

**Education & Women's Career Choices:  
Findings from a Case Study on Women's Informal Learning Pathways to IT Work**

Hong Zhu<sup>1</sup>

A Commitment to Training and Employment for Women (ACTEW)

Paper presented at Conference: Work and Lifelong Learning Research Networks  
Ontario Institute for Studies in Education of University of Toronto  
June 2006

The phenomenon of women's low participation in information technology (IT) and other traditionally male dominated occupations has been studied from various theoretical approaches (Grint & Gill, 1995; Hayes & Flannery, 2000; Henwood, 1998; Newton, 2001; Stanworth, 2000). This paper examines the stereotype(s) of gender differences constructed through various kinds of education and its impact on women's occupation choices and career development for the purpose of adding empirical evidence to theory construction; as well, the paper explores the factors facilitating women's self-actualization through overcoming gender-biased barriers to full socio-economic participation. The argument is developed as follows: first, the paper reviews the literature and theoretical constructs of women's participation in technology and science occupation; secondly, it describes the background of this article by presenting examples adopted from a study on women's in-formal/non-formal learning experiences of career development in the field of information technology (IT). In particular, the author illustrates how education helped shape women's mentality of gender differences, thus preventing them from choosing jobs involving high technology and engineering science; it also points out how the prescribed conceptions of women's social roles have become embedded in

---

<sup>1</sup> I acknowledge Dr. Shauna Butterwick of the University of British Columbia, Ms. Jen Liptrot, the director of ACTEW, and other members of our research team for encouraging me to compose this paper. I thank Dr. Dianne Stevens for helping me to develop a better English version of this paper. Please read footnote 2 for more information about the background of this study.

women's practices and have blocked them from soaring careers. The paper concludes with a discussion of the significance and implications for curriculum reforming, policymaking, and future research for advocating gender equity of education.

### **Related literature and theories**

Electronic technology, a key component of the "knowledge-based society," eliminates heavy manual work and converges with mental/intellectual work. Thus, one might optimistically assume that electronic technology provides women and men with equal opportunities in the labour market (Toffler, 1981). Despite this, the worry still exists as to whether women will pursue high technology as a career (Newton, 2001; Pearsall, 1997; United Nations, 2005). The United Nations (2005) reports that women's jobs are still concentrated at the lower end of the informal labour markets, which replicates trends in the formal economy. While the lower rate of women's involvement in the high technology sector has been investigated in the United States and United Kingdom (Friedman, 2000; Stanworth, 2000), women's underrepresentation in high technology fields has also been reported in Canada. According to 1996 figures from Statistics Canada regarding university enrollment, less than five per cent of Canadian females in full-time undergraduate programs choose engineering and applied sciences, compared to approximately fifteen per cent of males (Stanworth, 2000). When examining employment, a recent report on women's status in Canada (Statistics Canada, 2006) indicates that in 2004, women represented only 21% of professionals in these highly technical fields; this figure indicates almost zero increase because women have accounted for about 20% of these occupations since 1987. Statistics further reveal that, over the past decade, there has

been virtually no change in the proportion of women employed in the traditionally female-dominated occupations (e.g. teaching, nursing and related health occupations, clerical or other administrative positions, and sales and service occupations) or in the occupations traditionally dominated by males, such as the natural sciences, engineering, and mathematics.

Such a persistent shortage of women studying and working in high technology has made those in the information technology industry worry that there will not be sufficient high technology graduates to meet the needs of the new century (Pearsall, 1997); the situation has stimulated academics to inquire into the barriers preventing women from choosing high technology as a career. Barriers identified were the misconceptions caused by the merger of many computer science departments with schools of engineering (idem), pervasive societal stereotypes, and deep-rooted educational prejudices that science and technology favor male applicants (Newton, 2001). Studies also found that women tend to lack self-esteem in the high technology field, despite the fact women entering engineering often have higher marks than their male classmates (Pearsall, 1997). In addition, it is not rare to read that, once working in the field, the proportion of women who achieved managerial positions is very low. In some instances, women withdraw from the highly competitive fast track for the sake of their families (Scott, 2005; Stuart, 2006). The question is, what underlies the phenomenon of women's low participation in traditional male occupations and their pervasive withdrawal from high competition with their male counterparts?

Feminist approaches have provided several theoretical frameworks analyzing the phenomenon of women's under-representation in the field of high technology; frameworks include eco-feminism, liberal feminism, social shaping feminist views, and a post-structuralist approach (Henwood, 1998). *Eco-feminism* views women as essentially closer to nature than males, but because men dominate and control nature through their technology, they also control women. This control either separates women from engaging with male dominated culture, like information technology (IT), or it results in the development of a unique feminist technology (Stanworth, 2000). From the *liberal feminism* view, technology is essentially neutral and women are socialized away from involvement with technology because they have adopted stereotypes of women's roles in work and society (Grint & Gill, 1995). Thus, women themselves have to make changes in order to succeed in the field of technologic work.

Feminist theory leads logically to questioning the origin of stereotypical gender roles and how these gender stereotypes impact women's occupational choices and career development. Rather than imputing low involvement in information technology to women's self-exclusion, as the liberal feminists did, the *social shaping feminist view* treats technology as masculine culture. With empirical evidence, it analyzes how the relation between technology and manliness is created and recreated from historical and dynamic perspectives (Stanworth, 2000). Nonetheless, either the stereotype of women's roles or the masculine culture of technology is originated from and saturated with social practices. Thus, gender is not only a psychological differential, but also a social dynamic (Hayes & Flannery, 2000) related to varying degrees of status and power. Therefore,

women choosing or not choosing technological work, having or not having a career in high technology, is based not only on personal choice, but on social status as well.

The relationship between career choice and gender difference is a complex psychological and social dynamic, infused with individual and social structural elements. According to post-structuralist theories, subjectivities are constituted through a complex interconnection of discourses (Henwood, 1998). These discourses include not only people's conceptions, which are constructed in certain historical and social contexts and expressed through language, but also their practices, structures, and subject positions, which follow from these discourses (Foucault, 1972; Walkerdine, 1984). Perhaps the optimal interpretation of women's career choices evolves from adopting a comprehensive perspective that integrates feminist approaches with the post-structuralist theories.

This paper argues that, of all the elements which shape people's conceptions of gender roles affect women's career choices, education (that is, public education, family education, and the media) plays the most important role. As a special social discourse, education itself is constructed by historical and other social discourses. While being constructed, education simultaneously constructs men and women's mentality of gender differences regarding their roles in family and society, which further affect their profession choices and career development. Adopting a comprehensive perspective integrating feminist approaches and post-structuralist approach as reviewed above, this paper illustrates how education affects women's occupation choices and career development through direct psychological function and indirect social power

relationships by giving examples from a study on women's in-formal/non-formal learning pathways to jobs in IT sectors. A brief description of the study and the participants follows.

### **Background of the study**

The project, *Women's Alternative and Informal Learning Pathways to Jobs in the Information Technology Sector*<sup>2</sup> lasted three years (2003 - 2006). The research focused on the informal and alternative learning pathways of women working in the IT field through investigating the career histories and learning experiences of women who end up in jobs *without* these credentials. The study has four particular goals: first, to map where the women were working, what kinds of IT work they were doing; second, to illuminate how they learned their IT (and other) skills and knowledge; third, to examine whether these informally and alternatively acquired skills were rewarded and recognized; and fourth, to explore how gender influenced their careers, learning and job rewards.

Both quantitative and qualitative data were collected and analyzed in this study, which include data of government policy analysis, Statistics Canada labour market, adult education training surveys, the Workplace Employment Survey, and interviews and focus group discussions. For the interviews and focus groups, 75 women participants were

---

<sup>2</sup> This project is a partnership between academic researchers at UBC, Vancouver, and a community-based women's agency (A Commitment to Education and Training for Women) based in Toronto. Dr. Shauna Butterwick is the academic principal investigator and Ms. Jen Liptrot the principal investigator of the ACEW site. The study is one of 12 case studies that are part of a research network focusing on the changing working conditions and lifelong learning in the new economy known as WALL (Work and Lifelong Learning). The network is funded by the Social Sciences and Humanities Research Council of Canada (SSHRC) and led by Dr. David Livingstone at the Ontario Institute for the Study of Education at the University of Toronto.

recruited from three Canadian cities: Vancouver, Victoria, and Toronto. Participants ranged in age from 24 to 60 years old. Most do not have a degree in computer science or information technology credentials. They were from diverse ethno-cultural backgrounds. However, given the multi-cultural composition of the population in British Columbia's Lower Mainland and the Greater Toronto Area, a disproportionately high number of participants characterized themselves as white, Canadian or of European descent. Only four participants included South Asian/Indian in their ethno-cultural heritage, while eight spoke of their Chinese heritage. While the study did not ask about religious affiliation, four participants described their ethno-cultural background as Jewish. Almost all of the women had some form of post-secondary education, the majority of them from the liberal arts disciplines. Of the 75 participants, only 18 reported having children.

### **Education and career choices**

Although the future may look bright with the development of science and technology, it remains to be seen whether women choose to pursue technology as a career. Echoing previous studies on women entering professions, women participants of our study spoke about the ways in which their education shaped their understandings of IT as an employment possibility. Education plays the most crucial role of all the factors affecting women's occupation choices and career development. Education is constructed by social discourses; further, it shapes women's perspectives on gender differences, affects the roles they performed in family and society, and influences their choices throughout their career.

### *Stereotypes on gender differences limited women's occupation choices*

The stereotype of gender role has been embedded in women's thought and practices through various kinds of formal and informal education, such as school, family, and society (Hayes & Flannery, 2000). The participants in our study frequently noted how the public education systems, as well as families, do not encourage girls to choose engineering nor to think about IT as a possible career. The lived experience of our participants is echoed in studies, which find that it is not the absence of girls' talents that prevents them from entering IT; rather, the stereotype of IT, shaped by education in schools and families, turns them away from considering this occupational niche (c.f. UN report 2005). Girls are told what they should and should not to do. Boys are considered more capable, by nature, in fields related to mathematics and science. As our participants said:

*I think a lot of women hear, you know what you can do this, it's everyone, you're a girl you can't do this, they might not say it like that but they mean it, fight the power. (Ginger, System engineer)*

*I do think that oftentimes men in an IT role come a little more pre-respected. [Right.] So I think women are bound to be faced with a little bit of having to prove themselves." (Tina, Manager and consultant)*

Participants spoke about how education could have provided them with a broader vision of career choices by showing the diversity of jobs available. This broader view would encourage girl students to make more effort to study mathematics and natural science subjects. Thus, they would have the opportunity to pursue a career beyond traditionally

prescribed women's occupations, they would be capable of adjusting themselves throughout their lifelong learning process. As Sally, a director of a national service, said:

*I think the IT industry, certainly from my experience, is very based on math graduates. So people who – who are in math intensive programs in college or university or even starting in high school. ... I've always thought that one of the changes that needed to occur was that we needed to encourage more girls to be interested in math based programs early, so that they could get into those streams and become acquainted with those structures early in their academic world.*

Having technological knowledge enables students to make wise decisions about the technology they want to focus on as they map out their career. However, traditional conceptions prescribe social roles for each gender, and limit girls' learning experience of technology, which impedes their future career choices. Participant Hope, a business manager, expressed just such an opinion:

*It can be hit or miss as to whether you work in technology that is or is not going forward or leading somewhere else. So you can limit yourself or enable yourself by the choices you make.*

However, career choices are made on the basis of your previous training and experience. In order that our students become capable of making the choices regarding IT, it is important that education empower them with solid mathematics and science skills. In this way, they will be able:

*To recognize the direction technology might go and to see where your opportunities might be and see which ones are attractive to you.*  
(Hope, Business manager)

Another point raised by our study participants is the significance of having female models and mentors in formal and informal education. They felt that there were not enough role models for women. Women need to see more women doing really well in IT. They need to see the accomplishments of other women, and how successful they've been in order not be discouraged or afraid of technology.

*One thing is the importance of role models, female role models. So what can we do to make females in this industry more visible as serious practitioners, as someone that girls might want to emulate? I think society has changed over 30 years. Is there anything that we should be doing to reflect the changes of society in terms of how we use IT people? (Hope, Business manager)*

To facilitate educational changes, many participants suggest women mentoring programs (women mentored by women) in education. However, education institutions and the media seldom motivate women's participation in IT and engineering occupations by advocating women role models. There are still not enough of women out there in training programs or workplaces available to support other women novitiates who are asking questions.

#### ***Career developments (family, male dominant workplace...)***

Besides the horizontal segregation prevents women from entering IT occupations traditionally dominated by men, vertical segregation also prevents women from reaching high managerial positions (United Nations, 2005). One expellant factor influencing women to withdraw from high technical jobs is the discourse of "IT guys." Men do not exert power directly and visibly on women, but they crafted an air, an atmosphere, - a discourse, that they are more capable. The discourse comes to govern people's mentality,

thus constructs their practice. Our participants describe IT as “the boy’s club,” and very much a man’s world:

*You do sit around having macho, empty, verbiage techs peak and empire building and puffing up your chest. Certainly with the government, when I meet with quote-unquote “traditional IT” men in traditional IT management positions. [They engage in] an almost purposeful attempt to be as incomprehensible as possible to protect your [their] little empire. So people ... have a vested interest in making what they do look more complicated than it is, so they can’t be replaced and so that they can be competitive and weird.*  
(Tina, Manager and consultant)

However, a more serious barrier comes from women’s self-exclusion, as our participants pointed out:

*Women think that they cannot be in certain roles because they need to go home or they need to take care of their children – they can’t work the long hours or whatever.* (Sally, Director, National Service)

Women are still acutely aware that females still carry the majority of the responsibility for childcare and home making. This, together with the stereotype of IT being a field that demands long hours and complete loyalty, means that girls and young women will perhaps steer clear of jobs in the IT sector. The Toronto Star reported a story on June 12, 2005, about a senior woman electronic financial trade manager at the top of her field, who walked away in order to spend more time with her kids.

In her heyday running Canada's discount Internet brokerage, Colleen Moorehead was as ambitious as any man - or maybe more so. The 46-year-old investment banker possessed the total, hard-core drive required to go up against the banks as she launched a new brand in Canada, E\*TRADE. Then, on April 11, Moorehead sent an email to friends and associates to break the news. After nine years as president of E\*TRADE Canada, she was resigning.

The reporter added:

Moorehead was travelling 80 nights a year. That was too many nights away from her two sons, age 6 and 8, and her investment banker husband.

Scott (2005)

Moorehead's withdrawal from her high-profile profession role may not surprise people who have experienced a difficult time balancing the up-swinging of their career and the upbringing of their children. Many women give priority to their family, when family and work conflicts. As reported in CFO Magazine in 2006,

Lynn Calpeter had to choose. At 34, a veteran of General Electric's elite Financial Management Program (FMP), she was offered a shot at the brass ring: the CFO slot at GE's plastics division in Europe. But moving to Europe would mean Calpeter could no longer help care for her father, who suffers from multiple sclerosis. Until the night before she had to make her decision, Calpeter admits, she was "distracted." The big question: Would refusing a promotion for the sake of family knock her off the fast-track?

Moorehead and Calpeter's dilemma is one that confronts many women in senior management. As they approach the top, the tension pull between work and private life heighten and they have to make personal work concessions to adjust themselves to achieve a family-work balance. A survey of American women published in the Harvard Business Review of Spring 2005 reported that about four in ten women leave the workforce at some point. The number one reason those women chose to leave workforce was family (cited forty-four per cent of respondents). Although approximate one quarter of men leave their job, most leave for career reasons; only 12 per cent cited family as the reason.

Statistics on women in Canada gives similar report . Employed women of Canada are far more likely than their male counterparts to lose time from their jobs because of family responsibilities. For example, in 2004, 5% of all full-time female paid employees lost some time from work for the reasons of family, compared to only 2% of male employees (Women in Canada, 2005). In addition, Canadian women are far more likely than men to work part-time because of childcare or other personal or family responsibilities. In 2004, 18% of employed women worked part-time because of childcare or other family responsibilities, while only 2% of males were employed part-time for these reasons (Women in Canada, 2005). In fact, women's talents in the field of technology and management have been hidden by the discourses of prescribed gender roles in family, work, and society.

Women are also excluded from high managerial positions and taken advantage of by being hired do "hidden IT" work, and paid at manual labour salaries.

*They [women] were hired into an admin position. But when an employer finds out that they have technical skills, the they [employers] use those skills but still pay them the admin level of money.*

(Rosemary, Entrepreneurs Project Coordinator)

Our participants regretted not having knowledge of the market that would enable them to protect themselves.

*I wish I knew how much technical people got paid when I started out. Because I remember negotiating my first contract with the web design company and I was just thinking today, like, 'God, I totally undersold myself!' I didn't know the sector enough, or didn't know to be able to, and certainly wasn't confident enough in my skills, to be able to say, 'Well, I deserve to make, you know, X dollars. (Rosemary, Entrepreneurs Project Coordinator)*

To counter this exploitation, girls should be encouraged to enter IT fields directly, instead of following traditional secretarial or administrative work. Of the same importance, women need to be made aware of the discourses on gender roles and how people use such discourse to manipulate power, exploit women in the job market, and impede their career development.

### **Implications**

Education can take the lead in reshaping conceptions of gender differences and gender roles in family, work, and the society at large. It should start from public education.

Design curriculum encouraging girls to enter IT and other engineering fields instead of only following traditional office work by, for example, creating woman-friendly curriculum (e.g., collaborative learning), adding hands-on experience to cultivate interests in scientific technology, and establishing mentoring relationship with other women working in the IT field. These changes would help to challenge the stereotype of the IT worker by showing women the opportunities, and empowering them with the knowledge about the market and the self.

Establish internship/practica, using government policy to stimulate the employers to cooperate with universities and colleges who are launching education and training programs for women. Funding is needed for continuing education programs, where not only survival skills but also advanced skills are provided. Programs targeted to low-income women enter IT are particularly important. Such programs need to be free or

have low fees and enable women to continue on to advanced skills program. Tax reform could assist by refunding women the tuition they paid for their continuing education once they begin working.

The empirical findings and literature discussed above have illustrated the roles of education in shaping people's mentality of gender differences and thus impeding women's career development. In order to get rid of stereotypes on gender roles, empower women to make wider career choices through education, it is worthwhile in the future to map gender differences of mathematics education in public schools and perspectives on "science" and "engineering," examine the relationships between female/male students' conceptions of gender roles and their performances in math/science education and their career choices, and explore how these differences affect women's career development beyond math/science education.

## References

- Hayes, E., & Flannery, D. (2000). *Women as learners – The significance of gender in adult learning*. San Francisco: Jossey-Bass.
- Foucault, M. (1972). *The archaeology of knowledge*. London: Tavistock.
- Friedman, M. (2000). Women take to internet while avoiding IT. *Computing Canada*, 26(18), 9.
- Grint, K., & Gill, R. (1995). *The gender-technology relation: Contemporary theory and research*. London: Taylor and Francis.
- Hayes, E., & Flannery, D. (2000). *Women as learners - The significance of gender in adult learning*. San Francisco: Jossey-Bass.
- Henwood, F. (1998). Engineering difference: Discourses on gender, sexuality and work in a college of technology. *Gender and Education*, 10(1), 35-49.
- Pearsall, K. (1997). Wanted: Female graduates who specialize in IT. *Computing Canada*, 23( 24).
- Scott, S. (2005, Jun 12, 2005). FAMILY TIES. *Toronto Star*, pp. pg. A.18.
- Stanworth, C. (2000). Women and work in the information age. *Gender, Work and Organization*, 7(1), 20-32.
- Statistics Canada. (2006). *Women in Canada (Fifth Edition) A Gender-based Statistical Report*. Ottawa: Minister of Industry, Canada Catalogue no. 89-503-XIE.
- Stuart, A. N. (2006, June 01, 2006). *What Women Want: In finance, the operative words are opportunity, flexibility, and balance*. CFO Magazine. Available: <http://www.cfo.com/printable/article.cfm/6970016?f=options> [2006, June 30].
- Toffler, A. (1981). Computational reticence: why women fear the intimate machine. In C. Kramarae (Ed.), *Technology and Women's Voices*. New York: Routledge and Kegan Paul.
- Walkerdine, V. (1984). Some day my prince will come. In A. McRobbie & M. Nava (Eds.), *Gender and generation*. Basingstoke: Macmillan.
- United Nations. (2005). *Women in development: Report of the Secretary-General. Eradication of poverty and other development issues: Women in development*. United Nations: General Assembly.