or on "computer literacy courses" for students and teachers—equipment and courses that are largely redundant now. Considerable time was spent on the learning of programming, and energy was spent on debates such as those about various approaches to learning BASIC programming, much of which is considered irrelevant now. Programming in general has been largely replaced in schools and in society by integrated-software tool use, and very few teachers now need expensive workshops to be told, "This is a computer and here is how you turn it on and you need not be anxious," as was the case a decade ago. The commonplace and widespread availability of computers has provided in an osmotic way much of this first-pass familiarization. Also, tool-type software generally outsells curriculum-specific educational software in schools, and schools buy marketplace computers, not specially-made-for-education systems.

Perhaps too-early enthusiasm in a rapidly emerging field creates unnecessary disruption, cost, and stress. Too-quick "network" literacy and made-for-education information services may parallel the now-redundant (and expensive) efforts of the first years of computer-literacy-for-everyone thrust of a decade ago. Also, according to Rogers (1986, in Hamilton and Thompson, 1992, p. 267): "...early adopters play a vital role in the diffusion process. They serve as a filter for the network....If the early adopters have a poor perception of an innovation, the innovation will be filtered out of the system." Too-early escalation of expectations may exhaust or disillusion that pioneer or burn him or her out before real experience of the benefits of interconnectivity has occurred. (For example, Hudspeth's description (1992) of "Just-in-Time Education" is a good example of what could become available in education, given intelligent handling of design and implementation issues related to telecommunications.)

**Possibility 4: Teachers Not Interested;
Also, No Central Policy**

Initiative	Teacher	Policy-Maker
Take Initiative		
Wait and See	X	X

"We are not very interested" with respect to computers in education. There are few explicit examples of this scenario now with computers in education, at least on a large-scale basis, as comput-

ers are a pervasive part of school life throughout much of the world. At least some persons and decision-makers have had enough interest to have established a level of practice, which now has its own momentum. Computer applications courses have become part of the curriculum and part of some teachers' on-going assignment.

Word processing is broadly used by teachers, administrators, school-support persons, and students and their families. However, while something may keep happening with computers in schools, there is overall far from wide-scale use outside of the computer-applications course (Pelgrum and Plomp, 1991).

Teachers generally still are inclined to seek ways to fit computers into their preferred teaching practice rather than to change that practice to take advantage of the potential of computer use (Veen, Neut, Spoon, and Vogelsang, 1991) and there is even evidence of a plateau or drop in use, after early initiatives by both individuals and policy-makers have lost their stimulus value (Moonen and Beishuizen, 1992). Also, political or situational issues may dominate teachers' attention, or lead them to feel that dealing with an innovation is another imposition on their time and energy (Collis and Moonen, in press).

"We are not very interested" with respect to telecommunications in education. This brings us to the last scenario with respect to policy and telecommunications in education: teachers and policy-makers agree to wait and see with regard to telecommunications initiatives. Explicitly or implicitly, both groups agree to wait for things to get easier, better, cheaper; for standards to develop; for the system to "get in the mood" for change relating to telecommunications; for "results" to convince teachers and decision-makers alike that telecommunications use once put into practice is going to justify the cost.

The many other pressing demands of the day can be seen as more productive focuses for time and energy than may appear to be the case for technological innovations such as telecommunications. "Wait and see" can be prudent or even highly reasonable in the short term: however, as we will argue in the next section, it may have serious consequences in the future. It may also illustrate what Gerstein, 1987, calls the two major rules for failure with respect to decision-making about information technology within an institution: to "Firmly believe that information technology can't make that much of a difference" (technology myopia) and "Always use hard-nosed criteria to evaluate IT proposals" (pp. 173-174).

Assessing the Possibilities: Implications of Policy Options

There are serious problems for educational managers with each of the four scenarios, but to evaluate them comparatively, it is important to recall the changes in society that were sketched at the beginning of this article. These changes are occurring, regardless of whether schools want them or are ready for them. Even now, people are more and more turning to a source like CNN for their news and perspectives on world affairs. Students choose mass-produced international culture as their source of reference and pastime. Students are absorbing the rhythm of a society where they expect to be able to get up-to-date information or entertainment whenever they want, and at their fingertips. Tolerance for outdated, limited educational materials, or informational materials without visualization and sound is rapidly diminishing.

People are turning, not to their parents or teachers for information, but to the telephone or television. People communicate with the telephone rather than by letter; people travel without much hesitation when they want to see someone or someplace; a book is no longer the way many people think of to find out about the world. Consumer telemarketing is gaining momentum—buy, plan, do your own banking—all through your home computer. More and more, people are living and working in an interconnected world.

What happens, then, if we give a preference to Possibility 4? The problem with this "wait and see" approach is that the new interconnected situation outside of the school may leave the traditional school too far behind, conceptually as well as in experience. The idea of school as the place you go to learn may be rejected as irrelevant by a society which is learning and interacting extensively outside of the school setting in what might be called "off-school education" and in different ways than it is asked to learn and act in school.

There are many dangers here. The opportunity to reflect and evaluate and synthesize, to acquire a deep discipline of thought, to perfect communication skills—all things that are needed as a counterbalance to the information and communication glut rapidly exploding in our culture—may be drowned out in the excitement of the international information age. Why should school and its traditional standards still be seen as relevant? A world left to develop in its own way and children left to absorb it uncritically may come to be beyond our capacity to reach in the traditional school in the year 2001. The decade in which we "wait and see" may not only be a missed opportunity for intellectual stimulation but, more seriously,

may disenfranchise schools and education as it is now organized from relevance as sources of learning and influence.

The skills and insights needed to function capably and intelligently in the interconnected information age are complex and not yet well defined (although examples are emerging—see Carey's "goals of an information processing curriculum," 1992, as an interesting approach). However, one characteristic is obvious—the ability to evolve with new opportunities. Failing to strengthen this ability, as may happen by "waiting and seeing," may mean that the necessary skills and judgments for functioning in the interconnected information age will not be developed enough to be able to put into practice when (or if) the educational system decides, prudently, that it is now ready to get started in the information society. The same society may have left the schools behind.

So, What Should We Do Now, About Later?

We believe it is important to learn from our recent computers-in-education past. For example, applying the experiences of that past, education should probably not try to develop its own on-line general-purpose databases until there develops a critical mass of demand for them, but instead should look for good ideas about implementing and expanding what is already emerging in society in terms of on-line resources. The skills of information finding and discrimination are probably not going to be best developed by exposure to pre-packaged collections of textbook-like on-line material.

Again, learning from our experience with computers in education, we should look carefully at teachers' needs, and strategically support applications of telecommunication which provide good help relative to those needs. For example, we should use the advantage of centrally available specialized expertise to develop useful information sources of the resources teachers appreciate for their lesson preparation: access to software and resource inventories, centrally available test item banks, general and specialized releases of government or administrative-level information, and notices and information about school business and events. Also, we should anticipate the management and organizational problems teachers will have when trying to integrate telecommunications use into instruction, and make available models and examples of teachers dealing with these problems in different types of class situation. Verwijs (1992), for example, has developed videotapes for teachers to help them with these management-oriented strategies.

Cooperation with information vendors is another

important contribution that the decision-maker should explore—what kind of volume discount is possible for broad-scale use of an information service for all of the teachers in a district who wish to make use of it? Also, through the influence of central pressure or persuasion, the whole process of making use of telecommunications should be made easier and less expensive. The "it makes my life easier" factor of telecommunications use has to be improved (Collis and de Vries, 1991). Access to getting on-line has to become easy in its initial steps, so that more exploration can take place. This can give more teachers opportunities to become pioneers, as they are the people who initially fuel the system and can demonstrate their good ideas. However, we must support the pioneers and take care that we do not assume they should or could bear the overall implementation load.

In conclusion and in general, we think that a modified Possibility 2 where central effort is strategically spent on increasing the information-related payoff potential of electronically available resources and also supports investigation of some activities not so possible or convenient without telecommunications (such as cooperative scientific experimentation among students in different countries and cultures; as, for example, occurs within the excellent "Kids Network" activities (Julyan, 1992)), is a reasonable recommendation.

We have chosen Possibility 2 as a current recommendation for educational managers making decisions about telecommunications in schools, as the majority of teachers overall do not yet have enough personal experience of the potential applications of telecommunications to generate much grass-roots initiative. However, where pioneer-like enthusiasm can be identified, we also support a modified Possibility 3. Those teachers with enthusiasm should be encouraged and supported, as potential change agents in the system. As "diffusion of an innovation through a social system is determined by characteristics of the adopter and the perceived value of the innovation" (Hamilton and Thompson, 1992, p. 268) both a modified Possibility 2 and a modified Possibility 3 are important. □

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