Modelling Best Teaching Practices around Sustainability When Teaching Critical Thinking of Technology in Elementary Learning Settings

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 Children live enormously different lives in relation to technical devices than children before the invention of the television. The increase in technology over the past 50 years has been remarkable. The supposed benefits of this techno-revolution are promoted by government and business, but the effects on small children are becoming realized with growing concern. Exposure to hours of electronic stimulation on the growing intellect and physical grow of children needs to be acknowledged and addressed. Schools promote an ever increasing relationship to educational technology. Understanding the implications is paramount for the 21st century learner. How do educators respond to the new techno age? Keeping current with best teaching practices is a challenge, as new research and literature grows exponentially. New technologies replace older models every few years. The growing waste land of discarded electronic devices is a surmountable global problem. This essay is an attempt to address the importance of developing best teaching practices around sustainability when modelling and teaching children to become critical thinkers and self monitors of technology during the elementary years.

 Teachers have a responsibility to their students to model good practices and behaviours with technology. Currently, Education Technology is an integrated component of curriculum. Learning outcomes are stated in the Government IRP’s, although ethics and moral aspects of education technology are harder to define and implement. Little data has been collected, considered, and reviewed to give insight and support when incorporating best teaching practices for 5-9 year old children. Children are exposed to more digital devices on a daily basis. By spending more time with virtual realities, their time to experience and learn from nature is significantly diminished. There is a need to make responsible decisions about the health of young Primary children and understand what effect digital devices have on their general well being. According to Alliance for Children, “There is plenty of time in adolescence for children to learn, with adult guidance and reasonable limits, to navigate the complex world of advanced electronic technologies. (Alliance for Children 2).” Other researchers and authors are focusing on the young learner and when electronic devices should be introduced. “We are now training our children to live in a world that cannot be sustained.”(Milbrath, 1992). (Huckle and Sterling 18).

 The dilemma that teachers face within the framework of the educational system is two sided. Education is crucial for supporting and promoting sustainable development. At the same time education plays a role in reproducing an unsustainable community. For education to be an agent of change that trains teachers to use best practices in technology, it needs to become an agent of change. `A society faced with a radical imperative to achieve a socially, economically and ecologically sustainable basis within a historically short time needs to reappraise most aspects of its organization: education--- as the main means of social reproduction---has to be at the centre of the task, both as subject and agent.` (Huckle& Sterling 18). “Education has a vital role to play in the development of a sustainable society. It is a powerful agent of social change. It raises awareness of the new developments, it provides training for the professionals and it trains researchers who will develop the next generation of systems and devices.” (Philip Jennings 4). To develop a framework that focuses on best practices for sustainability in education, many key questions must first be asked and answered. To begin, what is meant by best practices in educational sustainability? Who develops the criteria? What is meant by sustainability and how it is implemented? Opinions vary from one end of the spectrum to the other. “Teaching and teacher education for sustainability should be a process of communication, rather than strategic action. Teachers should learn through critical pedagogy in universities, school classrooms, and the community and should thereby develop skills in planning and delivering a wide range of experiential and democratic teaching and learning activities of the type now used in moral, social, developmental and environmental education. (Smith, 1991). “ (Huckle & Sterling 109).

 The concept of “sustainable development” is described by Bob Jickling (1994) as problematic for educators. He states, “That it is inappropriate to plan and implement curricula without adequate conceptualizations of central concepts.” (Jickling. 231) He maintains that it is due to the amount of imprecision surrounding the term sustainable development. Jickling contends his primary assertion is not a new one, but is centered on the idea of “giving more attention to the concept of education, and thus the educational dimension of environmental education.” (Jickling 88) He describes an American and an Australian example of implementing educational sustainability and points out the challenges that educators face. Defining keywords, implementation and sensitivity to cultural issues were some of the issues within the studies. The Australian example sought to identify key characteristics that define education for the environment. The list is amazingly similar to other concepts of education sustainability. On the list is “develop critical thinking and enable problem solving; examine ideologies which underlie human-environment relationships; criticise conventional wisdom; work and live cooperatively; and realize that humans can act collectively to shape society.” (Based on work of Huckle, 1987,1983; Pepper, 1987; Greenall Gough, 1987; Fien, 1993). (Jickling 96).

 Another important theorist whose work is embraced by many teachers and transformative intellectuals is Jurgen Habermas. His critical theory of education emerged during the 1980’s and is of interest to educators today. “By the term “transformative intellectual’ we refer to one who exercises forms of intellectual and pedagogical practise which attempt to insert teaching and learning directing into political sphere by arguing that schooling represents both a struggle for meaning and a struggle over power relations. Teachers who assume the role of transformative intellectuals treat students as critical agents, question how knowledge is produced and distributed, utilize dialogue and make knowledge meaningful, critical and ultimately emancipatory. (Giroux and McClaren, 1986, p215).”(Huckle & Sterling 107). Habermas contends that ecological problems are growing along side of capitalism economic difficulties resulting in unrest, politically and socially. “Habermas’s principle claim is that interaction has become distorted by the rise of instrumental reason, which promotes science as universal and value-free knowledge and so fosters a distorted and incomplete understanding of our relations with one another and the rest of nature.” (Huckle & Sterling 108). This idea evolves into reflexive modernization. The philosophy is to encourage people to use judgement to monitor themselves within their society and environment.

 Education for sustainability is not a set of ideas educators can implement as a whole. One report which defines education sustainability says, “Sustainable development must meet the needs of the present without comprising the ability of future generations to meet their own needs. “ (http:ecocophyinquiry.blogspot.comepart-ecology-and sustainability) retrieved November 7, 2010. Questions arise about whose need and how are they defined. How do we prepare children to make smart decisions about technology? There is an urgent need to address the moral and ethical issues surrounding child development and the increasing dependence on electronic devices. There has been complacency with understanding how children grow and develop and how technology affects them. To place computers in the hands of very young children and believe that exposure to these devices will prepare the children for their future is inadequate. More than ever children are left with electronic machines to be entertained and kept busy. “The sense of competence and autonomy that many young people find in this new role has undeniable benefits—but it can also create new dangers. Many parents and educators report an initial enthusiasm about children’s use of computers followed by a growing concern about children’s overuse and even addiction to the technology.”(Alliance for Childhood 9). The kinds of things children are being exposure to through digital machines is a huge concern. We cannot expect children to make wise choices and exercise best usage practices, if they have not been shown and taught.

 Children need education that helps them to understand that technology cannot solve our social and ecological problems. “The active social engagement and moral commitment of human beings representing diverse voices and cultures will always be necessary. (Alliance for Childhood 4). One interesting and wise practice by the Haudenosaunee Confederation, or League of the Iroquois is the idea of thinking ahead. “They begin every council meeting with an invocation to the “Seven Generation;” “For each decision made or action taken, consider the effects on those who will live in the seventh generation from now. (Alliance for Childhood 9).” The definition that defines technology literacy as being skilled in operating computers is no longer adequate for the 21st century learner. We need a newer approach that necessitates that educators help children to develop critical thinking skills and self- censorship skills. These skills mature throughout childhood. Children become our future adults who have the capacities for moral reflection, ethical restraint, and compassionate service. (Alliance for Childhood 7). These skills need to be modelled and taught.

 Today’s children are growing up in a time of great technological advancement. Rapid change has brought a new set of complex global dilemmas. Many of the digital machines are literally consuming our ecosystems. Global warming, depletion of massive rainforests, animals, and the on slot of more weapons of mass destruction are grave concerns facing our global communities. The greater dependence on digital devices, especially in younger children, diminishes their relationship in other key areas; such as playing outdoors, connections with nature and exploration using imagination and creativity.

 The need for educators to understand, address, and implement best teaching practices with technology is paramount. We need to foster critical thinking in our children at an early age. This critical thinking is not an anti technology, but rather a respect for the amazing digital machines present in our time space reality and a proactive involvement that cultivates a sense of love for our environment and humanity. “As biologist Stephen Jay Gould suggests, “We cannot win this battle to save the species and environments without forging an emotional bond between ourselves and nature as well--- for we will not fight to save what we do not love.”(Alliance for Childhood, p.11). Children need time to honour the world of nature and develop the love and respect for animals and plant life. The B.C. Science curriculum for Grades One and Two mainly focus on plants and animals. “Children will be served by a renewal of science and technology education that explicitly brings issues of meaning and value-----including the value of what David Bohm calls “genuine love”---- back to the study and crafting of it.” (Alliance for Childhood 11).

 The need for a new literacy of technology criteria for educators is essential and timely. The challenge in education is to develop and implement a framework of criteria that embraces the balance needed to foster critical thinking skills in children during elementary years. The Alliance for Childhood is one of many organizations that have developed a set of objectives that support that goal. They advocate seven key reforms for all ages, but specifically address the early years. “Education about technology or anything else should address the child as a whole and integrate thoughts, feelings, and actions. (Alliance for Childhood 13).” The following seven actions are recommendations for educators and parents.

1. Make human relationships and a commitment to strong communities a top priority at home and at school.

2. Colour childhood green to emphasize children’s relationships with the rest of the living world.

3. Foster creativity every day, with time for the arts and play.

4. Put community-based research and action at the heart of the science and technology curriculum.

5. Declare one day a week an electronic entertainment-free zone.

6. End marketing aimed at children.

7. Shift spending from unproven high-tech products in the classroom to children’s unmet basic needs.

These suggestions are actions that are not difficult to realize. Implementation is more challenging.

 In Al Gore’s book, “an inconvenient truth,” he writes, “we are witnessing an unprecedented and massive collision between our civilization and the Earth.’” (Gore 136) Gore goes on to admit,” That the more technologically advanced countries have the greatest obligation to use technology wisely and treat the planet responsibly.” (Gore 156) One of the statements that Gore makes that continues to be a huge controversy concerns Capitalism. “Some people don’t want to admit there is a climate crisis. Others trust false and misleading information from political groups that want to confuse people into thinking there is no problem. (Gore 158). Interestingly, in the last four years since the publication of Gore’s book there has been a steady stream of programming and literature published to address global warming and sustainability issues.

 The issue of sustainability is not new to schools. Many schools worldwide offer programs on recycling. The 4Rs; rethink, reduce, reuse, and recycle are terms that are becoming synonymous with good teaching practises. The area least understood is technology. How we model usage and disposal of outdated computers, cell phones and many other machines is important to the future generations and the future of our planet. China and India are emerging as leading technological nations. They are also one of the leaders of technology recycling, as labour is cheap and the profit from recycling computer parts is lucrative. The problem with this is that many low paid workers are unaware of the health risks associated with exposure to toxic smoke and handling of disassembled computer parts. Studies have shown exposure to smoke and chemicals from recycling of computer parts has an adverse affect on the developing neurological systems in children. Adults exposed to the same toxins have a higher incident of immune system health problems. “Experts say exposure to toxic chemicals from e-waste, including lead, cadmium, mercury, chromium and polybrominated biphenyls, can damage the brain and nervous system, affect the kidneys and liver, and cause birth defects.”(Hindu Paper, Feb.22, 2010). Dumping of toxic water and acids used in the recycling process is hazardous to the environment. The pollution to the environment is a major concern. Manufactures of computers are slow to use less hazardous material. As of yet, there are no government regulations.

 The Primary child grows, develops, and changes dramatically in a short period of time. Imagination, playfulness and creativity are significantly higher in this age group than in older children. Older children are more logical, rational, and matter of fact. Technology education needs to be aware and reflect this dramatic shift. “Marshall McLuhan, the late scholar of media and their social impact, sensed this changing role for education and called it, “civil defence against media fallout.” Though often portrayed an advocate of high technology, McLuhan understood that children need developmental time, space, and experience away from products of advanced technologies in order to grow into sophisticated readers of technology.” (Alliance for Childhood 78).

 According to Donna M. Chirico of the Waldorf Education Research Institute, “The consequence in education is that economic and political concerns take precedence over pedagogy that supports the basic progress of children’s development. Computers are not demonic in nature. They are certainly useful tools and should be suitably and thoughtfully integrated within the educational system. However, exposing children to even a felicitous experience at the wrong time or in the wrong way may alter the manner in which they sense and perceive the world.” (Waldorf Research Institute. 1998 ). The exposure to technology and its effect on the neurological and cognitive development of young children is based on Piaget’s theory of child development. “The child’s neurological structures and cognitive productiveness are interdependent and each is sensitive to environmental influence.” (Waldorf Research Institute. 1998). Piaget’s constructivist model has been challenged in the last thirty years, however, more studies are currently being done to collect data that supports Piaget’s idea of intervention to quicken development might actually be harmful. Early introduction to computers, televisions, cell phones and other digital machines is an interfering element that poses such concern. The need for children to develop their own sense of self and creativity is important. It must come from healthy relationships with others and their connection to nature. The complex interplay of technology needs to be introduced in a respectful and timely manner.

 The Alliance for Childhood has devised ten principles for a new literacy of technology. These represent guidelines based on the developmental phrases of childhood and early adolescence. “These concerns taken together have led the Alliance for Childhood to redefine technology literacy as follows: Technology literacy is the mature capacity to participate creatively, critically, and responsibly in making technological choices that serve democracy, ecological sustainability, and a just society.” ( Alliance of Childhood 54).

1. Slow down; honour the developmental needs of children.
2. With adolescents, teach technology as social ethics in action, with technical skills in a supporting role.
3. Relationships with the real world come first.
4. Technology is not destiny; its design and use flow from human choices.
5. Choice implies limits—and the option to say “no.”
6. Those affected by technological choices deserve a voice in making them.
7. Use tools and technologies with mindfulness.
8. To teach technology literacy, become technologically literate.
9. Honour the precautionary principle: When uncertain, err on the side of caution.
* Ask tough questions about long term consequences.
* Make time, space, and silence for reflection.
* Responsibility grows from humility.
* Be resourceful with the tools you already have.
1. Respect the sacredness of life in all its diversity.

 An educational plan that addresses best teaching practices around sustainability and is aware that critical thinking is an important component for technology literacy in the early elementary years is an important issue for teachers. The challenge for teachers is developing a set of criteria to be adopted on a local and global level. A global consciousness that values tolerance and respect for the growing problem of ewaste is essential. This can be achieved when teaching becomes transformative rather than transmissive. “Educators for change need a clearer understanding of an ecological, participatory worldview from which a strong ecological educational paradigm and culture can be developed. Realization of a sustainable education paradigm requires vision, image, design, and action from all concerned with achieving healthy, ecologically sustainable societies.” (Sterling 2001).

 Asserting education for sustainable development within the educational system is challenging. However, it does begin with a social consciousness of every educator. This begins at the earliest academic level. It is important for teachers to consciously question usages of technology and to continue to reflect on the impact it has on students. Only then can teachers model to students good practices of questioning and reflecting. Students who are best prepared to make good choices with technology in the future will be students who will have knowledge and be reflective of their conduct. “Parents and educators can most effectively teach children to relate to technology in a healthy way by coming to terms with the effects of technology in their own lives and on the world around them. Developing technology awareness as adults will help us model a mature relationship to technologies new and old.” (Alliance for Childhood 86). Teachers are facilitators of educational technology. We have a responsibility to ensure best teaching practices of technology sustainability, beginning in the early elementary years.

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