Feminist Technology Assessment: Reflections On Theory And Practice

Ellen Balka

ABSTRACT

This paper explores the use of technology assessment as an approach to working with women in three contexts - unionized work settings, women's organizations interested in computer networking, and in a university classroom setting. A brief overview of technology assessment is presented, the three projects are described, and the successes and failures of each of the projects are discussed.

RÉSUMÉ

Cet article explore l'emploi de l'évaluation par la technologie comme une approche pour travailler avec les femmes dans trois contextes: le milieu de travail syndiqué, les organismes de femmes intéressés à établir un réseau de relation par ordinateur, et dans une classe à l'université. L'article donne un bref aperçu de l'évaluation par la technologie, il décrit trois projets et discute des succès et des échecs de chaque projet.

INTRODUCTION

Maurer (1996) writes that "to be able to follow the social interests of women in designing technology we need a broad and deep analysis as well as promising ideas [about] how to develop criteria for a feminist technology assessment and design and how to bring together theory and practice." Despite its potential as an educational tool (see Balka, 1987), technology assessment has received only limited attention from feminist audiences. Nonetheless, several feminists remain convinced that technology assessment can be used towards emancipatory ends (Balka, 1987; Bush, 1981 & 1983; Morgall, 1993). In this paper I reflect on some of my efforts to use technology assessment in the context of feminist social change, with a variety of audiences.

In discussing the successes and failures of the projects described here, I rely on critical self reflection, or reflexivity. Ristock and Pennell (1996) describe reflexivity as a process of self-awareness or self-consciousness that has as its goal establishing non-exploitive relations between the researcher and the community being researched. They point out that examinations of power and reflexive insights are seldom included in published methodology sections of papers. They suggest that the result is a sanitized view of the research process, bolstered by romantic stories of research outcomes. Ristock and Pennell argue that the purpose of self reflexivity is to improve, rather than derail research. They suggest that "self-reflexivity can show us areas in our data analysis and conclusions that are not accounted for in even the best-laid plans for community action research" (p. 66).

Technology assessment informed the approach taken in each of the three projects discussed here. It is my hope that this paper will encourage others to experiment with the use of technology assessment in education, as well as the use of reflexivity as a tool in the research process.

BACKGROUND

I was initially introduced to the concept of technology assessment in 1979 in the United States, during the "Golden Age" of the United States Office of Technology Assessment (OTA) (Weingarten, 1995:31). As a young student, with the memory of the energy crisis that beset North America in the 1970s still fresh and the discourse of the appropriate technology movement still a part of

everyday life, the potential of technology assessment to deliver a more humane set of public policies than might otherwise be possible seemed great, so I began exploring the possibility of using technology assessment techniques to empower women workers. Before reflecting on some of my efforts to use technology assessment in an emancipatory framework, I will briefly outline the world of technology assessment that I was introduced to as a young student.

TECHNOLOGY ASSESSMENT: A NEW KIND OF STUDY

Technology assessment, as it was originally conceived in the United States, was a unique form of policy analysis. Recognizing that the social impacts of technological change had become so great that national policy and life were being affected, the United States Congress in 1972 authorized the establishment of the Office of Technology Assessment, which until its demise in 1995 functioned as a Congressional source of information. In addition, it was designed to provide analysis of problems related to technology that was nonpartisan, expert, objective, and anticipatory (OTA, 1984).

Technology assessment has eluded easy definition (Coates, 1973a; Arnstein, 1977; Bereano, 1971). Arnstein (1977) suggests that the definition that has achieved the widest currency was articulated by the former manager of the technology assessment program at the National Science Foundation:

> Technology Assessment is a class of policy studies which systematically examines the effects on society that may occur when a technology is introduced, extended or modified with special emphasis on those consequences which are unintended, indirect or delayed ... Comprehensive impact or assessment studies are a class of holistic studies which attempt in some sense to embrace everything that is important with regard to a technology ... One characteristic of holistic thinking is that we do not know how to do it routinely; secondly, it almost certainly cannot be done routinely; and thirdly, it is not a scientific or an engineering or a disciplinary enterprise. It is essentially an art form. (Coates 1974, in Arnstein, 1977)

Most efforts to distinguish technology assessment from other forms of policy analysis begin with a list of what technology assessment is not. For example, it is not simply forecasting or futures research, or social impact analysis, or purely systems analysis (Lee and Bereano 1981). It also differs significantly from more conventional technology studies such as technical feasibility studies, market research, clinical trials, cost effectiveness, economic and environmental impact studies (Arnstein, 1977). Central differences between technology assessment studies and other forms of technology studies revolve around 1) the range of questions asked, 2) the depth of analysis accorded to the various analytic parameters, and 3) the comprehensiveness of the study's focus or scope (Arnstein, 1977). Technology assessment claims to go beyond identifying impacts and their causation, and looks as well at whether impacts are direct or indirect. Technology assessments attempt to describe both the beneficial and adverse consequences of technological change (Lee and Bereano, 1981). In theory this reflects the assumption that technological change alters the social distribution of costs and benefits.

Technology assessments can be characterized into four types recognized by technology assessment practitioners. These are 1) problem oriented assessments, 2) technology initiated assessments, 3) objective oriented assessments, and 4) group interest oriented assessments. Although these four approaches to assessing technology have been identified, group interest oriented or adversarial technology assessments have seldom been conducted. The notion of conducting group interest oriented technology assessments that focussed on women captured my imagination as a young feminist, and was fueled by Bush's work (1981 & 1983).

In her article about assessing technology assessment from a feminist perspective, Bush

(1983) outlined four contexts in which technology operates. The design or developmental context outlines the materials, tools, processes personnel and systems necessary to create a tool or technique from raw material. Bush suggests that this is the context of technological change we know the most about. The user context of technology includes the motives, intentions, advantages and adjustments called into play by the use of a tool or technique. We often know little about the user context of technological change. The environmental context describes the physical, psychological or environmental consequences of introducing a technology into a particular context. Often we address the environmental context of technological developments through environmental impact assessments. The cultural context of technology describes the effects of technology on the norms, values, aspirations, organizations and laws of a culture. Frequently we attempt to address the cultural context of technological change after technological change has threatened some popular cultural ideals.

Practically speaking, Bush's (1981 & 1983) approach to technology assessment consists of a description of each of the contexts in which technology operates, along with a list of questions those participating in the assessment process can discuss and answer in order to uncover the multiple levels of effects (or ripples of effects) related to the introduction of new technologies. Bush (1981) also provides a graphic tool (called an effects wheel) that can be used to visually present the links between direct and indirect effects of new technologies. Although Bush's contexts have not escaped criticism, they have provided a framework for introducing novice audiences to technology assessment, and one for the articulation of an equity based analysis. Bush's approach to assessing technology also legitimates users' knowledge of the technological change process, which is often lost in more traditional approaches to technology assessment.

In crafting my own approach to technology assessment, I integrated ideas central to traditional and feminist technology assessment writings. Specifically, I accepted as given the insight from traditional technology assessment studies that technological change resulted in both direct and indirect social changes, often spread unevenly amongst different social groups. I also drew on the notion introduced by Arnstein and Christakis (1975) that technology assessment practitioners should outline a set of futures which are important in the sense that they include a desirability criterion. I integrated these ideas with suggestions made by both Bush (1983) and Olsen (1983) that as a culture, we knew the least about the user context of technology assessment, and that we should have people affected by technologies involved in their assessment. I set out to engage groups of women workers experiencing rapid technological change in group interest oriented technology assessments, as it seemed to me that group interest oriented assessments could easily accommodate the framing of technology assessments around "desirable futures."

Bush's (1981 & 1983) approach to technology assessment became central to my efforts, as it could be utilized in a way that located each of the points raised above at the centre of an analysis. The assessment technique she proposes is easily adapted to both a group interest oriented assessment, and an assessment that is conducted by non-experts. By framing the questions that one might ask in addressing each of the contexts of technology in the future tense, Bush's strategy for technology assessment can be used to outline desirable futures.

Mies (1983) has identified several criteria that emancipatory feminist research should meet. Included among them are that neutrality and indifference towards the "objects of research" have to be replaced by a conscious partiality, that "the view from above has to be replaced with the view from below," that the uninvolved spectator has to be replaced by active participation in emancipatory actions and movements and the integration of research in these actions and struggles. For Mies, change of the status quo is regarded as the point of departure for a scientific quest, and the research process then becomes a process of "consciousness raising." It seemed that technology assessment could be used as a research and action strategy with women workers, that would meet the criteria identified by Mies for emancipatory feminist

research. In addition, it appeared that technology assessment could be introduced in a way that was consistent with popular education practices advocated by Friere (1972), Gelpi (1979) and feminist advocates of popular education, such as Griffin (1983) and Thompson (1983).

Introducing women to technology assessment also seemed to offer the possibility that they would develop "really useful knowledge" (Johnson, 1979) - real knowledge that served practical ends (Thompson, 1983). For Johnson, really useful knowledge consisted of acquiring ideas concerning the conditions of life (Balka, 1987). Like Friere's (1972) problem-posing education, Johnson's concept of really useful knowledge is anchored in the articulation and discussion of challenging and contradictory everyday experiences, by those who experience them. Technology assessment, with its emphasis on identification of direct and indirect, desirable and undesirable effects of technological change seemed a perfect vehicle for the discovery of really useful knowledge. By employing technology assessment techniques for feminist ends, feminist values can be featured as an important aspect of the study, rather than left uninvestigated, as is most often the case. In my efforts to use technology assessment in my work, I attempted to consider technology from the standpoint of women (who frequently were users of or consumers of new technologies), to identify and evaluate both direct and indirect effects of technological change on women, and to explore technological change in multiple contexts.

Below I reflect on some of my successes and failures in attempting to bring technology assessment to feminist audiences. First I discuss my attempts to work with unionized women workers experiencing rapid technological change. I then describe several years of work with women's organizations interested in improving organizational communications through computer networking. Finally, I reflect on teaching technology assessment in academic settings, to primarily women students. In each case after briefly describing the project and how it was carried out, I outline how principles of technology assessment informed the design of the project.

TECHNOLOGY ASSESSMENT WITH UNIONIZED WOMEN WORKERS (OR, WHO HAS TIME FOR ASSESSMENT WHEN WE LACK POWER TO MAKE CHANGE?)

During 1985-1986 I worked with two Canadian trade unions whose members were primarily women. Workers in both unions, the Brotherhood of Railway and Airline Clerks, Airline Division (BRAC) and the Association of University and College Employees (AUCE) were experiencing rapid technological change. Although airline workers (who were responsible for all aspects of reservations, record keeping and airport handling of passengers for one of Canada's two major airlines) had been working with computer equipment for some time, a new computer system introduced in 1985 threatened bargaining unit jobs throughout the country. Protection of workers through the inclusion of a new technology clause in the collective agreement became a major issue during contract negotiations. Among AUCE members, personal computers were being introduced into the university work environment at an uneven pace over the course of the study. University workers were unsure of their future work situations in relation to the new workplace technology.

In both instances I acted as a researcher, carrying out research concerned with the introduction of new technology into the workplace. In both cases I was employed by the unions, with funds from Canada's federal government. The BRAC study included extensive interviews as well as observations of workers in their work environments. Funding for the study also allowed the union to evaluate a range of furniture designed to allow workers to work more comfortably with computers. The AUCE study was conducted with substantially less funding. It involved the development and delivery of a workshop about technological change, described in greater detail below, as well as a survey. Technology assessment informed the approach to both projects.

Both studies included mail questionnaires of the entire bargaining unit membership. Seven hundred and forty responses were gathered from BRAC members, representing a response rate of

60%. Two hundred and fifty four responses were collected from AUCE members, representing a response rate of fifty-four percent. Both surveys were developed and laid out according to design principles contained in Dillman's (1978) *Telephone and Mail Surveys: The Total Design Method.*

The BRAC and AUCE surveys both included general questions about workers' views of the technological change process, which were based on theoretical claims made in literature about cultural views of technology. Several questions focused on how workers thought the introduction of new technology would alter the occupational structure, organizational structure and work processes (including specialization of tasks, degree of skill, etc.) of their jobs. In instances where workers had already experienced the introduction of new computer technologies at work, they were asked about how new technology had altered their work. Questions in these sections were broadly reflective of claims made in literature - but often not empirically tested - about the effects of new technology on women workers. Additional questions addressed whether or not workers had received training to work with the new technologies, and the demographics of participants.

The surveys produced interesting results, which were utilized as the starting point for discussion in the AUCE workshop about technological change. [1] Although workers were able to identify what they desired in a job, and could identify when those characteristics were disappearing with the introduction of new technology, the majority of those workers (74%) continued to hold the belief that technological change meant progress.

Among AUCE workers, 92% of women compared to 76% of men indicated that they believed that technological change would occur whether they wanted it to or not. These and other findings suggested that women more than men felt that technological change was inevitable. These surveys became a starting point in a discussion with workers about technological change, because the goal of the larger projects was the development of a critical consciousness about technology, that would leave workers with a sense of agency in relation to technological change.

Money available for the AUCE study allowed me to develop a workshop curriculum about new technology, that was delivered to interested workers during work hours. The curriculum developed for the AUCE workshop[2] introduced workers to the results of the questionnaire they had responded to, and highlighted contradictions in the results (for example, where workers simultaneously indicated that they felt that new technology meant progress, and at the same time that many workers were experiencing health problems related to the introduction of new technology). Following discussion of workers' contradictory views of technology, material about cultural views of technology was presented and discussed, along with Bush's four contexts (1983) in which technology operates. Workers' knowledge of the technological change process as users of the technology was stressed. Other sections of the workshop included a slide show about technological change that presented technological change in a critical framework, a series of discussion topics organized around themes that had been addressed in the questionnaire (such as the organization of work, changes in the content of work, health issues related to the new technology, changes related to the quality of services provided, and training), and an introduction to both Porter et al.'s ten step approach to technology assessment, [3] as well as to Bush's approach to technology assessment.

While it is difficult to know what impact the research or the workshop had on workers' long-term views of technological change, in the case of BRAC, interim results from the study were used during contract negotiations. Perhaps the fact that the research had been done gave union members some ammunition in their struggles to protect union jobs. In the case of AUCE, workers were eventually successful in having a very strong technological change clause included in their collective agreement. One feature of this agreement was that pregnant women could ask to be assigned to non-computerized work during their pregnancies. Bearing in mind that in the mid-1980s little agreement existed about the impact that working with video display terminals had on workers' health, this was a significant victory.

Puzzled by the low attendance at the AUCE workshop, I spoke to bargaining unit members about it and found that although many workers would not be penalized financially for attending the workshop, work would continue to accumulate on their desks. The accumulation of work combined with raised expectations about the quantity of work that could be done with the new computers deterred women from attending workshops.

In these two studies I did not learn all I had hoped about the potential of technology assessment as an educational tool, but my experience did leave me more keenly aware of the impact of work organization and the gender division of labour. I concur with Morgall (1983) that the value of such studies may revolve around the emphasis they place on creating dialogue with users. It seems that for technology assessment to work for women there may need to be an institutionalized process that allows concerns raised by technology assessment activities to be channeled into policy change.

ASSESSING WOMEN'S USE OF COMPUTER NETWORKS (OR, WE JUST WANT YOU TO MAKE IT SO WE CAN TALK)

With the emergence of new communications technology, my emphasis shifted to women's use of computer networking technology. I began conducting hands-on computer networking workshops for women's organizations in 1986, and began to study women's use of computer networks in 1987.

Between 1986 and 1992 I conducted six hands-on computer networking workshops for women's organizations, where participants experimented with computer networking during the workshop. Workshops were presented for the American Association of University Women (AAUW) Idaho Chapter in 1986, The Canadian Research Institute for the Advancement of Women (CRIAW) Board of Directors (1987), CRIAW Newfoundland and Labrador members (1988), academics and teachers interested in bringing women's studies into the high school curriculum in British Columbia (1989), and Women in Trades and Technology (WITT) members (in 1988 and 1992).

Many of the insights shared below were developed through conversations with Margaret Benston, who shared my interest in introducing lay audiences to technology in ways that would challenge knowledge monopolies. During this time I also had ongoing relationships with several women's organizations. I was often called upon to review funding proposals and plans for organizational computerization, as well as provide strategies for solving problems. Some of my observations are derived from my ongoing interactions with women's organizations.

We always attempted to introduce users to computer networking systems in a social context. Here, too, we tried several different approaches. [4] Our efforts included describing the military origins of the technology, highlighting the achievements of women's organizations that were already using computer networks and engaging women in discussions about their particular organizational context and the issues that might arise if their organization adapted computer networks. Our workshops always included hands-on experience combined with discussion about computer networks related to the realities of women's organizations. We emphasized how computer networking worked from a technical standpoint, and when that failed, we stressed hands-on experience followed by discussion of issues that might arise as feminist organizations attempted to implement computer networks.

We did enjoy some successes. We introduced women across Canada (and some in the United States) to computer networking, and the use of computer networks by feminist groups in Canada has grown dramatically in recent years. Although we cannot attribute that growth to our workshops, I think it was important that Canadian women's organizations' efforts to use computer networks have been visible over an extended period of time. Women's groups in Canada have been, in many respects, more successful than similar groups elsewhere in the world at utilizing computer networking technology towards feminist ends, and I like to think that this has occurred in part because women's organizations have paid consistent

attention to this topic over a number of years in Canada.

Despite what I generally regard as a successful project, I am not at all sure that we succeeded in introducing women to technology assessment as an approach to studying or implementing technology, nor that we encouraged the development of any critical thinking about social or policy issues related to computer networking. Again, I was left with a lingering sense that we had somehow failed when it came to facilitating the development of critical analytic skills related to technology assessment amongst our audience.

Our workshops tended to produce one of two outcomes. Either students got totally "turned on" to computer networking (the majority), or they got totally overwhelmed by the technical details related to it. We were perhaps most successful in introducing computer-shy audiences to computer networks. Participants' enthusiasm was evident at workshops, and workshop participants often went back to other women's organizations and began to encourage those organizations to use computer networks. We were probably least successful when it came to developing critical thinking skills related to the introduction and implementation of computer networks. Much to our surprise, our enthusiasm was most often confronted by users who were just as eager to have us tell them what to do as we were to teach them to become their own experts.

This caused my colleague Margaret Benston to revise her thinking significantly about the role of experts in bringing science to the people. Although she had originally argued (Benston, 1986) that scientific and technical experts should facilitate a process that would result in science by the people, after several years of delivering computer networking workshops to women's organizations, she suggested that science by the people was a long term goal that would, in all likelihood, be reached via an intermediate step of technical experts contributing their skills by doing science with the people (Benston and Balka, 1993). Although we had set out to aid women in developing both critical thinking skills related to technology and assisting them in developing technical expertise (rather than relying on "outside" technical experts), for the most part, I doubt we succeeded. On a more optimistic note, in Canada we have succeeded in having access addressed in public policy debates about the information highway, and I like to think that some of the work we did (see for example Balka, 1993 and Balka and Doucette, 1994) contributed to the visibility of access as a public policy issue.

Looking back I think we failed not because we were poor teachers, but because we were struggling against deeply rooted cultural beliefs about the nature of technology (that the form it takes is immutable and inevitable) and about women's relation to technology (women are supposed to be users and consumers, but not technological knowers). Although we succeeded in encouraging a few women to develop technical expertise, the reality is that there is a steep learning curve related to developing competence in relation to computers in general and computer networking in particular. Many women are unable to successfully navigate the maze of constraints (ranging from lack of discretionary time to a computer culture that actively discourages women from developing competence) that work against women becoming technological knowers.

Although I remain convinced that women lacking technical competence or expertise related to technology still have a great deal to add to assessments of technology (for example as users of technology), I have also come to believe that women lack faith in their knowledge of the social impacts of technology if they do not feel technically competent. This insight resulted in part from teaching undergraduate students about technology assessment.

TEACHING TECHNOLOGY ASSESSMENT IN THE CLASSROOM

For several years I taught a women and technology course to third and fourth year undergraduate students at Memorial University of Newfoundland. The majority of the students taking the course were women. The course was offered three times and was scheduled as a seminar course, intended for about 15 students. Below I draw on data from the 1992 and 1993 course evaluations, which is supplemented with my own reflections of

the process.

Students enrolling in the course came from a variety of disciplines, including sociology, women's studies, and psychology. Those who came to the course with a background in sociology might have taken a second year course about technology and society, and students coming from women's studies might have taken a second year course about women and science. Overall, though, the students enrolled in the women and technology course had spent very little time thinking about technology and social issues related to technology, prior to their enrollment in the course.

The thirteen week course began by exploring definitions of technology, cultural views of technology and technology and society as an area of study. Once technology assessment was introduced in the third week of the course, students gained practical experience accessing technology each week. Students were introduced to both Bush's (1983) and Porter et al.'s (1980) approaches to technology assessment, and were directed towards other approaches to technology assessment. Students were strongly encouraged to either conduct a technology assessment or invent or redesign a technology as part of their assessed course work. Student projects assessed technologies such as breast implants and other medical technologies, as well as computers in a wide range of work environments. They designed garments for pregnant women to wear to provide back support, as well as modified a number of existing technologies, such as toilets, baby-bottles and bicycle seats.

Typically, students were quite reserved at the start of the course. They often had somewhat simplistic views of technology though they all have stories about their own interactions with technology and stories about their interactions with men related to technology. In the fourth week of the course, class time was dedicated to discussing and analyzing ideas about technical expertise - what it is, women's experiences with technical experts, and the role of technical expertise in society. Students were asked to bring broken appliances to class. I brought a large selection of hand tools to class, and provided an introduction about technical expertise as well as information about the tools and how to use them. The class exercise consisted of dismantling the broken appliances.[5]

Most students in the class had never taken anything apart, and their experience working with hand tools was very limited. Because the appliances were broken, women were able to set aside their fears of doing damage to whatever they were working on. Although many women were initially quite reserved during this exercise, after some encouragement, and occasionally a bit of help (for example, in selecting the right screwdriver to use), most students dismantled their appliances with great enthusiasm. I always made sure there was a hammer available for those who wanted to gain access to the inside of plastic appliances quickly. Students were often surprised at how simple things are on the inside. For example, after opening up a stereo receiver a student was quite surprised to find that the mechanism that connected the dial to the station indicator was a simple rubber-band. Another student was quite surprised that when she opened up a blender that no longer worked, she was immediately able to see that a wire had burned into two pieces. Although the goal was not to fix the broken appliances, it was usually the case that one appliance ended up fixed, to the delight of the student who corrected the problem.

This exercise was often a turning point for students in the class. It is useful to think about the student's knowledge of technology and technology assessment in terms of the five perspectives of knowing described by Belenky, Clinchy, Goldberger and Tarule (1986), in their book *Women's Ways of Knowing*. Silence is a position in which women experience themselves as mindless and voiceless and subject to the whims of external authority (p. 15). Received knowledge describes a situation in which women view themselves as able to receive or even reproduce knowledge delivered to them by all-knowing external authorities, but remain unable to produce knowledge of their own. Subjective knowledge describes a state where women view truth and knowledge as personal, private and subjectively known or intuited. When they develop procedural knowledge, women are interested in "learning and applying objective procedures for obtaining and communicating knowledge (p.15)." When women become

constructed knowers they view all knowledge as contextual and experience themselves as creators of knowledge. At this stage Belenky et al. suggest that women value both subjective and objective strategies of knowing.

Generally, the women who entered the course described above can be viewed using Belenky et al.'s framework to describe their relationships with technology as predominantly silent knowers, received knowers or subjective knowers, depending upon their past experiences with technology and their general sense of self. Because their culture has systematically denied them opportunities to develop technical competence, few have been given opportunities to develop either a procedural sense of knowing or constructed knowledge about technology. It is as if dimantling appliances and seeing the simplicity of technology allows women to begin to see themselves as technological knowers, with valid claims to make about the social webs of social relations technology interacts with. Although women need not be technological knowers to contribute to technology assessments, until they see themselves in this way many women seem unable to fully engage in assessment activities.

THE FUTURE OF FEMINIST TECHNOLOGY ASSESSMENT

Among the successes and failures reported above are that the potential of technology assessment as a popular education tool was dampened by the realisation that women workers in Canadian trade unions juggle heavy loads, and ultimately their political power is limited. After several years of introducing women to computer networking technology, I concluded that although a broad assessment oriented approach may heighten awareness of the policy issues related to the use of computer networking technology, these may get lost as women simultaneously struggle with technical aspects of computer networking while discovering the potential of computer networking technology. Although the use of technology assessment in the social science curriculum in general and the women's studies curriculum in particular is not likely to produce immediately apparent results, it is in this context that technology assessment techniques seem to lead to the greatest change.

Despite what I have described here as my limited successes introducing technology assessment to feminist audiences, I still believe it is worthwhile to seek ways of bringing technology assessment to women. However, I now see feminist technology assessment much more as a process than as a solution. In North America feminists have not been very successful in influencing the policy process related to technology, except in some very selected cases. We should perhaps direct some of our attention towards intervening in the public policy process, in order to create a place for the results of feminist assessments. We had some success involving women in policy discussions about access to the information highway in Newfoundland, supported by the director of a public agency whose mandate was to criticize government policies on women.

There is also a future for technology assessment outside of the formal policy process. However, efforts to introduce women to technology assessment outside of the formal policy process should include discussion about how to develop political influence, and should also aim to strengthen levels of technical expertise among group members. In workplace settings this can be particularly challenging as the prospect of being out of work in many parts of the world discourages workers from engaging in any activities that might jeopardize their jobs.

Many questions remain about how technology assessment can be used with marginalized groups, and what the adoption of technology assessment as an approach can contribute to the development of critical thinking skills, and ultimately, to the development of technological knowers. Questions also remain about how - if at all - technology assessment can be used with technically sophisticated audiences to develop a critical view of technology. Are there similarities and differences in how technically naïve and technically sophisticated women learn to challenge dominant cultural views of technology? Although seeing the insides of technology may be an important part of the process of constructing a sense

of self as technological knower for those who start out with little technical confidence, it seems likely that those who are technically sophisticated will have to engage in a different process in order to develop a critical appraisal of technology. Clearly, the concept of "technological knower" warrants further attention. Technology assessment - as both an approach to research as well as a vehicle for the development of critical thinking skills - provides many opportunities for future research.

ENDNOTES

1. Results are reported in depth in Balka, 1987. Full coverage of the results of the AUCE and BRAC survey results is beyond the scope of this paper. Results reported here are inttended to illustrate the range of questions covered in the surveys, and the responses the surveys generated.

2. See Balka, 1987 for the curriculum.

3.The steps, or components are: problem definition, technological description, technological forecast, social description, social forecast, impact identification of direct and higher order impacts,% impact analysis, impact evaluation, policy analysis, and finally communication of results (Porter et al.,1980).

4. It should be noted that our approach to modifying the workshop was based on our accumulted experiences and observations, rather than a systematic study of what had worked and what had not worked.

5. I am indebted to my friend Corlann Bush for sharing with me her experiences of doing something similar in connection with a talk she had given.

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