"A PLACE AMONG THE FOSSILS": USING METAPHORS FROM IMAGINATIVE LITERATURE TO MANAGE CHANGE IN OUR SCHOOLS

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ABSTRACT. There is a significant focus in educational research that explores the nature of change in schools. In particular, researchers appear to be examining ways to minimize the negative aspects of change for both educators and students. One change that schools are currently struggling with is the use of technology – both in terms of the integration of technology into educational delivery systems and whether technology should have a place at all in schools. This paper explores the potential of metaphors derived from familiar imaginative literature as a means of reducing the stress associated with change, and also as a means of effectively conveying the need for change – especially with respect to the use of technology in schools.

«UNE PLACE PARMI LES FOSSILES» : L' UTILISATION DE MÉTAPHORES DANS LA LITTÉRATURE IMAGINAIRE POUR MIEUX GÉRER LES CHANGEMENTS DANS NOS ÉCOLES

RÉSUMÉ. Maintes recherches en science de l'éducation traitent de la nature des changements dans nos écoles. De façon plus précise, les chercheurs semblent vouloir étudier différents moyens de diminuer les effets négatifs du changement pour les éducateurs et les élèves. L'utilisation des nouvelles technologies est un changement auquel les écoles sont actuellement confrontées. Deux aspects sous-tendent ce changement : l'intégration des technologies dans la pédagogie et la pertinence même de la présence des nouvelles technologies dans les écoles. Cet article traite du potentiel des métaphores, puisées dans la littérature imaginaire populaire, comme moyen pour réduire le stress causé par un changement, ainsi que comme moyen pour sensibiliser étudiants et professeurs au besoin de changement; et ce, particulièrement en ce qui concerne l'utilisation des nouvelles technologies dans les écoles.

A common theme in contemporary educational literature holds that education is at a crossroads that has brought us to the brink of significant change. The crossroads image evokes a Frostian ". . . two roads diverged in the yellow wood . . ." situation that not only requires a choice but also suggests that there may be a poor or incorrect choice. The choice may be to make changes or to simply continue to observe the status quo. Nevertheless,

the choice will inevitably have significant consequences for both students and educators.

A prominent educational research focus lies in exploring the nature of change in schools and, particularly, in minimizing the negative aspects of change for educators and students. For example, Fullan (2001), explores a variety of issues worthy of consideration in managing the process of change. However, it is not change itself that causes so many difficulties for people but, rather, it is how individuals think about change. He states "we have become so accustomed to the presence of change that we rarely stop to think what change really means . . . the crux of change is how individuals come to grips with this reality" (p. 29).

Change implies that individuals must give up or, at least, soften their grip on their current views, practices and/or beliefs and accept or integrate new ones in their place. This integration of new ideas rarely takes place without difficulty. Marris (as cited in Fullan, 2001) observes that "*all* real change involves loss, anxiety and struggle" (p. 30, emphasis in the original). One might say that the feelings of loss, anxiety, and struggle will be particularly evident among teachers during the change precipitated by the emergence of information technologies because they have the potential to radically alter the traditional teacher/student relationship to one in which the students "learn to be constructors of knowledge and to think rationally, creatively, and critically . . . [as they] solve authentic problems [and] retrieve and manage information" (Lowe & Vespestad, 1999, p. 35). This shifts the responsibility for learning to the student and changes the role of the teacher from knowledge dispenser to that of a learning facilitator or coach. Means (1994) fleshes this idea out with her observation that this new orientation requires teachers to be

> responsible for setting up the inquiry units and for creating the organizational structure within which [students] do their work. But once the work begins, teachers no longer have the total control of the direction of instruction that they exercise in conventional classrooms. (p. 8)

While there are a wide variety of methods to help people come to terms with the reality of change, cognitive tools such as metaphors appear to have a significant impact on individuals' abilities to cope with change. "[Metaphors] enable us to build bridges between the known and the unknown through in-depth comparisons . . . extend[ing] our understanding of the connection of one phenomenon to another" (Brown & Moffett, 1999, pp. 32-33). Metaphors may be effective in reducing the anxiety associated with change by allowing the individual to have one foot in the familiar and yet place the other foot in the new or unfamiliar paradigm. Thus, an individual may use a metaphor as a tool to provide a "safe" platform from which change can be contemplated, considered, and visualized. In short, one can try the

change on for size and walk around in it for a while. As suggested by Brown and Moffett (1999), "the metaphor . . . can serve as a powerful frame or mental model to guide and inform the process of educational transformation" (p. 35).

Primary sources of useful metaphors include visual art, popular culture, films, music, and fictional literature. Porter (1991) agrees by observing ". . . the humanities can play a valuable role in educating people to be effective in organizational life" (p. xv). If Fullan (2001) is correct in his observation that change is a fact of organizational life, then an individual's effectiveness in organizational life might be a function, in part, of his or her effectiveness in coping with change. "Beyond shaping the way we think and act, metaphors also help us to solve problems . . . [by] mak[ing] the strange familiar" (Brown & Moffett, 1999, pp. 35-36). Perhaps, therefore, organizational leaders can reduce the anxiety associated with change and enhance the effectiveness of change by incorporating metaphors and other images from classic or familiar works of imaginative literature into the change process itself.

In the spirit of using the familiar as a bridge to the unfamiliar, I drew on my background as a high school English instructor for this article. I chose one of my favourite novels, *The Chrysalids* by John Wyndham (1955), as a source of metaphors to explore the issue of change in schools and, especially, the changes necessary to foster effective use of technology in schools. The novel's stance on change and society, as well as its status as being a relatively well-known work, made it immediately appealing to me as a frame around which to build this paper. Thus, the focus for this paper is to explore the usefulness of fiction in this context by applying a number of key metaphors and images derived from *The Chrysalids* to the pedagogical changes inherent in the incorporation of technology into contemporary education. In other words, what lessons can Wyndham's novel offer for contemporary educators as they cope with technological change in their schools? I will begin with a brief synopsis of the novel and an explanation of the reasons for the choice of this novel as a source of metaphor. Then I present a series of brief quotations from the novel; through these I structure the discussion of the management of technological change in contemporary education.

THE NOVEL

The Chrysalids is a post-apocalyptic novel that, on the surface, is an anti-technology treatise. The basic assumption of the story is that modern man had developed his technological abilities without adequately developing his communicative abilities. This imbalance resulted in a cataclysmic nuclear war that destroyed nearly everything and everybody on Earth. A key view brought to the surface in the novel is that while humans had evolved physically as far as they could, the human mind had not yet reached its full

potential. In fact, the war actually provided the impetus, both literally and figuratively, for the further evolution of the human mind. The nuclear fallout, over time, actually resulted in the protagonist, as well as a number of other characters, developing the ability to communicate telepathically. While a gift in many ways, this ability caused virtually insurmountable problems for them and their society.

The story takes place in Waknuk, a small agrarian community in Labrador. "This novel looks beyond the pessimistic future shrouded in the 'mushroom cloud' into the time of reconstruction after such an event . . . we are shown a world of the frontier" (Lowensteyn, 2001, p. 2). In *The Chrysalids*, the people have survived the chaos and destruction of a nuclear holocaust and started over. They have reached the stage of organized community life reminiscent of the 1800's and have developed ". . . a strict and stern inflexible morality based on a dark, incomprehensible fear of an unknown past" (Lowensteyn, 2001, p. 3). Over the generations, the community has forgotten the true nature of the destruction and has, instead, developed a religious explanation for the genetic mutations and for the destruction itself. They say that God had sent "Tribulation" on them and that they must continually strive to climb back into God's graces by destroying all that does not fit the "definition of man" or "the true image."

A common view of frontier life depicts the pioneers building and developing towards a vision of a new and exciting future. In contrast, "the people of this frontier do not look towards a new future, but instead have an all consuming passion for stability" (Lowensteyn, 2001, p. 3). This stability was viewed as the foundation in which the technological and societal marvels of the "old people" could be resurrected and preserved and became the vehicle by which the people of Waknuk could regain God's favour.

It is possible to justify their passion for stability by evoking current scientific understandings about the genetic mutations caused by exposure to nuclear radiation. However, "out of their fear of physical change, a severe conformity to the 'true image' has developed, a set of beliefs which stifles the human mind and much worse, the human spirit" (Lowensteyn, 2001, p. 3).

The novel's central thesis is that inflexibility and rigidity leads to stagnation of the human mind and, ultimately, of the human race itself. This paper uses a parallel thesis which suggests that since the human mind is developed, in part, by education, inflexibility in educational pedagogy could also ultimately lead to stagnation of the human race. I recognise that this position is overstated – implying that contemporary educators are doing a poor job of educating students. After all, technology is most certainly not some sort of panacea that will cure all of education's ills. In fact, often against incredible odds, teachers successfully and effectively teach and inspire students to be their best. Technology is merely a tool. However, "as the

Internet takes up residence in our offices, homes, and schools, we no longer have the prerogative to view technology as optional" (Oseas, 2000, p. 3).

If we compare the current role of technology in our society to the role of technology in many classrooms, a significant gap becomes evident. Cuban (2001) argues that in both milieus, technology has achieved a "ubiquitous presence." However, only in the world outside the classroom has technology become fully integrated into day-to-day operations. "School computer use – at least for most of the children in our society – [is] not infused into traditional curriculum subjects nor [are] children exposed to subject-related academic computing in school" (Giacquinta, Bauer, & Levin, 1993, p. 101). Rather, technology use is often used "solely for enrichment and reinforcement" (Cuban, p. 52). Thus, a typical child's experiences with technology in the classroom often evoke the image of a "thousand dollar flash card" (Papert, 1993, p. 41) in that the computer is used primarily as a drill machine or, perhaps, as a typewriter.

Nevertheless, as argued by Means (1994), education is "ripe" for real change in a way that has never existed before. "A new willingness to consider profound changes to the educational system is apparent in the current reform efforts of governors, state legislators, business coalitions, and teachers' associations" (p. 2). With the spectre of the school reform movement hanging over our educational systems:

> in many places, serious school reform is being undertaken without any real consideration of the facilitating role that technology might play. Even more common is the introduction of new instructional technologies without any serious consideration of how these technologies might further school reform goals. (p. xi)

In other words, the two movements – school reform and the implementation of educational technology – should, or at least, could complement each other. "I have come to believe that the causal relationship [between school reform and educational technology] flows at least equally strongly in the other direction – that is, that education reform makes a school ripe for technology" (Means, p. xii). This paper does not advocate blind acceptance of technological innovation. However, it does advocate a critical examination and implementation of technological possibilities which are educationally sound in a way that integrates technology into the very fabric of educational practice.

Dolence and Norris (1995), in their examination of post secondary education, suggest that education systems are currently organized to develop in students a skill set which was appropriate in the industrial age, but society has shifted to an information age. Thus, they theorize, the skill set possessed by graduates of contemporary education is somewhat out of date in relation to the societal reality they face upon graduation. The similarities between

education's resistance to pedagogical change and Waknuk society's rigid stance on innovation and change are unmistakable. Thus, *The Chrysalids* seems a good choice as a source of metaphors and images to discuss technological change in education. In recognizing the risks inherent in resisting necessary change in Waknuk, educators may be better able to recognize the need for change in their own contexts.

THE NORM IS THE WILL OF GOD

"The norm is the will of God" is representative of Waknuk's religious precepts. It is connected to a series of "inspirational" wall hangings which decorate David's house. Other statements in the series include "only the image of God is man," "keep pure the stock of the Lord," "blessed is the Norm," and "the Devil is the father of deviation" (Wyndham, 1955, p. 18). These statements illustrate the obsession that Waknuk society has with stability and the status quo and foreshadow the "punishment" of those who are deemed "deviant."

Clearly, innovation and change are viewed by the residents of Waknuk not only with suspicion but also as the work of the devil. The existing order is seen as having been preordained by God. Maintenance of the established order is not only expected but demanded as a condition of continued membership in the society. These precepts are a clear statement of the established customs and moral codes of the society. Those who do not conform either in their appearance to the "norm" or to the established ways of thinking are literally banished to the "Fringes," an area south of Waknuk which was more severely affected by the nuclear fallout.

In contemporary education, just as in Waknuk, the forces controlling change are often part of the very fabric of the organisation. Fullan (2001) observes that "the forces reinforcing the status quo are systemic. The current system is held together in many different crosscutting ways" (p. 7). In a similar vein, Papert (1993) states "there was a time when I believed, as many people do, that teachers would be the most difficult obstacle in the way of transforming School [sic]. [However] this simplistic belief . . . is in reality a far greater obstacle to educational change than the fact that some teachers actually are conservative" (p. 57). In other words, it is not so much the teachers who block change – they are just the most convenient and obvious targets. Instead, it is the educational community as a whole that obstructs change.

Papert describes schools as biological systems ". . . which act like any living organism in defending itself against a foreign body. [Schools] put into motion an immune reaction whose end result would be to digest and assimilate the intruder" (p. 40). In this illustration, the intruder could be understood to be either the teacher who is an innovator or who forwards a new approach to instruction (for example, authentic and appropriate use of

technology). Thus, the innovator is repressed and co-opted to remain the same by the forces of the institution itself. Alternatively, teachers may become prisoners of their own paradigms and would, therefore, be unable to see or realize the true educational potential of information technology.

According to Thornburg (2002), "one of the few institutions that have escaped relatively unscathed by the disruptive technologies of the past 50 years is 'school.' By and large, schools have avoided change by ignoring, banning, or trying to co-opt new technologies" (p. 84). In this way, "School [sic] did not let itself change under the influence of the new device [computer]; it saw the computer through the mental lens of its own ways of thinking and doing" (Papert, p. 41) and force-fit it into an already-existing role. Fullan (2001) suggests that this tendency to see new technologies or ideas in light of old ones is common. Wood (2001) points out that without the necessary training and support, even "techno-enthusiasts" who were among the first to recognise the potential of technology and began using it, "often fall back on the out-dated teaching styles they grew up with, such as behaviour/response, rather than incorporating new constructivist theories about learning by doing" (p. 122). However, in view of the place technology holds in contemporary society, educators are challenged to explore new pedagogical possibilities particularly in the area of technology, and evaluate them for use in classrooms. Even more importantly, school systems are challenged to provide the necessary professional development to ensure appropriate technology use. After all, "when used by knowledgeable teachers in a supportive educational context, these new technologies can significantly enhance teaching and learning" (Wiske, 2001, p. 69).

If the forces reinforcing the status quo are systemic; the forces required to effect change must also be systemic. "[Change] requires intensive action sustained over several years to make it possible both physically and attitudinally for teachers . . . it means changing the cultures of the classrooms, the schools, the districts, the universities, and so on" (Fullan, 2001, p. 7).

Yet the fundamentals of education have changed little throughout human evolution. For example, a modern mathematics teacher teaches concepts that are hundreds or thousands of years old, often supplementing his or her lectures by drawing on a piece of paper under a document camera or writing with a piece of chalk on a blackboard. One could argue that, from the student's point of view, this educational experience differs little from the experience of Pythagoras's students.

On the one hand, it certainly could be argued that Pythagoras's students were likely able to understand and apply his mathematical concepts at least in part due to his tutelage. Thus, the teaching methods he used were appropriate and successful and, perhaps, require no change for contempo-

rary applications. In this view, the concept has not changed so the approach used to teach it need not change either. Conversely, it could be argued that since both the context for the application of the mathematical concepts and the individuals who are learning and applying the concepts have changed, the method for teaching those concepts must change as well. This sentiment is common in much of the literature regarding educational change. For example, Fernstermacher (1990), observes that:

> Flying itself has not changed; it is still a matter of moving from one point to another in three-dimensional space. What has changed are the demands that must be met in order to fly well in the air traffic system of today. Neither has teaching changed in fundamental ways; it is still a matter of instructing and assisting students so that they acquire the knowledge, understanding, traits of character, and conduct required for a personally rewarding life, productive employment, and effective citizenship. But teaching under the condition of modern schooling is vastly more complex than it was thirty or forty years ago. (p. 140)

Similarly, Papert (1993) uses the following parable that is illustrative of this point:

> Imagine a party of time travelers from an earlier century, among them one group of surgeons and another of school-teachers, each group eager to see how much things have changed in their profession a hundred or more years into the future. Imagine the bewilderment of the surgeons finding themselves in the operating room of a modern hospital. Although they would know that an operation of some sort was being performed, and might even be able to guess at the target organ, they would in almost all cases be unable to figure out what the surgeon was trying to accomplish or what was the purpose of the many strange devices he and the surgical staff were employing. The rituals of antisepsis and anesthesia, the beeping electronics, and even the bright lights, all so familiar to television audiences, would be utterly unfamiliar to them.
>
> The time-traveling teachers would respond very differently to a modern elementary school classroom. They might be puzzled by a few strange objects. They might notice that some standard techniques had changed-and would likely disagree among themselves about whether the changes they saw were for the better or the worse-but they would fully see the point of most of what was being attempted and could quite easily take over the class. (pp. 1-2)

Thus, the educational experiences of many students in today's schools could be said to bear more resemblance to Pythagoras's instructional methods than to any modern educational theories.

Cuban (2001) offers the following description of a classroom that "typifies" the classrooms of teachers who used computers regularly:

> There were four Macs in her room, two of which did not work. She had two others stored in a closet. [She] lets the students use the two that are

> working every day during choice time right after lunch. She calls the software . . . that she has loaded on the machines 'games.'
>
> [She] promotes computer use 30 minutes per day because she believes that the software motivates [her students] and it already ubiquitous in their homes. Although she believes that the applications - some of which are drills – extend concepts the children have already learned in class, she does not require every student to go to the computers. [She] uses computers solely for enrichment and reinforcement, rather than direct instruction. District-provided training has equipped her with sufficient skills to manage these software applications and to do minimal trouble-shooting of hardware problems. (p. 52)

In this example, the computers that do work are used frequently but not in a way that integrates them into the regular work the students are doing. However, Cuban argues that computers "must be integrated seamlessly into daily routines" (p. 49) in order for their true potential to be realised. Oseas (2000) argues that the school system itself must take an active role in fostering the integration of computers into classroom routines by providing high-quality training in the methods for achieving this integration. Otherwise, "educational technologies are likely to have little impact on students' abilities to learn without trained teachers to guide and frame their use" (p. 4). While the teacher in this example has been provided with minimal training to use the computers in her classroom, she has not had the opportunity to receive the level of training necessary to achieve full integration of computers into her daily instructional routines (and she does not have enough computers in her classroom to do it in any case).

Other authors are somewhat less critical of current educational practices but still suggest that today's educators have their focus on the past. Cleveland (1997, p. 13) argues, "to manage future complexities, we certainly can't keep using the concepts that served us so well in the industrial era [as we do now]." Similarly, Kozma and Schank (1998) posit that "currently, the emphasis in U.S. schools is on individual learning and performance - what students can do by themselves without the aid of other students or external supports such as books, notes, calculators, and computers" (p. 3). However, economists such as Reich (as cited in Kozma and Schank, 1998) suggest that there has been a ". . . dramatic shift in jobs away from those engaging individuals in production services, moving workers instead toward the role of 'symbolic analysts'. . . [who] use a variety of tools and resources, including computers and scientific and creative instruments . . . [and who] often have partners and associates and work in small teams" (p. 4). Thus, Gardiner's (2000), observation that "a human being miraculously transported from 1900 to our time would recognize much of what goes on in today's classroom – the prevalent lecturing, the emphasis on drill, the decontextualized materials and activities . . ." (p. 30) illustrates what Dolence and Norris (1995) call a factory model of education in which the practices of education were

designed according to society's (or the teacher's) view of the appropriate preparation for a future life as a factory worker. Since a teacher's instructional methods reflect, in part, his or her conception of what a child needs to know for the future, the conceptions of current teachers must also change. Otherwise, in this light, one may argue that today's schools prepare students for a future that no longer exists.

Kay (1997), accepts that computers have crept into educational delivery. He stresses, however, that educators have not gone far enough. "[The current uses of computers] represent a desire on the part of a future-shocked public to see a new technology only as a better version of an old one" (p. 19). This suggests that some educators have simply adopted the trappings of technological change without really implementing it. For example, an educational institution could require its instructors to use PowerPoint or some other electronic presentation program in their lectures. While this gives the impression that the institution is technologically advanced, the "advancement" is illusory because faculty may use it in an old way – as a "high-tech" over-head projector. "To change school practice, curriculum goals and materials, assessment policies and teacher development must shift. Without these changes, a new technology will merely be used to enact traditional practices" (Wiske, 2000, p. 73).

In addition, just as Waknuk's "deviants" were banished to the "Fringes", so too can educational innovators be ostracized by their colleagues. Greenfield (1986) posits "to choose and to acknowledge responsibility for ones' choice is often a risky way of living. It may require standing with those who are heretics by powerful and possibly vengeful authorities" (p. 63). Innovators are not always welcomed either by their colleagues or by their superiors. The following vignette is an example of the ostracism experienced by an educational innovator at the hands of colleagues:

> I was asked by my superintendent to join an on-line cyberschool project that he wished to get off the ground. Some fellow teachers had requested a transfer to the project but had not been chosen – they felt that it was a personal affront that one of their immediate colleagues had been selected. The principal of the school at which I was teaching told me that he was reluctant to permit me to participate because I would be away from school to participate in the project. However, what he really meant was that he was concerned not because I would be out of the classroom but, because I would be doing something out of the norm - it created problems for the principal in terms of scheduling. My use of technology in my "regular" classroom setting was also viewed by my colleagues as threatening. Some were worried that they would be expected to follow my lead and others expressed a certain level of jealousy that they were not able to use the technological tools in their classrooms due to hardware shortages.

While this experience was technology related, it did not need to be. Any innovation in a school can lead to similar reactions among staff. Consequently, the norm is reinforced as being "the will of God."

A RUSTED MIRROR

The phrase "a rusted mirror" comes from a discussion between David (the protagonist) and his uncle Axel. "A word, he said, a rusted mirror, reflecting nothing. It'd do the preachers good to see it for themselves. They'd not understand, but they might begin to think . . . What are we doing?" (p. 79). In part, this statement is another illustration of the education's tendency to stolidly maintain the status quo. However, it also refers to individuals' tendencies to adopt accepted meanings without question as well as the tendency for phrases to lose their meaning if they have been learned by rote and/or become overused. The word referred to in David and Axel's discussion is "Tribulation." Axel observes that when the context for the word has been forgotten or when the word becomes a rote response; then, the word become like a rusted mirror – it reflects no meaning. While educational pedagogy must change to incorporate technology, this change must be considered and thoughtful – not just surface adoption of educational technology because it is the current bandwagon on which to jump. McAdoo (2000) observes that schools and governments have responded to public pressure by placing large numbers of computers in schools. Further, Kleiman argues that "the investment in technology for schools resembles the investments being made in many 'dot-com' Internet companies. In both cases, the investments are based on the *potential* of new technologies, in the hope that this potential will be fulfilled in the coming years" (p. 7, emphasis in the original). However, as pointed out by Wiske (2000), the mere presence of technology does not change school practice – curricular goals and materials, assessment policies, and teacher development must change as well. Consequently, "[while] counting the computers in a school and comparing the total with other schools is straightforward; assessing what and how children are learning is another matter altogether" (p. 145).

The purpose of most educational reform proposals is, and should be, to improve instruction and enhance student achievement. Indeed, a common phrase that has almost become a mantra in current educational circles is "What's good for kids?" However, as stated in the previous section, schools are tending to prepare kids for a future that may no longer exist. Gardiner (2000) suggests that "much of education in the past [and present] was calibrated to make sure that individuals could carry out a regular job, reliably, throughout their productive adult years" (p. 31). It is an admirable and, perhaps, a desirable ambition for schools to provide a school environment that resembles a likely future place of employment for students.

However, one must ask what sort of future employment environment today's students will face. For example, most of the tasks that can be handled algorithmically are or soon will be handled electronically. Also, statistics suggest that fewer people will occupy the same occupational niche for their whole lives than was previously the case (Gardiner, 2000). Thus, today's educational systems resemble an assembly line model commonly referred to as an industrial model of education (Dolence & Norris, 1995) or a factory model (Shaffer, 2000) that was appropriate in the past but may no longer be in the present. While it may be appropriate to view school as a place to enculturate students to the world of work most likely to face them as adults, that environment must be accurate.

Thus, a potential future reality for education must recognize that our society has entered an information age that is, perhaps, unparalleled in human history. In fact, "information . . . has quite suddenly become the world's most important resource" (Cleveland, 1997, p. 13). Therefore, students must be encouraged to use technology to cope with and utilize this vast array of information much as they may be required to do in their adult work lives.

In addition, a potential future for education must take into account society's changing expectations of a high school graduate. "This most recent shift [in expectation] is requesting and even demanding that educational institutions produce graduates with computer and technical skills, strong work habits, effective teamwork skills, problem-solving skills, and literacy and numeracy skills" (Jefferson & Edwards, 2000, p. 138). This is, indeed, a dramatic shift from the traditional expectations of schools and one only a shift in the educational paradigm can serve. Most descriptions of successful integration of educational technology describe an educational experience in which students work cooperatively in authentic projects and assignments which address most if not all of these new societal expectations and will begin to reflect more of the potential of information technology in schools.

"GOD'S LAST WORD"

> They weren't God's last word like they thought: God doesn't have any last word. If He did He'd be dead. But He isn't dead; and He changes and grows, like everything else that's alive. So when they were doing their best to get everything fixed and tidy on some kind of eternal lines they'd thought up for themselves, He sent along Tribulation to bust it up and remind 'em that life is change. (Wyndham, 1953, p. 153)

The above quotation, from one of David's captors, is in response to David's shock at the variety of life forms in the Fringes. David looks around him and realizes that the world is not as homogenized as he had previously thought. While he had asked Axel and others questions about life outside of Waknuk, David had never really made the connection between what he knew intel-

lectually to be true and what was actually true. He also began to internalize the ironic realization that he was more a being of the Fringes than of Waknuk due to his telepathic abilities.

In the organizational context, this quotation has particular significance. Many schools, especially good or effective ones, tend to forget that continuous reflection and change is necessary to maintain an effective organization. Much of the school effectiveness and improvement literature suggests that all schools can and should continually strive to improve. Of course, improvement also implies change.

Fullan (2001) identifies "three broad phases to the change process" which he calls "initiation, implementation and institutionalization" (p. 50). The following discussion of the change process will be organized according to these headings.

Initiation

Initiation, according to Fullan (2001), is when "someone or some group for whatever reasons initiates or promotes a certain program or direction of change" (p. 50). It would be hoped that the information presented in this paper along with the vast body of evidence suggesting the change in technology focus would provide schools with the motive to initiate change. However, they may ask "How? Where do we start?" Perhaps, then, it would be valuable to examine the successful initiation procedures of a couple of schools in order to identify a possible strategy in this regard.

Lowe and Vespestad (1999) outline the initiation process of the West Junior High School in Lawrence, Kansas in the following way. The school began with a group of students expressing an interest in computer programming. They convinced a teacher to provide supervision and began a club to learn from each other. Over the course of a few years, the program grew until the school community recognized a need for and created a new mission statement reflective of the growing importance of technology in the lives of their kids and in society in general. The school states this mission as follows: "... student work should incorporate a variety of complex information sources that will motivate a desire to expand the knowledge base. For teachers, professional development goals include achieving an instructional transition from a teacher-centered to a facilitative, learner-centered, constructivist environment that supports [local] exit outcomes" (p. 30). From there, the school went about implementing or operationalising the mission statement and has created a learning community which recognizes the importance of technology in word and deed.

A more general but similar strategy was advocated by Mehlinger (1997). He suggested that schools form broad-based committees made up of teachers,

administrators, and community members (parents) which should lead the planning process and define the mission. Instrumental to the success of this plan, in his view, is that ". . . a small group . . . should not decide key issues without consultation with others" (p. A23). However, many other authors would suggest that the key issues in most successful innovations could be and often are decided by a small group (perhaps one or two people initially) or the innovation may never get off the ground because it gets bogged down in the consultation process. Nevertheless, this committee (whatever the makeup), according to Mehlinger, should develop a vision, assess the available resources, decide on goals and objectives, decide on an action plan and evaluate the project regularly and objectively.

The above plans are echoed in much of the literature in the discipline. However, Bull, Nonis, and Becker (1997) identify an additional aspect of the change that seems likely to be a key ingredient if the change is to be successful. They emphasize the need for pointed professional development for teachers at the initiation stage in order to create an informed faculty and, perhaps, a more receptive one as well. In addition, it is suggested that ". . . one of the chief barriers to developing technology [interest] in teachers was lack of sufficient access to computers. . ." (Sheingold & Hadly cited in Bull et al., 1997, p. 30). Since "educational change depends on what teachers do and think . . ." (Fullan, 2001, p. 115), a "reculturing (how teachers come to question and change their beliefs and habits)" (Fullan, 2001, p. 34) will be necessary. Getting the faculty "on-side" both from a philosophical and a practical point of view would be an important step at the initiation phase. This could be addressed, at least in part, by providing teachers with access to, and instruction in, the use of computers.

Finally, Fullan identifies eight factors affecting initiation. Virtually all of the factors can be brought to bear on the decision to initiate a technology-based educational framework. In the interests of brevity, only the factors with the most impact on the process will be identified here. With respect to the existence and quality of innovation, it is clear that a variety of models exist (e.g., West Junior High). It would not be difficult for a school to adopt an existing model or to develop one of its own based on an existing model. Technology, itself, might be seen as an external agent for change; the change in society that precipitates the inclusion of technology in schools definitely is and it leads to the overwhelming community pressure on schools to change in this way.

Implementation

Implementation of a new idea is a complex process. It involves moving beyond the abstraction of the idea itself to operationalizing that idea in concrete terms. In other words, it requires action. No longer can the

stakeholder community stand back and tacitly support an idea in principle - they must become involved and make the idea work. Fullan (2001) supports this notion with observation that "educational change is technically simple and socially complex" (p. 69). Further, he posits "implementation is critical for the simple reason that it is the means of accomplishing desired objectives" (Fullan, 2001, p. 70, emphasis in the original). If the initiation stage defines the objectives and sets the course for change, implementation involves following that course in an attempt to reach those objectives. However, it should be noted that once the implementation of an innovation of any kind begins, it often evolves in ways that were not predicted or foreseen at the outset.

If one is to identify issues critical to the successful implementation of a new technology focus, a perusal of accounts of successful implementation in various school districts may again provide some suggestions. Bull and his colleagues (1997) identify two key factors of technology implementation success – adequate technical support and relevant ongoing instructional support.

ADEQUATE TECHNICAL SUPPORT. If school divisions truly wish technology to become integral in the educational process, they must ensure that the technology is "up and working" at all times and that there is a support person to manage the inevitable technical glitches presented by computers. "[When] teachers cannot rely on a computer or printer being in working condition, the use of technology quickly takes a low priority and rarely becomes an integral part of the educational process" (Bull et al., 1997, p. 31). This probably requires that schools have a full-time computer technician. Yet, "the number of schools that allocate a full-time, non-teaching position to coordinating teachers' use of technology is small" (Becker, 1998, p. 24). Therefore, it seems that a critical factor in determining the success of implementation is having reliable functioning hardware and having someone available to address concerns when they arise. The herder will soon give up on his new herding tools and techniques if they do not function correctly when he needs them.

RELEVANT ON-GOING INSTRUCTIONAL SUPPORT. Too often, teachers are expected to "do more with less." They are often provided with ill-advised and episodic in-service which appears to be ". . . 'one-shot' or [of] short duration . . . [which has] little or no impact [on instruction]" (OTA cited in Bull et al., 1997, p. 31).

In addition, a school must create a culture in which change is seen as a positive and necessary means to a valuable educational end. Lowe and Vespestad (1999) describe the key professional development goal in West Junior High School as achieving instructional change. From that perspective, they say ". . . we have created opportunities for teachers to engage in

results-based staff development by providing released time for learning, practice with feedback, ongoing coaching, collaboration, mentoring, and planning" (p. 32).

Many of the other accounts of successful implementation also point out the need for relevant and on-going teacher development. In fact, ". . . this kind of support and encouragement is the most important factor in determining successful [implementation] of educational technology" (Becker in Bull et al., 1997, p. 31).

Institutionalization

The institutionalization or continuation of this or any educational reform will be influenced by the perceived importance of the change relative to other district initiatives as well as the level of active support for the continuation provided by the school or school system. In addition, the provision of mechanisms for on-going data collection and assessment must also be addressed. These issues will be discussed in the following sections.

RELATIVE IMPORTANCE. School systems and individuals within them often suffer from what Fullan calls "innovation overload." He says "the main problem is not the absence of innovation in schools, but rather the presence of too many disconnected, episodic, fragmented, [and] superficially adorned projects" (2001, p. 21). Other authors, notably Sabatier and Mazmanian (1979), in their examination of the reasons that educational planning sometimes fails, state that "any particular policy [reform] decision is susceptible to an erosion of political support as other issues become relatively more important over time" (p. 499). Further, Fullan (2001) points out that "the problem of continuation is endemic to all new programs . . . negative school cultures, unstable districts, and uncoordinated state policies all take their toll" (p. 89).

These observations paint a somewhat dismal picture of our attempts to herd the technological elephant in our schools. They imply that the odds of successful integration of educational technology into the schools are quite long indeed. However, in the face of the overwhelming evidence suggesting the need for this change to be successful, this is one innovation that simply should not be ignored or allowed to be eroded over time. Sabatier and Mazmanian (1979) suggest five strategies that tend to maximize the likelihood of successful integration and institutionalization of innovations over time. They include: having a sound theoretical base, an unambiguous policy directive, well-trained leaders, active support from the school board, and an on-going indication of high priority of the innovation (p. 483).

The sound theoretical base supporting the integration of educational technology can certainly be constructed. Of course, it is important for teachers to know why this change has been proposed in the first place and what

impact it will have on them and their students. In this case, well-trained leaders are probably related to the strong theoretical base. It seems that if teachers are going to be asked to implement the use of technology that many of them are not comfortable or, at least, familiar with, they will need some well-trained leaders to provide support and encouragement. In addition, it would seem prudent to add the additional dimension of teacher training in this context. "Teachers are the key to effective and efficient technology utilization" (Jefferson & Edwards, 2000, p. 140). The technology that is being proposed here was not in existence when many current teachers were trained. A constructivist approach to in-service opportunities in which teachers are provided opportunities to begin learning about educational technology from the point at which their personal computer knowledge begins may be the most successful strategy.

The remaining three strategies may be grouped together for ease of discussion. In this case, it may not be necessary to enact a policy directive because of the nature of the innovation. However, support from the school board is often seen at the school level in the form of money. If a school board wants technology to be fully integrated into the instructional delivery of the classroom, it will have to specifically attach a significant amount of money over a long period of time to the acquisition and maintenance of computers and their related software as well as to teacher training. It may be essential, then, to include a budget line indicating the school board's support of this endeavor.

ON-GOING DATA COLLECTION AND EVALUATION. This aspect of managing change needs to be monitored closely both from the point of view of whether the requisite funds and support structures are in place and whether the desired instructional changes have been made. Admittedly, it will be difficult to monitor the implementation of instructional technology in the classroom. However, instructional supervision can shed some light here. Perhaps, it will be possible, over time, to alter the supervisory culture in schools to include teachers' use of technology. It will require the development of a new vocabulary for supervision and, probably, new supervisory structures as well. Nevertheless, it is hoped that the change will ultimately become a part of the fabric of school culture and no longer be viewed as an innovation at all. Again, the goal is to integrate technology so seamlessly into the context of the educational experience of students that computers almost vanish in their use and the decision to use them becomes as commonplace as picking up a pen or a book.

A PLACE AMONG THE FOSSILS

> The living form defies evolution at its peril; if it does not adapt, it will be broken. The idea of a completed man is the supreme vanity: the finished image is a sacrilegious myth . . . They are determined still that there is a

> final form to defend: soon they will attain the stability they strive for, in the only form it is granted – a place among the fossils. . . . (p. 182)

This rather startling statement is a comment from a woman from New Zealand who comes to save David and the others. She tries to ameliorate David's worries about the fate of his father and the others who live in Waknuk. She quite rightly points out that in creating a rigid structure to eradicate genetic mutations, they also created the pattern for their own destruction. Essentially, they had created a planned obsolescence that would cause Waknuk society to run into a dead end.

The focus for contemporary education should be to help students avoid this planned obsolescence in their own lives. "Most adult teachers and parents will not have experiences on which they can draw to prepare youngsters for a world in which they can expect to change . . . regularly" (Gardiner, 2000, p. 31). Therefore, as many authors suggest, the focus of education today, more than ever, should be to help students become "life-long learners" who have learned the means for coping with the changes they regularly face.

While, to some extent, the focus of education has always been to help students become life-long learners, it must be mentioned here that the term itself seems to have undergone a subtle shift in meaning. Reeves (1998) points out that:

> Integrated performance support systems are essential to the levels of workplace performance required of all workers in organizations that hope to compete in a global economy . . . [and] . . . these support systems must be multi-sensory, integrating a variety of media appropriate to the task to be learned or performed. (p. 49)

This requires workers to be life-long learners who are able to cope with the changes in technology and multi-media as well as the sheer volume of those media. However, they will not possess the skills necessary to perform at this level of multi-sensory competency unless schools program learning opportunities through the authentic use of computer technology across the curriculum which allow students to develop these skills.

The co-NECT school, for example, is one of the platforms of school reform advocated by the New American Schools movement. The basic underpinnings of the co-NECT school are built on a foundation which includes ". . . a comprehensive, technology-supported framework for learning . . . [which is] project-based [and] interdisciplinary" (Kearns & Anderson, 1996, p. 14). Further, Becker and his colleagues (1999) observed that "co-NECT schools can be characterized as schools involved in a thoroughgoing program of whole-school reform, one that involves substantial use of computer technology in pursuit of student learning that is project-based, interdisciplinary, and emphasizes authentic, real-world applications of academic content and community service" (p. 4). The co-NECT school platform is not exactly

unique, however, it is illustrative of the kind of change in focus regarding educational technology advocated in this paper. Its focus on project-based and cooperative application of technology is reminiscent of much of the literature regarding the skills students may need for the future. "Projects play an important part in learning . . . students engage in a complex process of inquiry . . . and design. The result is an artifact – a product of student knowledge that can be shared and critiqued" (Guzdial, 1998, p. 47). The project has become central to many work environments as well.

While it is difficult to predict what skills and competencies students will need in the future, one can begin to paint a tentative picture based upon society's expectations as evidenced above. In 1996, Jacquie MacInnes, described an early experiment in the implementation of technology in the classroom. She suggests that the primary focus should be on the *effective* use of technology. For example, students should "use a wide range of processes, techniques, tools and materials to gather information, solve problems, create and evaluate products and communicate results" (MacInnes, p. 15) in the context of safe and ethical use of technology with an eye to the evaluation of the influence of technology in our lives. This parallels the descriptions of the new expectations of lifelong learners outlined above and speaks to the activities one may complete in order to become prepared as expected by contemporary society.

This represents a significant change in thinking from simply seeing technology as a glorified library database as suggested by Howe (1998) or even as an Internet surfer and e-mailer as suggested by many other authors. After all, "computers are really for helping us understand systems that are too complicated to think about in classical ways, such as political systems or the AIDS epidemic" (Kay, 1997, p. 19) and should be used in ways that reflect this reality.

CONCLUSION

Technology must be integrated into our educational systems seamlessly; we need to accept the computer and allow it to be used to its full potential as the tool it is. Schools must, therefore, begin to create a new reality for themselves which embraces technology as a fact of life rather than as an "extra burden." While "technology cannot supplant good instruction" (Thomas, 1998, p. 8), good instruction can utilize technology in more effective ways and can, as a result, prepare students for whatever future reality they may encounter.

While the resultant change in teacher-student relationships may be unsettling for both teachers and students, metaphors derived from familiar sources may ease the transition. *The Chrysalids* is not the only potential source of metaphor. However, it does provide a prophetic and chilling view of the

consequences of resisting change. It points out that we are caught in a difficult position as we try to provide children with appropriate and relevant educational experiences. However, the present structure of the use – or lack of use – of technology in schools cannot be allowed to continue. In view of the importance of technology in our society, educators have a moral and ethical obligation to address the use of technology in our schools.

One cannot advocate change for change's sake - we should not simply grasp at anything. It is difficult to predict just what a future reality could look like. The computational abilities of computers grow exponentially almost every day and this leads to ever more sophisticated software. However, the explosion of virtual schools and provincial on-line consortia shows some promise as does the proliferation of co-NECT and other school platforms. The creativity and imagination of both students and teachers really provide the only bounds for technology in schools but the key is to use technology in ways that are truly different. After all, to this point ". . . students still spend most of their school day as if these [technologies] and information resources had never been invented" (Becker, 1998, p. 24) and virtually any use of computer technology would represent progress.

It is the school's challenge and responsibility to create a culture that better integrates technology into its organizational framework. Using a familiar fictional text such as The Chrysalids as a basis for discussion with teachers and administrators is one approach to an exploration of technological change in their working lives. The novel allows for non-threatening exchanges about new social concepts. It encourages complex dialogic interactions which support, rather than undermine, the developing viewpoints and practices of educators.

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