Can Educational Technologists Help Change Public School Education?

Richard F. Kenny

Abstract: During the past decade, public schools have been subject to demands - particularly In the U.S. - that they be changed, even restructured. While educational technologists have joined in the debate, they have not tended to participate at this level. This paper first examines the question of whether Canadians see a need for change in their public schools. It next reviews what educational technologists might offer to the change process. Finally, three different strategies are suggested to help educational technologists improve K-I 2 education. These are (a) participate In total restructuring efforts, (b) train in-school personnel as educational technologists and (c) act as external change agents to improve teaching-with-technology and to develop innovative computer-based learning materials and environments. It is concluded that the third approach is that likely to be the most feasible and productive under current conditions.

Resume: Au cours des dix dernieres annees, les ecoles publiques, partlculierement celles des Etats-Unls, ont ete pressees de changer et de se restructurer. Les technologues p6dagogiques etaient de la discussion mais ils n'etaient pas de la partie a d'autres niveaux, Get expose exam ine done ce que pensent les Canadlens de la necessite d'apporter des changements aux ecoles publiques? Le role que peuvent jouer les technologues pedagogiques est aussi abordee et trois strategies sont suggerees aux technologues pedagogiques pour ameliorer le systeme d'educatlon K-I 2 : (a) la participation active des technologues pedagogique 6 la restructuratlon totale du systeme; (b) la formation en technologies pedagogiques du personnel enseignant deja en place; (c) et l'adoption par les technologues pedagogiques du r6le d'agent pour l'amelioration de l'enselgnement asslste par ordlnateuret, pourundeveloppementinnovateurd'envlronnementsetdeproduits d'apprentissage assistes par ordinateur. Nous sommes d'avis que la troisleme approche est probablement la plus appropriee et la plus productive dans les conditions actuelles.

INTRODUCTION

The need for change in public school education has been a topic of much discussion during the past decade in the United States, and to a lesser degree, in Canada. American reports and books indicating that the quality of instruction must improve have abounded (e.g., Boyer, 1983; Goodlad, 1983; National Commission on Excellence in Education, 1983). The overt, sometimes strident,

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tone of the debate, however, may reflect the relatively large involvement of the American federal government in education as well as perceptions of the competitive position of American society in the world order.

The Canadian Viewpoint

Canadians appear to be less concerned about the state of their educational system. Maguire (1986) indicates several reasons: education is strongly entrenched as a provincial responsibility, there is a tradition of a conservative, non-interventionist supreme court and the time lag between the creation of ideas in the U. S. and their movement to Canada leaves space to evaluate and pick the best. Indeed, Canadians appear generally satisfied with their schools. Lee (1988) found that, in Manitoba, 48% of the public gave elementary schools a "B", while 41% awarded high schools a "C". An Ontario study (Livingstone, Hart, & Davie, 1990) found that nearly half (47%) of those surveyed were satisfied with the "current situation" in Ontario elementary and high schools while less than one third (29%) were dissatisfied. A Canadian Education Association sponsored Gallup poll (1984) found respondents more confident in Canadian schools than in other institutions, while a more recent CEA poll (Williams & Millinoff, 1990) found that most Canadians gave the schools in their community a B (39%) or a C (35%). The authors concluded that this suggests a relatively high degree of satisfaction with the schools. While positive, "B" and "C" scores are not "A's". As well, Ontarians are concerned with certain aspects of school performance, with the core curriculum and the link between schooling and jobs (Livingstone & Hart, 1987). On the other hand, they do not confuse such issues with the larger economic and social problems created outside the schools, but look to the schools to aid in their resolution. Overall, it appears that Canadians think their schools can improve, but should they?

Why Schools Should be Improved

Fullan (1982) stresses that educational changes are not ends in themselves but must be considered in relation to the basic purposes and outcomes of schools. Innovations should be introduced to help schools accomplish their goals more effectively by replacing some programs or practices with better ones. In his view, schools serve to educate students in the academic and social skills and knowledge necessary to function occupationally and sociopolitically in society.

Yet, modern society has not remained static, nor have the academic and social skills required of its citizens. A current example of this is the technological impact of computers and the rapid development of the information society. Schools, though, have been slow to adapt (Dalton, 1989). Successful examples of computer use in classroom practice are still relatively rare (van den Akker, Keursten, & Plomp, in press). And yet, technology will continue to shape our processes and systems of schooling and will have an important role to play in the future of education (DiSessa, 1987; Foster, 1988). Even in the absence of overt demands, there is pressure for change.

Moreover, Fullan indicates several reasons, based on research, why school reform is necessary:

- Many innovative teaching practices of the new curricula of the 1960's and 1970's have not been implemented despite their endorsement in national, regional and local policy statements.
- There is an almost arbitrary variation and emphasis in classrooms on some subjects over others with many teachers teaching in subject areas for which they have limited preparation.
- Teachers do not have time for reflection or analysis either individually or collectively about what they are doing.
- There is every reason to believe that the textbook industry dominates the teachers' field of choice in many states in the U.S. and several provinces in Canada.
- Change is needed because many teachers are frustrated, bored and alienated.
- Most teachers do not take the initiative to promote changes beyond their classroom because of their cultural conditions and practicality concerns (1982, pp. 116-120).

And finally, Fullan, Bennett and Rolheiser-Bennett (1990) have indicated that more is now known about effective schools. Educators have learned a great deal about classroom and school improvement recently and are able to make more informed decisions. From a number of points of view, then, public school education can, and should, change. It remains to be decided what form such change should take and who should implement it.

The Practice of Educational Technology

If schools should change, who will do it? What skills do educational technologists offer to the process? The colloquial use of "technology" connotes devices and related materials — especially computer hardware and software. However, it is technology as applied science that was meant by those who adopted the term "educational technology". *Instructional technology* has been recently defined as "a discipline concerned with the systematic design, development, evaluation, and management of instruction and instructional materials" (Branch, 1990, p.6). Educational technology has been variously viewed as either including, or a subset of, instructional technology (c.f. AECT, 1977, p.3).

The Systems Approach

Regardless, the field is most often associated with the systems approach to the design and development of instruction. This includes such techniques as needs assessment, articulating behaviourally stated objectives, using objectives to determine strategies/media and evaluation criteria, and carrying out some

form of assessment of the product or service (Rossett, 1987). Assessment of student performance should be examined in light of the developed objectives to determine whether instruction should be revised and whether learners require remediation (Dick & Reiser, 1989, as cited in Reiser & Mory, 1991). An educational technologist would be someone proficient in this approach.

For some, the systems approach is sufficient. Heinich (1984), for instance, claims that instructional technology allows all instructional contingencies to be managed through time and space. The application of the systems approach permits the development of reliable and replicable instruction. However, the argument that educational technologists know enough about instruction and, particularly, the role of media, to effectively direct and manage learning is in dispute. Clark and Sugrue (1988) conclude that media do not directly influence learning. Further research is needed to determine the necessary conditions for learning.

The Cognitivist Paradigm

In fact, the research focus in the field of educational technology in recent years has been characterized by a shift towards understanding the learning process and to a greater adherence to cognitive theoretical orientations (Bernard & Lundgren-Cayrol, 1991). Many writers now consider the systems approach to reflect a dated paradigm - behavioural psychology. Nunan (1983) insists that the emphasis of the systems approach on behavioural objectives results in a focus on discrete, overt behavior. It takes control out of the hands of teachers and conflicts with the creative and adaptive nature of teaching. The cognitivist view is that learners actively process the information presented to them and construct their own meaning from instruction (Winn, 1989). Winn argues for the use of first principles of learning. Educational technology will only advance when "students of instructional design are taught to reason about the consequences of instructional strategies for learning and not just to follow prescribed steps in a design model" (p. 43).

Those advocating cognitive constructivism go further. From this perspective, learning is not the process of mapping the real world into the mind of the learner. Rather, how one constructs knowledge is a function of the prior experiences, mental structures, and beliefs that one uses to interpret objects and events (Jonassen, 1991). That one can specify in advance what a learner might or might not learn, then, is debatable. The capability of the systems approach to produce reliable and replicable instruction is thrown into question.

Resolving Conflicting Viewpoints

Given these varying views of the practice of the educational technology, can its proponents offer anything to public school education? Rossett (1987) stresses that there is a body of research and theory to apply. It is a question of which theories and how well they are applied. Reigeluth (1989) believes that the uncertainty indicates that the field of educational technology is at a synthesis stage. There is, in his view, "a considerable knowledge base of validated

prescriptions, [albeit] primarily for the simpler types of learning." Practitioners now need to think holistically and concentrate on "building components into optimal models of instruction for different situations" (Beigeluth, 1989, p.70).

These conflicting viewpoints may reflect a healthy field which remains open to debate and can adapt to new paradigms, that is, change itself. How its practitioners can effect (or affect) change in the public school system will depend on which view of the field they hold, the circumstances under which they become involved and the role they choose to play.

THE ROLE OF THE EDUCATIONAL TECHNOLOGIST IN PUBLIC SCHOOL EDUCATION CHANGE

Given that change is both needed and possible in public school education, what role can educational technologists play in the process? Salisbury (1987) notes three distinct approaches to improving public schools: school system reorganization, the teacher-training approach and the diffusion/adoption approach.

Change the System

Many writers argue that public schools are outmoded. Long-lasting change will only occur if school systems are radically re-organized or restructured. Views of how to do this, however, vary widely (Heinich, 1984; Reigeluth, 1987, 1991; Branson, 1987; Peck, 1991; Banathy, 1991).

Use the systems approach. Heinich (1984) claims that the application of educational technology (i.e., the systems approach) can result in superior instruction in schools. In his view, "the basic premise of instructional technology is that all instructional contingencies can be managed through space and time... Primary emphasis is given to the development of more powerful technologies along with the development of organizational structures that facilitate their use" (p. 68). Such organizational structures would place subprofessionals (aides) in the most frequent contact with students and reserve professional contact for specific instructionally oriented purposes. Educational technologists would create change in public education by creating large scale mediated instructional systems to replace the current system.

Branson (1987) attributes declines in school performance and quality to an obsolete management model, improvements to which "have reached their practical upper limit; that is, performing in the vicinity of 97% to 98% as well as they can ever function *according to the current design philosophy* [original emphasis]" (p. 16). This archaic classroom concept should be abandoned in favour of a school environment that is designed for function; that is, both individual learning and group processes. Branson advocates the use of the systems approach but in conjunction with change models, improved management models and other approaches for improving instruction. Educational technology has a role but is not the sole player.

Use systems design. Banathy (1991) states that public schools represent the design of an earlier (industrial) society. Previous reform efforts have failed because they "have not grappled with the essential nature of education as a societal system", one which is "embedded in the rapidly and dynamically changing larger society" (Banathy, 1991, p. 12). The solution, he claims, lies not with the systems *approach* advocated by educational technologists, but in the use of systems *design.* Banathy's systems design consists of four spirals of activity: a) the creation of an image of a future educational system, b) the development of a core definition and system specifications, c) the description of system functions, and d) the design of systems and organizations to manage and carry out the specified functions. Banathy offers a specific methodology for restructuring schools but defers the particular design to the individual community.

Other writers suggest specific designs. Reigeluth (1987, 1991) calls for the development of a third wave educational system. Piecemeal modifications of the present system will not work and system-wide planning and modification is required. Reigeluth offers a blueprint for a cluster system operating on an entrepreneurial basis. Teachers, working cooperatively within clusters, would serve as guides to help each child meet individual goals. Much of the instruction would be provided by independent learning labs to which the clusters would have access. Like Branson, Reigeluth views educational technology in a service, not commanding, role.

The approach of Project Rethink (Peck, 1991) is a cooperative effort between the Pennsylvania State University and a local school district to reinvent middle school (junior high) education. Standard subjects and the traditional school day are being replaced with four activity strands: a) multidisciplinary projects, b) creativity, problem-solving and thinking skills, c) independent study, and d) basic knowledge and skills offered via computer-based instruction (CBI). The CBI is being developed by a team of instructional designers from the university. Other schools and school districts interested in the project will be supplied with a series of steps to follow, a list of materials and equipment to acquire and a pre-designed set of learning materials.

Restructuring and the change process. Which, if any, of these positions is feasible? Although Heinich insists that educational technology provides a clear alternative, his position on the capabilities of the field is in dispute (e.g., Clark & Sugrue, 1988; Kerr, 1989). Nor does he take change theory into account. His approach demands fidelity of implementation or what Berman (1981) termed a *technologically dominant process.* Berman, however, notes that "the interaction between an educational technology and its setting can be uncertain because of the technology's characteristics or how it is used" (p. 262). How an innovation is implemented may be as important to outcomes as its initial technology. Reigeluth and Peck have addressed implementation, although only Branson specifically discusses change models. Banathy's systems design is a form of change model but is quite extensive in scope. Also, the question of who would implement this approach is problematic, for as Banathy (1991, p. 154) notes, "neither schools of education nor educational professional development programs offer curricula in systems design".

Regardless, while demonstration projects such as that developed by Peck (1991) may be successfully implemented in one or two schools and even draw acclaim, such restructuring efforts are not likely to become widespread. The pressure for large scale changes is not likely to bear fruit because of the diversity created [in the U.S.] by state and local control of education and because "that control is rooted in the United States Constitution by the strongest kind of political support" (Burkman, 1987, p.31). That argument holds true in Canada as well. Further, considerable research (Berman, 1981; Fullan, 1982) has indicated the difficulty of implementing and institutionalizing even small scale change.

Teach the Teachers

Teach the systems approach. Some propose to train teachers to use the systems approach to improve instruction (e.g., Snelbecker, 1987; Klein, 1991; Earle, 1992). Snelbecker (1987) advocates that teachers be taught instructional design skills both in preset-vice and inservice education. He contends that teachers "need at least fundamental instructional design strategies to plan, evaluate and modify instruction as a regular and continuing part of their classroom duties" (p. 35). He offers several suggestions for addressing "technology transfer" problems, including providing assistance to teachers in recognizing how instructional design techniques can be made relevant for their day-to-day activities, assistance for integrating content and method and assistance in recognizing how some aspects of a theory may be adopted or adapted for their setting. Further, Snelbecker postulates that contemporary uses of microcomputers in education might lead to increased interest in instructional design skills and provide a window of opportunity.

Earle (1992) concurs, stating that it is the school system that requires attention and that this can be improved by means of systematic design of instruction. He provides evidence that courses in instructional design can be successfully incorporated into the undergraduate teacher education program. Further, teachers thus trained report that a knowledge of systematic design processes has improved their planning (Earle, 1992). A study by Klein (1991)also demonstrated that preservice teachers were successful in acquiring and using principles of learning and instructional design. Reiser and Mora (1991) compared the planning of an experienced teacher trained in systematic design to another not trained. They concluded that teachers who have received formal training in the use of a systematic planning model are likely to employ it. The assumption here is that the application of the systems approach by teachers will lead to improved instructional planning and practice. However, some research evidence indicates that this may not be the case. Reiser and Mora (1991) also found that teachers not trained in the systems approach still plan their instructional activities with their objectives clearly in mind. Further, trained or not, teachers work mainly from mental plans and their planning processes are quite similar. Only in the area of student assessment is the difference striking. A teacher trained in the systematic design used far more written tests to verify achievement

of unit objectives while one not trained in the process relied on informal observation. Moreover, according to Branch, Darwazeh, and El-Hindi (1992), the argument for training in the systems approach is fallacious because teachers already engage in instructional design practice. Their study revealed a positive correlation between teacher planning activities and instructional design practices. The problem, they suggest, is that instructional design jargon inhibits communication between educational technologists and teachers.

Engage in staff development. Shrock and Byrd (1987) suggest that educational technologists would "find it instructive to examine the messages that are currently beingdelivered to teachers through staff development [because it] is one of the most influential forces currently impinging on teacher behavior" (p.45). They argue that the instructional design model has much in common with both the effective teaching message and the reflective teaching message, but offers a more comprehensive schema. Educational technologists should enter the debate taking place within the field of staff development. As well, like Snelbecker and Earle, they advise educational technologists to become involved in preservice teacher education in order to provide teachers with a "frame of reference to put instructional research findings into perspective and to apply the results conditionally" (p.52).

Train the school media specialist. Schiffman (1987) suggests that educational technologists train school media specialists as internal change agents. It is her view that "technological developments and the growing interest in information literacy have brought school library media centers to prominence among educators" [and that] "the computerization of library systems is also finally making it possible for school library media specialists to devote a portion of their time to instructional matters" (p.41). Schiffman notes that more than a third of all graduates of educational technology programs take positions in school library media centers but tend to come from programs that emphasize "media" rather than "instructional systems design". She argues that these school library media specialists be trained in instructional design theory and the use of computer and information technologies. Thus armed, they would be well equipped to act as in-house change agents by providing design and production advice to teachers.

Teaching teachers and the changeprocess. Such indirect approaches are more likely to succeed than the advocacy of wholesale change to the public school system. Rather than an implementation dominant process, they represent what Berman (1981) terms *mutual adaptation;* that is, both the innovation and the organization adapt. Berman suggests that effectively implemented innovations are characterized by this process. As well, by considering teacher practice, they are also indicating the appropriateness of the innovation, an important step according to Fullan (1982). When the innovation is a completely restructured school or school system, it is doubtful that mutual adaptation occurs —even when teachers are involved in the change, as was the case in Project Rethink (Peck, 1991). Complete restructuring is necessarily implementation dominant.

However, it is not clear that any of the proposals to convert teachers into educational technologists takes into account all three dimensions that Fullan

considers necessary to achieve change. They address the possible use of new teaching approaches and the possible alteration of beliefs, but not the provision of new or revised materials. It is presumed that teachers, or school library media specialists, will use the newly acquired skills to develop their own. These proposals fall one step short. Even educational technology graduates often find it difficult to make full use of the systems approach in the field (Eossett, 1987; Lange & Gravdahl, 1989).

Take a Diffusion IAdoption Perspective

Some educational technologists believe that members of the field can be effective *external* change agents. They stress the application of change theory in effecting reorganization in public school education.

Work at the system level. Despite the more recent evidence (Earle, 1992; Branch, Darwazeh, & El-Hindi, 1992) to the contrary, Burkman (1987) insists that current school practice does not even meet the minimal requirements for systems design. Goals often remain tacit and objectives left unstated, let alone written in behavioral form. In his view, the most realistic way to get instructional systems design utilized in the classroom is to work to reduce the complexity of the existing system. He advocates focusing at the local school system level, developing projects which concentrate on a single subject and focus on subjects which are skill oriented and easy to attack with the techniques of educational technology.

Work directly with teachers. Dalton (1989) asserts that educational technologists make ideal change agents. The systems approach allows them to determine if a change is needed, analyze the environment, evaluate the consequences of their actions and decide on courses of action based on the best evidence available. Dalton advocates that educational technologists examine their solutions in light of the wants of the implementors and offers several suggestions. The majority involve creating instructional materials and working with teachers directly to effect change. Dalton suggests: a) building cooperative computer-based learning environments and friendlier computer interfaces, b) developing software integrated with routine curriculum objectives, c) providing teacher training in the use of the particular innovation, d) letting the teacher make the decision about the use of computer technologies and/or e) defining new roles for the teacher as counsellor, developer and manager.

Kerr (1989) concurs with Dalton. He rejects the views of Heinich and others who would strictly apply the systems approach for ignoring schools as social institutions and focusing narrowly on the transmission of information. Educational technologists should work with school reform communities on: a) the preparation of models of teaching-with-technology, b) the design of software, c) the creation of computer-based tools to support teachers' professional development, and d) the improvement of research on teaching-with-technology. Mappin and Campbell-Bonar (1990) provide an example with their approach to the development and implementation of interactive video. They stressed building client involvement and presenting alternative approaches to instruction and theory at different points in the process. They identified seven selected points of intervention:

- analyzing the audience, keeping both the instructors and students in mind;
- identifying educational and training needs;
- stating detailed learning objectives in terms of "plausible" responses to classroom situations;
- selecting media appropriate to instructor needs;
- key decision makers accepting the final design;
- (the production phase) working with a core design team with the provision to allow key decision makers to review work at specific points;
- (the implementation phase) introducing the final product, [and providing] inservice sessions for instructors at the beginning of the term, supporting materials, a utilization consultant and on-going equipment and technical support (pp. 8-11).

Emphasizing the importance of implementation led to a model which helped ensure that process but also led to materials more directly tied to perceived problems.

CONCLUSION

It is the view of this writer that the diffusion/adoption approach offers educational technologists the best route to generating change in the public schools. It takes full advantage of their expertise by allowing them to apply their instructional design skills to the improvement of instruction and also takes into account Fullan's (1982) three dimensions of change. In fact, Dalton (1989) and Kerr (1989) have independently suggested many of the criteria advanced by Fullan, Miles, and Anderson (1988) as necessary for an effective strategy for implementing microcomputers such as local responsiveness, initial acceptance of an uncertain target, provision for increasing target clarity and intense, sustained, responsive assistance.

Educational technologists must maintain a realistic view of what their design techniques can achieve and continue to improve them in light of developing theory and technology. That, coupled with a sound knowledge of change as a process and a willingness to accept the role of external change agent working in cooperation with teachers, administrators and other educators, could make them valuable indeed in initiating needed change in public school education.

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