A Different Storytelling of Technology Education Curriculum Re-Visions: A Storytelling of Difference

Patricia O'Riley

> Narrative theory has challenged literary critics to recognize not only the various strategies used to configure particular texts within the literary canon, but to realize how forms of discourse in the natural and human sciences are themselves ordered as narratives. In effect narrative theory invites us to think of all discourses as taking the form of a story.
>
> (Knoespel, 1991)

> Any narrative that predetermines all responses or prohibits any counter narratives puts an end to narrative itself by suppressing all possible alternative actions and responses, by making itself its own end and the end of all narratives.
>
> (Carroll, 1982)

Taking up Knoespel's invitation "to think of all discourses as taking the form of a story," this paper is an attempt to open technology education curriculum re-visioning to different angles of vision by thinking about it as a form of storytelling. Over the past two decades there have been efforts "to understand curriculum work as a storytelling practice" (Gough, in press), and as a "collective story we tell our children about our past, our present, and our future" (Grumet, 1981, p. 115). Gough (1993) adds that curriculum narratives are not only collective but "selective" stories, and in the case of technology education the selection of technology stories have been articulated from a particular, relatively small, cultural community—industrial education/arts. In light of global restructuring with its different allegiances and arrangements of information, capital, time and space, bodies and geographies, and poststructuralism's skepticism of narrative authority, I would like to place into question both the adequacy of the selection of technology narratives to represent the study of technology in our current technologized/technocratized society, and the relevancy of these stories to meet the needs and interests of the diversity of students entering today's technology education classrooms.

Although curricular changes from industrial education/arts to technology education have been viewed as constituting a paradigm shift (Clarke, 1989; Todd & Hutchinson, 1991), from my positioning as one of few women in this programme area and writing within feminist and poststructural leanings, the

Patricia O'Riley is a doctoral candidate in Educational Policy & Leadership at The Ohio State University . She is completing her research in Vancouver, BC, Canada.

possibilities for a generative re-visioning of technology education that creates space for difference appear to have been missed, as have the opportunities for living up to the justificatory rhetoric of creating curricula for all students. While the technological processes within the selected "domains" of knowledge in the re-visions are more diverse and more high-tech, many of the values, assumptions and beliefs underpinning industrial education/arts curriculum, which historically excluded many students, remain unproblematized and unchallenged. Moreover, the International Technology Education Association's current high-profile project, *Technology for All Americans*, to create *standards* for technology education seems to be a movement towards tightening rather than opening technology education discourses to difference, and to different ways of understanding and experiencing technology. The desire to configure standards resonates with what Harding (1986) refers to as "the longing for the 'one true story' that has been the psychic motor for Western science" (p. 193). Haraway (1991) writes that questing for universals, is nothing less than reductionism "when one language . . . must be enforced as the standard for all translations and conversions" (p. 187).

Gough (1995) maintains that realist curriculum stories "largely ignore the ways in which agency is *produced* by and within the complex circuits and relays that connect—and contingently reinforce—knowledges and subjectivities in the technocultural milieu of postmodern societies" (p. 5). Rather than shutting down conversation in technology education through the imposition of standards, taking a cue from efforts in environmental education (Gough, in press), I would like to consider the possibility of reconceptualizing technology education discourses as a postmodernist textual practice. Re-visioning from a position that there is no nondiscursive reality, that there is no outside of text, is a move to make visible the invisible—the historicity, materiality, and agency of the textual practices within our technology storytelling. What is viewed as fact and reality to one storyteller may be fiction and fantasy to another storyteller. From different perspectives, each story may have validity.

Haraway (1989) suggests that "[m]ixing, juxtaposing, and reversing reading conventions appropriate to each genre can yield fruitful ways of understanding the production of origin narratives in a society that privileges science and technology in its constructions of what may count as nature and for regulating traffic between what it divides as nature and culture" (p. 370). So, from my own partial perspectives, my voice "always to be present, marking off the edges of the text, revealing or at least characterizing, its mode of being" (Foucault, 1984, p. 107), I begin with a re-telling of two curriculum narratives: one Canadian, *Technology Education: Primary through Graduation Curriculum/Assessment Framework* (British Columbia Ministry of Education [BC], 1992), and one American, *A Conceptual Framework for Technology Education* (International Technology Education Association [ITEA], 1990). Next, from the infinite number of technology stories that I could chose from, I introduce merely a glimpse of the richness, contradictions, and complexities of feminist and postcolonial technology stories that appear to be overlooked in technology education curriculum re-visioning. My re-telling is neither to erase, co-opt, and

integrate with the curriculum writers' knowledge claims, nor to unveil the Truths or falsities of their stories; it is an effort towards understanding how things have come to be the way they are. And, it is neither to provide alternative stories, nor to prescribe curriculum content. However, this storytelling may be helpful to those who seek other stories to enhance their pedagogy. From a place of awkwardness and odd angles within the terrain of technology education discourses, this is an attempt to blur and reshape the borders of technology education narratives, and to open them to different ways of knowing, being, and becoming in the world. It is a movement towards un-standardizing curriculum narratives and towards re-visioning technology education as a space of possibilities for "becoming something else than what our history has constructed us to be" (Lather, 1993, p. 687).

Representing the One True Story: A Universal Story

Over a decade ago, industrial educators decided to revise and update their curriculum stories and rename them technology education. In some places technology education has been constructed as a separate subject for study and in others it is seen as an emphasis to be included in all subject areas—technology-across-the-curriculum (e.g. Saskatchewan Education, 1988). In the United Kingdom and Wales, technology education has incorporated several existing subject areas (craft, design and technology; home economics; art education; business education; and information technology) into one programme area (Department of Education and Science, 1990). North American technology education re-visioning exists mainly as a new version of industrial arts/education. For at least a century, industrial education in one form or another has primarily taught boys the knowledge and hands-on skills of woodworking, metalworking, automobile repair, electricity/electronics, and drafting/graphic arts.

In the United States, a conceptual framework for industrial education, the *Jackson's Mill Industrial Arts Curriculum Theory*, was developed in which the authors identified "four universal technical systems . . . communication, construction, manufacturing, and transportation—technical systems that are basic to every society" (Snyder & Hales, 1981, p. 16). Nine years later, the International Technology Education Association updated the Jackson's Mill model, and also identified four universal content reservoirs (ITEA, 1990, p. 17): bio-related; communications; production; and, transportation. Similarly, in British Columbia, four content organizers have been languaged to represent the study of technology: information technology; materials and products technology; power and energy technology; and, systems integration technology (BC, 1992). In a recent re-writing (BC, 1994), the BC writers have re-named their four prescribed curriculum organizers: communication technology; production; control; and, energy and power. Self and society is added as a new framing.

Considering the gender, cultural and socio-economic diversity of students in technology education classrooms, these traditional content organizers need to be opened to different epistemological and ontological positionings so that technology education narratives might become more appropriate, relevant, and

equitable to a broader range of students. For example, they might become cultural stories—technologies of aboriginal peoples, technologies of less advantaged countries, technologies of popular culture. They might become stories of technologies of control and normalization, technologies of justice and ethics, technologies of peace and liberation, technology as (hyper)textual practice and virtual reality. We might even invite students to deconstruct technology education discourses and to reshape them to make meaning in their own lives, and in the world.

In addition to limiting technology education to four purportedly universal systems of technology, the BC and ITEA curriculum authors propose that curricular content is to be delivered through a universal problem solving process called *the technological methods model* (ITEA, 1990), and *technological methods* (BC, 1992). The goal of the problem solving activities is to "[create] technology for human purposes . . . using appropriate technological knowledge, resources, and processes to satisfy human wants and needs" (ITEA, 1990, p. 20), and to make "high-quality articles, systems, and environments" (BC, 1992, p. 13). Although not excluding non-technological solutions, problem solving is effectively promoted as the one way to teach technology education, and within the framework of problem solving, only one approach is identified—the technological method. The BC document offers variations on the technological method.

Such an approach to problem solving envisions the world as a series of problems that lend themselves to technical solutions. This perspective mirrors methods that have been practiced in male-dominated areas such as science, the military, engineering, and industry for decades (Hacker, 1989). There is little or no discussion about technology's potential to create problems. Petrina (1993) contends that the perception of the technological method in technology education is flawed and "should be viewed as it is: a heuristic whose efficacy is limited to systems thinking. Methodological claims to the 'technological method' are bereft of any epistemological grounding within the history, philosophy, or sociology of technology" (p. 72). For Robins & Webster (1989), within such a "process-oriented model for the curriculum. . . . the concept of knowledge that is mobilized is instrumental in the extreme and is concerned with control" (p. 226) privileging analytical thinking over holistic and downplaying intuitive, emotional, aesthetic and spiritual dimensions of human experience. Moreover, such a form of consciousness may be particularly dangerous today "with its vision of continued progress in technology and personal freedom, that is now exceeding the life sustaining capabilities of the natural system that makes up our habitat" (Bowers, 1993, p.104). Scott (1995) offers a playful, yet serious re-consideration of problem solving: "we could be unsolving the problem: reversing it: rewriting the problematic into question and returning toward the formulation. it would be a different kind of relation" (p. 3).

Technological literacy is put forward as a goal of technology education in both the ITEA and BC curriculum documents. Lewis & Gagel (1992) maintain that "having set forth its commitment to technological literacy so unambiguously, the field of technology education has had the problem of trying

to communicate just what technological literacy means, and how it could be measured" (p. 132). The ITEA authors suggest that a technologically literate population is essential for economic vitality, while the BC authors express the notion that technological literacy is effectively achieved through people solving practical problems.

Statistics and projections of the International Labour Office (1992), United Nations (1993), Statistics Canada (1993), U.S. Department of Commerce (1993), and Department of Labor (1992), indicate that the jobs being created are concentrated primarily in four areas: community, social and personal services; trade, restaurants, and hotels; financing, insurance, real estate and business services; and, manufacturing. A large percentage of these jobs are low-paying, low-status, and part-time. What if we told these stories to students as well, so that they might have the options of preparing not only for employment, but also for the possibilities of un(der)employment? What different technological literacies might students need for such possibilities? To move beyond economic discourses, what shape might technological literacy take without economic expansion, consumption, and commodity production at the centre? What other possibilities might there be for "doing" technology in schools beside designing and making?

Another Storytelling: Technology and Gender

Concepts such as *universal man* and *human adaptive systems* underpin technology education curriculum narratives. Haraway (1989), documents how these concepts have been challenged as a result of feminist struggles for decolonization and liberation. She points out that universal man and human adaptive systems were fostered at a particular historical time by geneticists and physical anthropologists in response to flawed, but important, struggles against racism in science. Universality was judged an advance over views that explicitly placed women and non-whites at a lower order than white males. Regardless, as Foucault (1984) writes, "the universal intellectual, whose task was to speak the truth to power in the name of universal reason, justice, and humanity, is no longer a viable cultural figure" (p. 23).

The predominance of technology stories in the literature are universal stories informed primarily from men's perspectives (O'Riley, 1992). A multiplicity of exclusionary practices have contributed to the mapping of women on the periphery or invisible in technology stories, including: the assignment of women to the private sphere since the Industrial Revolution; the gendering of work and tools; and the omission of women's perspectives and contributions to technology in historical records. Since most historical representations construe technology as "devices, machinery, and processes which men are interested in" (Kramarae, 1988, p. 5), some feminist research is aimed at recovering the history of women and technology. To do this requires substantive broadening of contemporary languaging of technology as "largely interested in manufacturing" (Wajcman, 1991, p. 162). Many inventions designed by women, or for women, have been overlooked altogether as they are not considered to be technology—they are "tools" when associated with men, and "implements" when associated with women (Cockburn, 1988; Kirkup & Keller, 1992; Wajcman, 1991). Cowan

(1979) underscores this point with her discussion about a baby bottle, "a simple implement . . . which has transformed a fundamental experience for vast numbers of infants and mothers, and been one of the more controversial exports of Western technology to underdeveloped countries—yet it finds no place in our histories of technology" (p. 52).

Duelli Klein (1987) argues that many technologies represent "powerful socio-economic and political instruments of control" (p. 65), particularly over women. Faulkner & Arnold (1985), Leto (1988), and Wajcman (1991) document how technologies have been used as a "social tool" to both construct and maintain stereotypical gender roles. For example, household technologies have been a significant market for manufacturers who have a monetary interest in reinforcing ideologies of gender, which is further complicated by women's complex and contradictory embrace of particular technologies. And, outside of the home, industrial and office automation is often used as a technology of power and surveillance to monitor and control workers, "keeping an eye on her nimble fingers" in electronic sweatshops (Garson, 1988; Fuentes & Ehrenreich, 1988). In a film, *Global Assembly Line*, Gray (1986) exemplifies technologies of control as she documents the experiences of poor, primarily non-white, women working for slave wages, under slave working conditions, in transnational electronics assembly plants in the free-trade corridor between Mexico and the United States, in the Philippines, and in Tennessee.

Some feminist researchers consider bio-technologies to be at the core of women's status with women's bodies increasingly becoming colonized by new reproductive technologies (Corea, 1985; Duelli Klein, 1987; Haraway, 1991). When intersected by race and socioeconomic status, bio-technologies take on yet another dimension. According to the Third World Network (1993), women in non-western countries are often used as guinea pigs in the experimentation and testing of contraceptives, drugs, reproductive high-technologies and techniques, which are restricted or banned in western countries before they are considered acceptable for consumption and practice on white women. Added to this are the influences of massive evangelical-like crusades to impose western values on non-western women about birthing techniques and birth control, as well as the downplaying of breast feeding in favour of western infant formulae and other western consumer goods.

Bio-technologies are inscribing more than women's bodies. Billions of dollars are being allocated for high-tech, militarized, bio-technology projects to code our imperfect human bodies for retrieval as perfected genetic mutations (Haraway, 1991; Kroker, 1994). With the current emphasis on nationalism and global competitiveness, there are increasing political and corporate demands for "productive and efficient human resources"—the rhetoric within technology education curriculum narratives. Wells (1995), concerned about "confusion" around understandings of bio-technologies, that they are "far too inclusive, and by definition inaccurate" (p. 11), presents a taxonometric structure of eight bio-technology knowledge areas for consideration by technology educators. Although genetic engineering has a place in this structure, reproductive technologies are absent. From my positioning as a mother, and as a woman with

considerable experience inspecting workplaces as an occupational health and safety officer and human rights officer, I ask if technology education textual practices might open to allow room for discourses on reproducing bodies, bodies-as-commodities, and commodity-producing-bodies?

Undoing the 'Whitewash': Technology and Race

Because of my place of privilege as a white Canadian woman, I cannot do justice to this section as I have much to read and many silenced voices to listen to before I am able to gain even a modest understanding of the implications of western technologies on people of colour around the world, including aboriginal people of Canada and the United States, African-Americans, and Hispanic-Americans. According to the Third World Network (1993):

> Modern science and technology has dislocated Third World societies, destroyed traditional cultures and played havoc with the environment of Third World nations. It has also replaced a way of knowing, which is multi-dimensional and based on synthesis, in Third World societies, with a linear, clinical, inhuman and rationalist mode of thought. Western science and technology has systematically plundered Third World countries in the name of scientific rationality. (p. 486)

Rural workers around the world, particularly women of colour, have been pushed off their land and into factories by transnational agricultural corporations that have replaced their way of life and diversity of crops with monocrops, requiring the "latest piece of machinery which may render her labour obsolete, ineffective or more difficult: or with pesticides which endanger her (and her unborn) or her family" (Third World Network, 1993, p. 499). For example, a colleague tells a story of the implications of industrial development for the women of her village in Kenya (M. Ndunda, personal communication, 1992). Her mother and the other women now have to spend much of their day walking to find potable water, where twenty years ago they would only have had a short walk. The water that they do collect is barely suitable for drinking, cooking, and washing, and when they return there is little time left for the children, community, or themselves.

Within our own borders, Grossman (1993) maintains that the discriminatory practices of dealing with toxic waste and polluting by-products of industrial and technological development amount to no less than environmental racism. Grossman writes of toxic waste dumps located in/near inner cities, radioactive contamination of Native American reservations, pesticide-related cancers of Hispanic farmworkers, lead poisoning of inner city children, and exportation of toxic waste to non-western countries.

Western narrative configurations ignore altogether, or portray as antiquated or primitive because of their simplicity, technologies that fall outside a "mechanical model of reality" (Needham, 1993, p. 31) and technologies associated with non-western cultures. Although Chinese, Indian, and European-Semitic are the three greatest historical civilizations in the world, only recently has attention been paid to these technologies and sciences (Needham, 1993).

There is little recognition that a mechanistic view of the world is simply a western project, and that other cultures' more organistic ways of viewing the world, as well as their "low" technologies, are equally valid, and possibly more ethically and ecologically sound.

So, what might technology look like if it included technologies of, and was designed for, the majority of the world? A serious re-vision of technology education curriculum stories might mean a reshaping of technology narratives "committed to increasing consumerism and profit, maintaining social control, and legitimating the authority of elites" (Harding, 1993, p. 3). Rather than converging into standardized narratives, technology education textual practice might become a space of embodiment of divergent, contradictory, and multiple perspectives consisting of "partial, locatable, and critical knowledges sustaining the possibility of webs of connections in solidarity in politics and shared conversations in epistemology . . . but not just any partial perspectives" (Haraway, 1991, p. 191-192).

Opening Technology Discourses to Difference

> standard-*n.* object, quality, or measure serving as a basis, example, or principle to which others conform or should conform or by which others are judged.
>
> (The Pocket Oxford Dictionary, 1992)

Foucault (1980) refers to any combination of knowledge and power as technologies of control, and schooling is one place where "docile bodies" are re-formed "through drills and training of the body, through the standardization of actions over time, and through the control of space" (Foucault, 1984, p. 16). Such disciplinary technologies are about ordering of bodies and knowledge, a technique of normalizing the body social in the name of efficiency and progress so that anomalies do not disrupt the structures of power and control. Perhaps we need to take a pause in all the flurry of designing and making, and to ask ourselves if technology education is not also in the business of designing and making technosubjects —docile bodies—with our continuing insistence on standards and universals? Several writers believe that with our increasing dependency on technologies we have already become *capitalist bodies* (Deleuze & Guattari, 1983, 1987), *possessive/possessed individuals* (Kroker, 1992), and *terminal bodies* (Grosz, 1992, Hayles, 1993).

The world is a very different place from the one in which many of us grew up. Family, church, and school are no longer the primary source of information for students. From my own research in technology education classrooms, students' understandings are informed largely from texts outside of school: students make meaning of their relationships in the world through television, videos, movies, computer games, comic books, magazines, music, body languages, and other cultural and technological interactions (O'Riley, 1995). Haraway (1991) documents how the "informatics of domination" has shifted an "organic industrial society to a polymorphous information system" (p. 161) which has already transformed our bodies into "cyborgs"—part human, part

machine. She contends that we need to find ways to converse with "[t]his world-as-code . . . a high-tech military field, a kind of automated academic battlefield, where blips of light called players disintegrate . . . each other in order to stay in the knowledge and power game" (p. 186).

Imagining a way out of the non-innocent border stories we tell to explain our bodies and our tools to ourselves could turn on re-visioning "the world as coding trickster with whom we must learn to converse" (Haraway, 1991, p. 201). Rather than privileging too narrow a range of texts through standardizing curriculum, might it not be more beneficial for students to have multiple and different tools so that they can converse in the world as coding trickster, and become actors themselves, agents in the mediation of their own knowledges and subjectivities? Gough (1993) maintains that educators need to provide students with more complex and complicating discourses as we can no longer assume to represent, interpret, and explain "reality" and the "complexity and instability of the phenomenal world that presents itself to human sensibilities" (p. 621).

Technology for All Americans is supported by the National Science Foundation and the National Aeronautics and Space Administration in the "creation of new National Standards for Technology Education. . . . to enhance America's global competitiveness in the future" (Dugger, 1995, p. 4). This project is a *persistence of vision* (Haraway, 1989) that continues to perpetuate the prevalent practices within technology education of linking technology primarily with industry, science, and mathematics, traditionally male-oriented areas. Meanings for technology are much more complex, fluid, and ambiguous than those presently articulated within these selective and partial perspectives. Nietzsche (1979) writes that "nobody can get more out of things, including books, than he [*sic*] already knows. For what one lacks access to from experience one will have no ear" (p. 70). If girls and students of diverse cultural backgrounds are to become more than ontological and epistemological optical illusions in technology education re-visions, a reshaping, a different way of seeing, a move beyond rhetorical gestures of gender and cultural inclusivity is needed. Sanders (1995), writing specifically about the *Technology for All Americans* project, suggests that technology educators "should welcome those different models while unabashedly promoting those which have made us so successful for the past century" (p. 3). There have been certain successes as a particular cultural community. It is now time to re-vision with different angles of vision towards an optics of care and compassion and to create openings for both difference and different visions of technology and of the world. As Scott (1995) writes, it would indeed be a different kind of relation.

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