

# WOMEN'S EDUCATION DES FEMMES

Girls in Science: Discovering Their Choices

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WOMEN'S EDUCATION DES FEMMES, a feminist connection to the world of learning and education, is published quarterly by the Canadian Congress for Learning Opportunities for Women, a national organization that promotes feminist education and the empowerment of women.

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#### Women's EDUCATION des femmes

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We gratefully acknowledge the continued support of the Secretary of the State, Women's program.

#### **DEDICATION**

Despite their successes, on December 6, 1989, 14 women were counted out of careers in engineering when they were killed by Marc Lepine at the University of Montreal's École Polytechnique. Men's violence against women in Canada, so often hidden when it occurs daily in our homes, on our streets and in our institutions, suddenly became a tragically public massacre. This WEdf special issue on girls and young women's interests in science and technology is dedicated to Genevieve Bergeron, Hélène Colgan, Nathalie Croteau, Barbara Daigneault, Anne-Marie Edward, Maud Haviernick, Barbara Maria Kleuznick, Maryse Leclair, Maryse Leganière, Anne-Marie Lemay, Sonia Pelletier, Michèle Richard, Annie St-Ameault. Annette Turcotte and all other victims of male violence. We mourn their absence.

CCLOW is working for change by bringing together the voices of students, educators and researchers talking about their efforts to transform the social practices of science and technology. Girls' and women's aspirations must be taken seriously; we must not be counted out of science and technology. In future we will be counted in.

#### **GUEST EDITOR**

Jan Clarke is an independent social researcher who has studied scientific, technical, and trades occupations across Canada. In her current involvement in graduate studies in Sociology at Queen's University in Kingston, she is pursuing interests in women and work and the social

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impacts of science and technology. Her earlier education and training in molecular biology led to several years of work in medical and scientific research.

#### DÉDICACE

En dépit de leur réussite, quatorze jeunes femmes qui prévoyaient faire une carrière d'ingénieures ont été assassinées le 14 décembre 1989 par un certain Marc Lépine à l'École polytechnique de l'Université de Montréal. Ce numéro spécial de WEdf consacré aux sciences et à la technologie et à l'intérêt que les filles et les jeunes femmes y portent est dédié à Geneviève Bergeron, Hélène Colgan, Nathalie Croteau, Barbara Daigneault, Anne-Marie Edward, Maud Haviernick, Barbara Maria Kleuznick, Maryse Leclair, Maryse Leganière, Anne-Marie Lemay, Sonia Pelletier, Michèle Richard, Annie St-Arneault, Annette Turcotte et toutes les autres victimes de la violence masculine. Elles nous manquent toutes.

Le CCPEF s'efforce de faire changer le cours des choses en donnant la parole aux étudiantes, aux chercheuses et aux éducatrices dont l'objectif est de transformer les coutumes sociales régissant les sciences et la technologie. Il faut prendre au sérieux les aspirations des filles et des femmes. À l'avenir, nous occuperons une place non négligeable.

#### RÉDACTRICE INVITÉE

Rédactrice invitée Jan Clarke fait des recherches sur des questions sociales de façon indépendante et a étudié entre autres les professions scientifiques et techniques ainsi que les métiers spécialisés dans tout le Canada. À l'heure actuelle, elle s'intéresse dans le cadre d'études de troisième cycle à l'Université Queen's à Kingston, à la femme, au travail et aux conséquences sociales des sciences et de la technologie.

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#### **EDITORIAL**

### Hurdles and Roadblocks on the Road to Science and Technology

#### BY JAN CLARKE

**R**eflecting on my own interest in biology, I realize that trying to make sense of the natural world has always sparked my imagination and temporarily satisfied my unquenchable curiosity. But a closer look reminds me of the confusing psychological and social hurdles I too often face. Some I clear well, others bruise me as I stumble.

Entering the "rational" and "objective" world of science and technology has never been easy for girls and women; our enthusiasm and aspirations too often evaporate in the face of social practices that thwart us. The contradictions girls and women face in science education are obviously not new, but challenging them head on is long overdue.

In this issue, the voices of girls and women are heard expressing frustration with the blatant and subtle barriers they encounter in science education. But the clear recognition that math, science and technology are creative, fun and even beautiful is an encouraging change. To kindle the interests of girls and their teachers, educators both within and at the margins of the school system recognize the importance of teaching the joy of science. At the same time, recognizing the persistent social practices which dampen enthusiasm may stimulate new strategies.

A common thread in many of the articles is the importance of presenting math and science to girls in ways that include them, by focusing on creative student-centered projects. This is particularly evident in the carefully designed girls-only programs - the annual careers programs and the hands-on workshops held at colleges, universities and in small communities - that currently remain at the margins of the school system. It is in these programs that feminist pedagogy is usually explicit, whether through an emphasis on relational learning, by fostering a cooperative environment, or through sharing ideas with female role models and mentors. Clearly these experiences can change a girl's attitude towards math, science and technology and can be a turning point in her education and future. Even so, the women who develop these programs express impatience with the school system's reluctance to take feminist pedagogy seriously and incorporate new ideas into the curriculum.

Breaking down the gender socialization which discourages girls' enjoyment of math, science, and technology is not accomplished solely through girls-only programs. It also involves the women who teach girls, particularly at early levels, in school. The quite different educational backgrounds and life experiences of the contributors to this issue indicate that re-learning math and science as adults may offer the opportunity to share our new knowledge and take our own interests in new directions. Recognizing that women

teachers also need to learn to enjoy new technologies so they can comfortably incorporate them into their classrooms, and act as role models themselves, is a positive way of empowering teachers and a step towards reshaping the educational system from within.

Many strategies for taking girls' interests and aspirations in science and technology seriously are enthusiastically discussed in this issue of WEdf. But, our efforts to cover a wide range of topics and regions still leaves out some voices and barely represents many regions. We regret that an analysis of the unique difficulties and concerns of many girls is not included.

Clearly the approaches taken in girls-only programs have led to interests in unusual topics and unique projects; an in-depth analysis of how girls and women might change science and technology will raise new questions. And what can we learn from the voices of young girls themselves? In what way do both traditional and feminist approaches to science education spark their imagination or satisfy their curiosity? We need more feedback.

In this process of making connections to create a network of women involved in science and technology education, the links are strengthening. Counting girls and young women in as a part the shared fun of discovering science is a major step. Next, we must ensure that the routes to careers in science and technology are cleared of hurdles and well-paved.

Jan Clarke is the Guest Editor of this issue of Women's Education des femmes.

#### ÉDITORIAL

# Sciences et technologie: une route parsemée d'embûches et d'obstacles

#### PAR JAN CLARKE

<u>E</u>n pensant à l'intérêt que je porte à la biologie, je me rends compte que chaque fois que j'essaie de donner un sens au monde naturel mon imagination s'enflamme et mon insatiable curiosité se trouve temporairement apaisée. Mais, si j'approfondis le sujet, me reviennent alors à l'esprit les embûches psychologiques et sociales auxquelles je me heurte trop souvent. J'en franchis certaines sans mal, d'autres, en revanche, me valent des contusions au moment où je trébuche.

Pour les jeunes filles et les femmes, il n'a jamais été aisé de pénétrer dans ce monde «rationnel» et «objectif» des sciences et de la technologie. Trop souvent, notre enthousiasme et nos aspirations s'évaporent face à des mesures sociales rebutantes. Les contradictions que les jeunes filles et les femmes remarquent dans l'enseignement des sciences ne sont pas de toute évidence nouvelles, mais il est grand temps que nous les attaquions de front.

Dans ce numéro, des femmes et des jeunes filles expriment leur frustration devant les obstacles évidents et d'autres plus subtils qu'elles rencontrent dans le domaine de l'enseignement des sciences. L'admission, toutefois, que les maths, les sciences et la technologie font appel à la créativité, sont amusants, voire beaux, change le tableau de façon intéressante. Pour attiser l'intérêt des filles et de leurs enseignant(e)s, les éducateurs et éducatrices appartenant au système scolaire ou se trouvant à la périphérie de celui-ci reconnaissent qu'il est important d'enseigner les sciences comme une matière gaie. Simultanément, si l'on admet que les méthodes sociales atténuent constamment l'enthousiasme, on entraînera peut-être l'élaboration de nouvelles stratégies.

On retrouve le même fil directeur dans nombre d'articles, à savoir qu'il est essentiel de présenter les sciences et les maths aux filles de façon qu'elles soient impliquées, c'est-à-dire en se concentrant sur des projets créatifs axés sur les élèves. Cela est particulièrement évident dans les programmes méticuleusement conçus à l'intention des "filles seulement". Il s'agit de programmes annuels sur les carrières et d'ateliers sur le tas organisés par les universités, les collèges et dans de petites collectivités, qui pour l'instant sont encore en marge du système scolaire C'est dans ces programmes que la pédagogie féministe est en général explicite, que ce soit en mettant l'accent sur l'apprentissage en groupe, en créant un milieu où règne la coopération ou en échangeant des idées avec des modèles féminins à imiter ou des mentors. De toute évidence, ces expériences peuvent changer l'attitude d'une fille à l'égard des sciences, des maths et de la technologie et marquer un tournant dans son éducation et son avenir. Pourtant, les femmes qui élaborent ces programmes se montrent impatientes vis-à-vis d'un système scolaire qui n'est guère empressé de prendre au sérieux la pédagogie féministe et d'incorporer de nouvelles idées dans les programmes d'étude.



Ce n'est pas seulement grâce aux programmes réservés aux filles qu'on éliminera le carcan dans lequel on enferme ces dernières et qui les empêche d'aimer les maths, les sciences et les matières techniques. Il faut aussi compter sur les enseignantes, en particulier aux premiers niveaux. Les expériences personnelles et les antécédents en matière d'éducation très différents des collaboratrices de ce numéro montrent que le réapprentissage des maths et des sciences à l'âge adulte donne l'occasion de partager de nouvelles connaissances et d'orienter différemment ses intérêts. Reconnaître que les enseignantes ont également besoin d'apprendre à aimer les nouvelles techniques de façon à pouvoir les inclure sans problème dans leurs cours et à jouer un rôle de modèles à imiter est une excellente manière de leur donner du pouvoir. C'est aussi un pas dans la bonne direction pour remodeler de l'intérieur le système d'enseignement.

Dans ce numéro de WEdf, nombre de moyens sont discutés pour prendre au sérieux les intérêts et les aspirations des filles dans le domaine scientifique et technique. Pourtant, en

dépit des efforts que nous avons déployés pour aborder un large éventail de sujets et couvrir nombre de régions, des voix et des régions ne seront pas entendues. Nous regrettons de ne pas pouvoir inclure une analyse des difficultés et des préoccupations de tant de filles.

De toute évidence, les programmes réservés aux filles nous ont amenées à nous intéresser à des sujets inhabituels et à des projets uniques. Une analyse en profondeur sur la façon dont les filles et les femmes risquent de changer les sciences et la technologie soulèvera de nouvelles questions. Et que peuvent nous apprendre les filles les plus jeunes? Comment les approches traditionnelles ou féministes dans le domaine de l'enseignement des sciences font appel à leur imagination ou satisfont leur curiosité? Nous avons besoin de plus d'information.

En établissant des contacts pour créer un réseau de femmes s'occupant d'éducation scientifique et technique, nous resserrons les liens. Compter sur les filles et les jeunes femmes pour participer à la joie générale de découvrir les sciences représente un grand pas. Nous devons ensuite nous assurer que les chemins qui mènent à des carrières scientifiques et techniques ne sont pas parsemés d'obstacles.

*Jan Clarke* est la rédactrice invitée de ce numéro de Women's Education des femmes.

# "I Would Emphasize the Joy of Science": An Interview with Ursula Franklin

#### BY JAN CLARKE

<u>Ursula</u> Franklin is well known for her interest in the social impact of technology. In her distinguished career as an experimental physicist and professor at the University of Toronto, she has influenced many women in their careers in science and technology. As a convinced pacifist, she has encouraged all women to become "citizen scientists", that is, to gain a general knowledge of scientific and technical information in order to understand issues which interest them both personally and politically.



Ursula Franklin

WEdf Guest Editor Ian Clarke interviewed Ursula Franklin when Ursula visited Queen's University in Kingston as a Scholar-in-Residence with the Art Conservation department. The interview took place in the relaxed setting of the Scholar's apartment where a lively discussion between Ursula Franklin and a small group of interested students and faculty covered topics ranging from math and science education, to art conservation, archaeology, metallurgy, and scientific research. Heather Jamieson, an adjunct professor of geology at Queen's university, joined Ursula and Jan in the following discussion of math and science education for girls and young women.

#### «Je mets l'accent sur les joies des sciences»: une entrevue avec Ursula Franklin PAR JAN CLARKE

Notre rédactrice invitée, Jan Clarke, a fait passer une entrevue à l'Université Queen's de Kingston à Ursula Franklin, scientifique et éducatrice bien connue en raison de l'intérêt qu'elle porte aux répercussions sociales de la technologie. La géologue Heather Jamieson s'est jointe à elles pour discuter de l'enseignement des sciences et des maths aux filles.

Ursula pousse les enseignant(e)s à mettre l'accent sur «les joies des sciences» et «le plaisir ressenti de concert quand quelque chose marche.» Mais elle nous met en garde : dans notre enthousiasme à vouloir compter plus de femmes dans les sciences nous mettons peut-être trop l'accent sur l'enseignement des maths sous prétexte que c'est bon pour les filles. Nous risquons de fabriquer des «pousse-boutons» au lieu de former des femmes qui comprennent plus à fond les sciences et leurs répercussions sur nos vies.

Ursula fait aussi remarquer que le milieu scolaire n'est pas le seul endroit où on peut acquérir des connaissances scientifiques et mathématiques. Elle cite entre autres un exemple tiré de sa propre expérience : Elle explique des points scientifiques très compliqués à des femmes qui désirent participer à des audiences publiques.

En pratique, Ursula recommande que les enseignant(e)s prennent conscience qu'il n'existe pas de différence entre les capacités des garçons et celles des files, mais seulement des différences d'intérêt dans l'ensemble de la population étudiante. Les éducateurs et éducatrices devraient traiter les maths et les sciences comme une autre matière et mettre l'accent sur les joies de la découverte, plutôt que sur les notes et la concurrence. Elle fait remarquer, toutefois, qu'il ne faut pas sous estimer la responsabilité sociale qui est liée à l'enquête scientifique.

**Jan:** What are your views on encouraging girls and young women in math and science? Are there any topics which you think particularly interest girls?

**Ursula:** If I were to teach science in school, I would not necessarily encourage the girls, but discourage the boys. So often math teachers mention that boys are so competitive and so on. I would just send those competitive boys to the library. I'd say, "If you want to be competitive, why don't you do it in the library?" If they want to organize everybody, like a sports team, they can do their problems in the library until they respect other people's contributions, and realize it's not all a question of who gets what fraction of the mark!

"One has to question what is intended by saying that girls need to retain their math and science in school,"

I would very much look at the structure, the purpose, the way problems are phrased and the sorts of things that go into the teaching of science and math. I would emphasize the joy of science, the pleasure of doing it, the sheer shared fun when suddenly something works or becomes clear.

When teaching math and science in school, teachers have to be careful not to come across like one of the characters in Mordecai Richler's Jacob Two - Two books. I'm referring to Jacob's aunt who lives with the children while the parents are away. She is called Aunt Good-For-You by Jacob and his sisters, because everything she does from breakfast on is prefaced by telling the children "It's good for

you." Math and science in school is often taught as if by Aunt Good-For-You. Nothing is done just for the enjoyment of it. You stay with math because it's good for you, you'll get a better job, you'll get to college. Not because it's nice stuff.

**Jan:** I know I studied science because I thoroughly enjoyed it. But one thing I find myself particularly concerned about now is the need for girls and women to try to understand our technological society, in the citizen scientist role perhaps.

**Ursula**: Yes, though one has to distinguish between doing science and understanding science. I discussed understanding technology with people in the Faculty of Education here at Queen's. They said that one of their main roles is to teach kids to understand modem technology. I feel that they may be training button-pushers which has nothing to do with students understanding science or technology. Instead, it's pushing a button and saying "Aha!", rather than discovering for themselves.

The education system has to figure out what is really required to teach science well. Is it to be housebroken with respect to technology, so that you don't jump up and down because you plug something in and it goes "bzzzzz"? Or is it really to cultivate the ability to do engineering, to design something, to practice that science? I think these are two very separate things.

There will be a lot of befuddlement if everybody has to understand science and draw some consequence from it. For instance, then you would say that anybody who drives a car

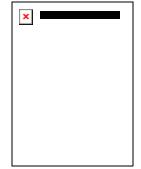
ought to understand how an internal combustion engine works. If this were so most problems of urban congestion would be solved, because there would be such a nice limited number of cars on the road. Instead, to get a driver's licence, you are tested on the rules of the road so you can safely drive a car without being a hazard to yourself or others.

What educators often want to "produce" are people who are technologically housebrokenable to drive their equivalent of a car in this technological society without saying "why on earth am I doing this?" One has to question what is intended by saying that girls need to retain their math and science in school. Is it for careers? Is it to contribute to a housebroken labour force that doesn't ask inappropriate questions? Or is it genuinely the wish to contribute to civic participation in a technological society? These are all different things, and they are taught differently.

**Jan:** My concern is that often girls drop science and math so early that they don't have the choice of any of these three options. If you like, they don't even get the basic rules.

**Ursula:** I'm not sure of that. Schools are not the only place to learn. I have worked with citizen groups on quite sophisticated issues, and haven't encountered any subject that I couldn't not only explain, but get understood to the point that "Mavis" would go to the library and take part in the research. In fact, many of these women become so skilled that some experts get apprehensive of them in public hearings. The whole area of public inquiry is very interesting. For example, two women who spearheaded the inquiry into uranium mining and the pollution of ground water in Nova Scotia were two professors of English.

None of the initial advocacy group participants were scientists; many had dropped their math or chemistry in school. There's also a friend of mine who's an authority on alternate energy and energy pricing, and who appeared before the National Energy Board in very technical debates. She is a woman who has taught history at high schools all her life. So the notion that the bus to science comes only around once, and if you don't get math by the age of thirteen you will never be able to understand it, is mistaken. There has to be more motivation for girls in school than to pass their math and science courses "just in case..."



Heather Jamieson:" I wonder if an all-girls school makes a difference."

**Jan:** Do you think some of the women who are active as environmental advocates could be helpful within the school system, as far as giving girls a different view of science and technology?

**Ursula:** Yes. But that still reinforces the notion that you have to do it in school. I really doubt that anybody remembers anything they learned in grade ten. Do you remember?

Jan: No, I don't think so.

**Heather:** But, the bus schedule is not that convenient if you are a motivated person who

wants to learn as an adult. You can't do a science or engineering degree at Queen's by taking evening courses and it's very hard to do part-time study at all because there are few evening courses in advanced science. That means a restricted education for women who want to return to university to study science as mature students, but who also have other responsibilities such as a family, a job, or both.

Ursula: But our reaction ought to be to say, "School isn't the one and only place to learn science." What you learn in school may, in fact, be out of date by the time you want to use it. Why not open a large number of opportunities for women so they can acquire the knowledge they would like in a given area? We must not treat them as little kids by saying, "You first have to do your long additions before we'll talk to you about science." I have always felt that one should, in every setting, encourage kids to learn as much as they can, but avoid the Aunt Good-For-You attitude. In my generation this approach was still used to advocate such things as learning

"Math and science in school is often taught as if by Aunt Good-For-You. Nothing is done just for the enjoyment of it."

Latin, as a way to make learning other languages easier. Latin would sharpen our minds.

**Jan:** What do you suggest to avoid the Aunt Good-For-You attitude?

**Ursula:** The pleasure of math! The pleasure of playing with numbers. Teachers might bring in more of the human element, such as the story of the German mathematician Gauss, who was a child at a time when a slate and chalk were used. The teacher tried to keep his class of students occupied for an hour or so by asking them to add up all the numbers from one to hundred. Gauss, reportedly a somewhat sullen and grumpy child, came to the teacher after a short time with the right answer. At which point he got a sound spanking because the teacher thought he had asked his older friends for the answer beforehand.

But Gauss persisted he hadn't done that. Eventually the teacher asked him to explain and, of course, what Gauss had done was added 99+1, 98+2, 97+3, etc., to quickly arrive at the correct number of hundreds. Any child you tell this story to, at the right stage in their learning, will say "Isn't that neat. I wish I'd thought of that." The pleasure of playing with numbers, that's what kids often miss in encounters with math.

**Heather:** Having given a lot of thought to encouraging young women to go on in science and math, I've reflected on my own experience in school and read some of the current research on the problem. I've realized that you're exactly right. The fun of science has to be included, which requires excellent teachers. And if you're thinking about science as a profession, it has to be demystified and made available to those who aren't already exposed to it in their families. In the Canadian studies I've looked at, most of the people who choose science as a career have a parent who is a scientist or engineer. In 99% of cases it's the father.

There is no difference in the inherent abilities of girls and boys but different interests among all students."

**Jan:** Does that apply to you as well?

Heather: Yes, my father was an engineer. It was quite an influence. Another thing that comes up in women's studies courses when I talk about women in science, is the influence of an all-girls class. At Queen's there are several women scientists on faculty who were educated in all-girls convents (which by the way, they don't remember with much pleasure). But I wonder now if these all-girls schools made quite a difference to them. I went to a regular school in a small mining town and I was in a very small class. By some demographic quirk there were no boys of academic consequence in

that class and so I measured myself against other girls, and I wonder if that has made a difference to me too.

**Jan:** I have great reservations about all-girls schools because my experience with them in England was not positive. I worry that it's stepping backwards, rather than changing the way science is presented to girls.

**Ursula:** When I began to teach engineering twenty years ago, my first female students all came from all-girls schools in the separate school system. What makes the difference in these schools is that math is treated like everything else. For example, like music. Some people make a career in music, but nobody is expected to do so. You just teach music to all, be it for enjoyment or a career.

I was so intrigued by my first female engineering students that I made friends with the woman most often mentioned when I asked my students about their schooling. Sister Mary Benedict was often either one of their teachers, or their teacher's teacher. The interesting thing about her was her attitude. She was surprised to hear that other educational institutions would think there was a problem with girls and math. Her attitude was that even though some kids may have a talent for, say, art or French, it is the purpose of the educational institution to encourage a certain level of literacy and fluency in all fields.

Then students can begin to see where their vocation might be. Nobody is excused from French, and nobody is excused from math. The students are expected to do as well as they can, at the same time it is clear that their interests will be different. This is the attitude we need to have in our schools, to say that there is essentially no difference in the inherent abilities of girls and boys but different interests among all students.

**Heather:** Before we leave you again to your Scholar's peace and quiet, I would like your reaction to something I find rather distressing. Apparently, in the last few years of grade school, students have started to see scientists as evil and socially irresponsible. Engineers are still considered people who wear hard hats and drive trains, and for some reason biology is considered a more socially responsible and acceptable career area. But I'm very disturbed by this perception of science as evil.

**Ursula:** As a very convinced pacifistic, I've always spoken to my students about the responsibility that scientists carry with their knowledge. If students going to university are suspicious of what's at the end of their studies in science, that's understandable, but one: must openly discuss it. The constructive use of science is a lot more difficult that many of us thought it to be.

Jan Clarke is the Guest Editor of this issue of Women's Education des femmes.

# Reducing the Risk: Co-operative Education Strategies for Girls in Math, Science and Technology

#### BY MARY BEAM

<u>A</u> workshop concerning the education of women in Canada sponsored by the Science Council of Canada in 1982 produced Who Turns the Wheel, a document which alerted the federal government that education equity in secondary schools was far from a reality and that aggressive action would be necessary (1). My school board, the Waterloo Region Catholic School Board, is the recipient of a federal grant that paid for the salary of a teacher for the last four years to affect changes in female participation in science and technology classes. The program's goal is to increase the participation of women in non-traditional careers.

Our schools are situated in an area in which business, industry and education are technically enlightened. Active investment and development by European and Pacific rim countries, coinciding with the Free Trade Pact undertaken with the United States, accentuate our need for students who are involved in practical applications in business and industry. Since the school Board's cooperative education program is well supported by two universities and a

We must challenge female students early in their school careers.

community college as well as local business and industry, it became the vehicle for the work of introducing girls to science and technology.

As we started working with young women in the early years of high school, we began by stressing facts and statistics about the reality of work, salaries and opportunities (or lack thereof) and left them to assimilate this unpalatable information. We expected them to react appropriately - take more mathematics courses, get better marks in science, and sign up for technical apprenticeships. Instead, bizarre developments such as girls stating that they would like to be involved in computer placements for individual senior students who had shown promise in technical subjects or who seemed to have the necessary stamina to survive a non-traditional environment. In the case of one culturally sheltered seventeen-year-old, we secured a cooperative education work experience at a progressive drug production company leading to an apprenticeship as a packaging line mechanic, a desirable and lucrative specialization. She found, unfortunately, that she could not take the risk of such a position, no matter what it might mean for her future. We in turn realized

we must challenge female students early in their school careers and that female students will have trouble accepting the risk of non-traditional environment if they are to be isolated in that environment. We decided to change our strategy.

# Réduire les risques: les méthodes d'éducation coopérative en maths, en sciences et dans les matières techniques pour les filles

#### PAR MARY BEAM

En Ontario, le Conseil scolaire des écoles catholiques de la région de Waterloo a touché une subvention du gouvernement fédéral pour que davantage de filles suivent des cours de maths et de sciences. Dans la mesure où le monde des affaires, le secteur industriel, le collège communautaire et les deux universités de la région soutiennent bien le programme de coopérative du Conseil scolaire, celui-ci a permis de présenter aux filles des professions de nature non traditionnelle.

On rassemble au moins une fois toutes les étudiantes âgées de quatorze à seize ans relevant du Conseil scolaire de la région, pour discuter de questions portant sur les professions. On met l'accent sur les statistiques sur les femmes et le travail et on encourage les jeunes filles à parler ouvertement de leurs attentes et de celles de leur famille. Les étudiantes qui donnent l'impression de porter un vif intérêt aux professions de nature non traditionnelle ont l'occasion d'observer une étudiante à l'université ou un collège ou un ou une professionnel(le) à son poste de travail. On aide aussi les enseignant(e)s à modifier leurs méthodes d'enseignement: de façon qu'ils et elles se reposent moins sur la concurrence.

Le but ultime du programme est de donner l'occasion aux étudiantes de suivre pendant un mois un programme d'éducation coopérative dans un milieu non sexiste, à la pointe de la technique et exigeant. Les enseignants et enseignantes rendes visite aux étudiantes placées pour leur dispenser tout cours nécessaire de façon que celles-ci puissent s'identifier fortement avec leur nouvel environnement.

Tout programme visant à mettre en oeuvre des changements doit s'assurer de créer un climat propice à la population étudiante. Les tâches données aux élèves les premières années doivent être étayées d'occasions d'apprentissage par la suite. Le personnel enseignant doit également faire preuve de persévérance et encourager les élèves à se fixer des objectifs à long terme. Des changements sont du domaine du possible et le succès est stimulant.



A member of the all-female technology class, now about to graduate and become an auto mechanic.

In the current program, all female students between ages fourteen and sixteen in the school board area are gathered together into small groups at least once for a team-led discussion of career issues. We still emphasize realistic statistics about women at work but the issues are often couched in humour and students are encouraged to speak openly and clearly about their personal and their family's expectations (2). We attempt to integrate all academic and career perspectives with the strengths and motivations of the students themselves. We assist them in researching a wide range of courses in new as well as anticipated careers. For example, we might emphasize materials management rather than secretarial courses because the former receives more salary and leads to management levels.

Each student must consider two qualifiers: school admission requirements to ensure that she has chosen and will choose correct courses and maintain appropriate grades; and the placement statistics of her chosen program to ensure reasonable expectation of employment after graduation. We have found that it is ideal to have one of the students' trusted teachers stay in the room during the workshop to make them feel that the school community cares and that this teacher is informed and will aid in subsequent discussions.

Independent and competitive marking processes traditionally used often exaggerate students' sense of isolated fear and mediocrity.

Students who show definite interest in a non-traditional career receive an opportunity to job shadow a student at the local community college or university who is pursing the pertinent education. Job shadowing of professionals in the community is also relatively easy to arrange due to the active cooperative education programs and the existence of many role models who welcome students into the work environment. Workshops in specific subjects such as mathematics, science, or computer studies provide opportunities to raise teachers' awareness of and provide resources for the study of women's accomplishments in these fields (3). Materials to motivate students are left for follow-up by the teachers (4).

We also assist teachers in developing group teaching strategies such as "peer tutoring", "cooperative learning" and even the Japanese model of "quality circles" which include evaluation of the students' oral communications and social skills. Process learning is encouraged and a traditional focus on content is downplayed since independent and competitive marking processes traditionally used often exaggerate students' sense of isolated fear and mediocrity. Under such pressure, female students will often drop a

course before education and career goals are well formed.

One school offered an introductory technology studies section exclusively for girls. It provided an opportunity to gain skills in drafting, woodworking, machining and auto mechanics. As many as forty students enrolled in one year and most of these pursued senior level drafting, auto mechanics, woodworking or computer technology as a complement.

It was very important to keep academic requirements and accomplishments comparable to those for all-male or mixed classes because student might otherwise associate their success with "sissy" curriculum, rather than to more congenial methods and a more comfortable environment. These classes were ideal to take on field trips to work, community college and research environments, to hold peer and adult role model panel discussions and workshops, and to job shadow women in non-traditional careers.

Many students who enrolled in classes have continued in technology and they form a core of female students who have had one or more cooperative education experiences which lead to an apprenticeship. Another benefit has been the prolonged contact of technology teachers with more female students. Their reports to me at the end of the program indicated that their teaching styles became much more congenial and that techniques recommended by Carol Brooks in particular had improved their teaching generally (5).

The ultimate goal of the program is for female students to experience a semester of cooperative education in an environment that is non-sexist, technically advanced, and demanding in such a way that problem solving becomes part of every working day. The students are challenged to assume positions which are not service-oriented. Business students are placed in computerized offices and technical students are placed where the latest equipment is available for teaching. Employers are urged to move students through a variety of skill areas rather than allow them to fill one job, which might aid the employer but which could become repetitive and mundane. Teachers visit the students once every two weeks to monitor progress and ensure that they are learning and earning credits, not just helping an employer reach a deadline.

Female students experience a semester of cooperative education in an environment that is non-sexist, technically advanced, and demanding.

Each year we co-host with our coterminous board and an organization called the K-W Women in Networking, a banquet for one hundred and fifty women who purchase dinner for themselves and an equal number of female students from selected local secondary schools. The keynote address is motivational and highlights aspects of women, work and success. Students are taught how networking functions and they are given practical advice about post-secondary education and careers. The all-important message - that women may make several career changes and undergo a series of retraining procedures in their working life - is better absorbed by students when it is delivered by successful women from outside their home or school environment.

Two innovative programs were initiated in September of 1989. One involved the local community college and local industries who employed a total of fourteen students (four girls) for a full semester. The students at the community college assisted instructors as work experience while participating in classes and working on projects in each of six different technologies (including civil engineering, mechanical engineering, and electronics). In this way they learned basic skills and acquired confidence in a wide variety of subjects while determining those which best suited their individual skills. Industry-based students were considered pre-apprenticeship in machining, tool and die, and pattern making.

Those capable of sustaining the level of work required were offered apprenticeships and their employers credited the students with the hours spent learning their trades during the semester. A co-operative education teacher and an English teacher went out to the college and the industry so that students stayed the full day at their placements and learned to identify strongly with their new environment:

This program permitted students with little or no prior technical experience to investigate and choose a technical career. The young women were able to risk a full semester in a small group and showed a great deal of promise in electronics and related fields. Two of them are currently pursuing education for non-traditional careers. One of the students, Carey Woodcock, said "It changed my view towards school. It gave me an opportunity to experience new things for a better paying career."

The second program is a cooperative education program at the University of Waterloo for students in their final year of secondary school (6). They serve as research aids for professors on projects which give them their first experiences in research while they acclimatize to the university environment. They receive secondary school credits in the discipline in which they are working and take their first university course for credit. Although this program is open to both young women and men, our prior workshops and shadowing programs netted more women - a majority in science and engineering. As the students progress on their projects, they consider research as a career possibility and feel more comfortable in a choice which may otherwise seem isolating and intimidating.



One benefit has been the prolonged contact of technology teachers with more female students.

Again, the secondary teachers go to the university to teach any necessary classes and to monitor the progress of the students. Students learn a great deal about current theory and research methods and teachers acquire a truly valuable resource: professors willing to return to the school system for student enrichment and to give special lectures. Students

write a co-op work term report and present their project to a secondary school class. One student who worked in biomechanical engineering returned to a grade eleven biology class just after the skeletal system had been studied to explain her research in knee and hip implants.

Any program designed to implement change must form a whole environment around the school population. The challenges presented in the early years must be augmented with opportunities in the later ones. From our experience, programs are most effective if students are immersed in the environment for full days over a full semester since they gain a sense of personal accomplishment and confidence over an extended period of time.

Any program designed to implement change must form a whole environment around the school population

Teachers must also be consistent, persistent, and promote long term objectives or the risks that we ask girls to take will seem external and too great to accept. But change is possible and the success is rewarding. Gale Daly, a teacher, remarked, "I highly recommended this program for those educators who have forgotten why they originally went into teaching."

Mary Beam is Business Studies Head at Resurrection Catholic Secondary School in Kitchener, Ontario. She is presently involved in implementing a school-based plan for Computers Across the Curriculum in which issues of equity will be a focus.

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- 6. This highly successful program has been expanded to include Wilfrid Laurier University, in order to take ad vantage of the business and commerce opportunities there.

#### Math is a (Wo) man's Subject

#### BY M. ELAINE HARVEY

<u>I</u> would like you to consider this article as a wine-taster would taste wine. Approach with an open mind and no preconceived opinion, sniff the bouquet and enjoy the fragrance. Risk taking a sip and swirl it around in your mouth. If you favour the old flavours, don't dismiss this one on a whim; give it a second chance by checking it out another day.

Western society in general has been patriarchal since the time of recorded history. Men have held the powerful positions, and it is men's history that has been recorded. Analyze the amount of air time given to men and to women on radio and television. Analyze the amount of space given each sex in the newspaper, and you will see we still live in a male-dominated society.

Until recently in the western world, women have been excluded from formal education. Many subjects, including mathematics, have been considered out of their realm. Frequently when a woman asks a man how to do something, he does it for her and she never has the experience of trying for herself under the direction of someone who understands the process.

Men have valued analysis at the expense of intuition, content at the expense of process, and objectivity at the expense of subjectivity.

We are very sex-conscious. We tend to label objects, ideas, and practices as either male or female. We have Mother Earth, Father Time, male logic, female intuition, male and female hose connections. Many feminists would avoid the duality of male/female and prefer to consider human qualities, accepting female/male as two poles in a continuum. In fact, this is a key message of feminism. Patriarchy sees black and white. Feminism sees shades of grey. Patriarchy sees right and wrong. Feminism sees degrees of rightness.

Classifying is one of the means by which men's ideas have dominated the western world; classification is a male-created thing. It is men who have classified plants and animals, who have identified and classified learning disabilities, and who have identified and classified the academic disciplines. It was also men who divided mathematics into various branches: algebra, calculus, trigonometry, statistics, geometry, etc.

It was perhaps these divisions, and their hard sounding names, that prompted one woman to write the following comment:

On the eighth day, God created mathematics. He took stainless steel, and he rolled it out thin, and he made it into a fence, forty cubits high, and infinite cubits long. And on this fence, in fair capitals, he did print rules, theorems, axioms and pointed reminders. "Invert and multiply." "The square on the hypotenuse is three decibels louder than one hand clapping." "Always do what's in the parentheses first." And when he was finished, he said "On one side of this fence will reside those who are good at math. And on the other will

remain those who are bad at math, and woe unto them, for they shall weep and gnash their teeth."

Math does make me think of a stainless steel wall-hard, cold, smooth, offering no handhold, all it does is glint back at me. Edge up to it, put your nose against it, it doesn't take your shape, it doesn't have any smell, all it does is make your nose cold. I like the shine of it-it does look smart, in an icy way. But I resent its cold impenetrability, its supercilious glare. (1)

Les maths: un sujet masculin

#### PAR M. ELAINE HARVEY

Elaine Harvey affirme que l'optique des hommes sur le monde domine depuis trop longtemps divers domaines, dont les mathématiques. Ce sont les hommes qui ont classé les différentes branches des mathématiques (algèbre, géométrie, etc.). Qui dit classification, dit souvent hiérarchie et rapport de force. Les femmes, si la chance leur en avait été donnée n'aurait sans doute rien classifier. Le langage paternaliste de la classification, du pouvoir et de l'autorité n'est pas nécessairement celui de l'apprentissage. Les féministes commencent à modifier les méthodes pédagogiques de façon à mettre moins l'accent sur le vrai, le faux et l'évaluation. Selon Mme Harvey, l'apprentissage peut se faire sans évaluation. Son expérience en tant que professeur de mathématiques lui a fait découvrir que l'approche dualiste (vrai / faux) du sujet est souvent un obstacle pour les élèves. Ces derniers, en particulier les filles, se sentent beaucoup plus à l'aise si les enseignant(e)s peuvent reconnaître un fil directeur entre le vrai et le faux et donnent davantage aux élèves l'occasion de ne pas répondre mal aux questions. Les enseignant(e)s doivent comprendre les styles d'apprentissage des filles et des femmes en ce qui concerne les concepts mathématiques et scientifiques. Ils ou elles doivent aussi respecter les élèves et être à leur écoute pour que les sciences et les techniques deviennent accessibles à tout le monde.

Yes, it was men who identified and classified mathematics as an academic discipline. I wonder if women, if they had the choice, would have classified at all. Classification suggests a hierarchy, and women may not have created hierarchies. Hierarchies impose a power structure, and a power structure implies competition for control.

Evaluating students through testing, assigning marks, and ranking, is a patriarchal approach.

Morris Kline acknowledges that mathematics "has brought life to the dry bones of disconnected facts and, acting as connective tissue, has bound series of detached observations into bodies of science" (2). But mathematics has also allowed us to dismiss those natural phenomena that cannot be organized - those disconnected facts and detached observations that do not fit into bodies of science. Our methods of labeling and/or classifying both elucidate and limit our knowledge of the subject in question.

If women had classified mathematics, or if women do classify mathematics, it will yield a greater understanding of the subject. A new classification system allows people to look at something from a different perspective. Take a mathematical example. Classifying triangles as equilateral or equiangular, isosceles or scalene, forces one to measure sides and angles. Comparing triangles by their symmetries focuses on properties other than sides and angles and clarifies where the figures are the same instead of different. Dr. Roberta Hamilton, a sociologist and lecturer in Women's Studies at Queen's University, has said about women: "In changing the world, we are changing what there is to know. Our way of apprehending the world is different because we ask different questions of it. It has to do with how we define what is women's work and how we value it." Seeing things from different perspectives gives a more complete understanding of the whole.

The parameters of the question define the parameters of the answer. Men have valued analysis at the expense of intuition, content at the expense of process, and objectivity at the expense of subjectivity. (Adrienne Rich says that objectivity is merely male subjectivity). Men thrive on dualities; women tend to be more comfortable with continua. Yet the male view of the world has generally been accepted by both sexes as the only view. Women are beginning to identify our own view, but it must be remembered that we cannot forge new meanings overnight.

Women's own view is beginning to be identified in methodologies of teaching. Feminists consider that the methods of education (the process) are as important as the content. Evaluating students through testing, assigning marks, and ranking, is a patriarchal approach. In feminist teaching, marks are generally not determined by one do-or-die exam. Marks for work during the term have become increasingly important. But let's not even assume that marks are necessary. We could use grades or even assign complete/incomplete status. Why do we even labour under the assumption that evaluation is essential to education? It is not essential to learning. In fact, it may even be detrimental.

Douglas Barnes in *From Communication to the Curriculum* says that there are different types of language. The language of control and authority, the patriarchal approach, is not the language of learning. Teacher-led learning does not promote student learning. Learning is asking questions and listening to the ideas of others. Learning is an active process where the learner remains open to ideas, is self-processing and initiates the exploration. The dualistic, right/wrong way of approaching a subject leaves many elements out of consideration.

For example, Carol Gilligan recognized that Kohlberg, a psychologist, constructed moral dilemmas as a conflict between life and property (3). For example, should the penniless man steal a drug he cannot afford in order to save his wife's life? Women frequently found his questions difficult to answer because they wanted to put them in context. The dualistic response to the dilemma is either yes or no, but putting the question in context means bringing in the pharmacist to ask if she would provide the drug free of charge.

I realize now that the obstacles I have encountered in encouraging students to grapple with a problem - experience it, discuss it, share ideas about it, take it home and dream on it - are the result of this dualistic/hierarchical/patriarchal way of dealing with mathematics. Students often need a larger context in which to consider a problem. When a grade nine class discovered a pithy problem for which none of the students had an immediate answer, I asked them to ponder it for homework. I was accused by an observing administrator of avoiding the issue because he thought I did not know the answer. However, the students came back the next day eager to continue the discussion and were able to resolve the problem with very little help from me.

In yes/no, right/wrong teaching methods, students realize that getting the answer is where a teacher puts priority. An answer can be checked by glancing quickly at the solution without working through every step. Students who give a wrong answer in class frequently feel self-conscious and embarrassed; those that refrain from answering have learned about the embarrassment and will not risk it.

Students would also feel less self-conscious if the continuum from wrong to right were recognized by teachers.

Students would feel less self-conscious if opportunities were provided for them to avoid giving wrong answers. One technique I use is to pose a question and then ask several students whether they have an answer (or even whether they want to answer), and then choose one who has agreed to respond. One day I told my students that I do not want to put them on the "hot seat". A couple of days later I asked a student a math question. Her response was, "I don't want to be on the hot seat." I apologized and went on.

Students would also feel less self-conscious if the continuum from wrong to right were recognized by teachers. A student of mine got a whole page of subtraction questions wrong, until I noticed that she started her subtraction at the decimal point, subtracting the whole number portion to the left and the fractional portion to the right. Using her rule, all the answers were correct. She was thrilled when I told her they were right by her method, but that she should learn the common method of subtraction unless she wanted to teach everyone her method. She learned it quickly and retained it.

A professor of mathematics (a woman) told me once that women students can be frustrating in their pursuit of the larger context. Just as the lecturer gets to the key teaching point, a women student may ask a question concerning an idea on the fringe of the main lesson. That student has to be satisfied with an answer before she is able to absorb the main point of the lesson, even though other students and the professor herself may find the question irrelevant. If we can find links between the pure mathematical concepts and the learning styles of women, and if teachers can respect and hear their students so they feel a sense of accomplishment and avoid frustration, we will soon have a more perfect wine to taste.

Elaine Harvey, a secondary school mathematics teacher for twenty-five years, has modified both her teaching and curriculum in response to a growing feminist awareness. She is the founder of the Women and Mathematics Committee of the Ontario Association for Mathematics Education and has served as Women and Mathematics editor of the Ontario Mathematics Gazette. She has written articles and made presentations on women and mathematics and was an author for Prentice Hall's Math scope series-textbooks for the intermediate levels. She is presently chair of the Advisory Committee for the Women's Studies Certificate Program at St. Lawrence College.

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#### POETRY

#### **SEWING SHIRTS**

Only those white clouds are free to soar beyond the factory window; inside, grey dust scales the cutter hacking out shirts. flinging dismembered parts, inanimate as dead dreams, into open boxes. Here, life is taped, ruled "At the double!"- the double seam yoking body to arm, the double load of outside job plus housework, the double talk of a radio playing "Workers' Play time" while women sweat for a minimum wage. Their hands cling to a Singer racing like a small, frantic beast toward five o'clock and freedom of a sort: life buttoned down from eight to five, for fifty weeks a year the stop-and-start embrace of these whose limp arms hold only the bone and flesh of a five-day week plus compulsory overtime.

Their eternal home is this dead end where St. Mary is a supervisor with hennaed hair, steel eveglasses and a tongue whipping them forward and God is a scissorswielding boss slashing seams and wages. Neither the singer nor the song these women are only the necessary between the dole and the rent due Friday next, and the young girls marry arm to body, try to pin life down by the tail. and dream of collaring a husband, rattling out short and long stitches: hopeful SOS to that future Prince faceless now as these headless ones who will take the m away from all this, into a fairy world of wifedom where life will be a seamless wonder and the inside will be as perfect as the outside...

And the older women. wiser, turn away, knowing that in a woman's world all hope hangs only by a threat and they fold the shirts and entomb them tight in plastic, seeing in these pale look-a likes an image of themselves boxed in, straightjacketed, branded in cut-rate, throw-away packages.

### Jantis Andrews West Vancouver, B.C.

#### *Here Today, Where Tomorrow?*

#### BY BARBARA LEEK AND JANE DALTON

<u>Here Today... Where Tomorrow?</u> is an annual program for young females, initiated in 1985. It was conceived, and developed in response to the voices of women enrolled in college level career change programs, such as Women Into Trades & Technology and Introduction to Non-Traditional Occupations. These women described a lifetime lack of practical learning experiences and work opportunities that provided both satisfaction and financial (independence. It was also a response to the voices of women who were working in education at various levels, as members of Women Teachers' Associations and as college faculty. These women (privileged by virtue of their professional status) heard, observed, or personally experienced other women's life-world concerns and felt a commitment and the capability to respond.

At a meeting of representatives from Simcoe County Women Teachers Association and from Georgian College after a 1984 international conference in Montreal on the status for Girls, the concept of *Here Today... Where Tomorrow?* was formed. Our program focus and design were influenced by other initiatives predominately in urban centers, such as event days sponsored by Boards of Education to encourage girls' exploration and consideration of applied science and math-related occupations, and Open Doors, a community-based mentor program developed of the Ontario Women's Directorate.

An integrated, activity-centered approach respects what we have discovered about the ways most females learn best.

The format and objectives of *Here Today... Where Tomorrow?* have evolved over the five years since its inception. In 1985 the primary objective was to provide an opportunity in which young females could broaden their horizons and discover more about themselves through involvement with industrial project-based tasks. One hundred elementary students from across the county came to a local college for a one day event featuring a dynamic female guest speaker (a successful entrepreneur), small group discussions with female mentors from a variety of occupations, and a series of hands-on project-based workshops and demonstrations in wood, metal, and electrical.

To enable the continuity and delivery of this program an infrastructure had to be created. A Program Committee was established with representation from the principal sponsors - Women Teachers' Associations, Georgian College, and participating school boards.

#### Ici aujourd'hui...Où demain?

#### PAR BARBARA LEEK ET JANE DALTON

Lancé en 1985, Ici aujourd'hui... Où demain? est un programme annuel axé sur des activités qui se déroulent au collège Georgien à Barrie (Ontario) Ce programme vise à présenter aux élèves du sexe féminin de l'école élémentaire les métiers spécialisés et les technologies. Il a été mis sur pied pour répondre aux plaintes de femmes inscrites à des cours de recyclage dans des collèges. Celles-ci affirmaient qu'au cours de leur vie elles n'avaient jamais eu d'expériences d'apprentissage pratiques et de possibilités d'emploi stimulantes.

La philosophie du programme se fonde sur l'expérience de l'organisme. Les femmes dans les métiers et les technologies, qui insiste sur l'apprentissage en groupe. Pendant qu'elles se familiarisent avec des méthodes, outils et matériaux associé à divers métiers et professions techniques, on encourage les filles à réfléchir à leurs expériences et à en parler ouvertement entre elles.

Depuis cinq ans, le programme a changé. Ce qui au départ était un événement d'une journée qui regroupait 100 élèves dure aujourd'hui six jours et accueille 600 élèves en provenance de la campagne et de petits centres urbains. L' un des objectifs de ce projet est que le programme fasse partie intégrante du programme scolaire, mais le personnel scolaire se contente de cette réunion annuelle dont l'organisation et la prestation reviennent un agent externe. Tous les commentaires et recherches sur ce programme indiquent qu'il est important d'avoir un programme réservé aux filles pour faire découvrir à ces dernières les métiers spécialises et la technologie.

The program format and objectives have continued to evolve, in response to solicited feedback from students and teachers, from program resource staff and steering committee members; to current feminist research; and to the systemic barriers that continue to persist within the educational system.

#### The Nature of the Program

Here Today... Where Tomorrow? direction and philosophy is based on previous experience with the Women Into Trades and Technology programs. While exploring methods, tools and materials associated with various trades and technical occupations, girls are encouraged to tinker, to verbalize and share their experiences, to trust their intuitions, to be reflective, to assume leadership roles, and to incorporate observations into developing theoretical perspectives. This integrated, activity-centered approach respects what we have discovered about the ways in which most females learn best. Carol Brooks' interpretation of Sandra Segal's research about "relational learning" has been a significant resource in the development of the programs (1).

Unfortunately, most school personnel seem satisfied with a oneshot annual event organized and delivered by an external agent.

From the beginning, the project resource staff hoped that *Here Today... Where Tomorrow?* would become an integral component within school curricula. Unfortunately, most school personnel seem satisfied with a one-shot annual event organized and delivered by an external agent. It was also hoped that parents' awareness of career alternatives for females would be heightened through participation in a specially planned evening program. The poor response discouraged any subsequent programming for parents. Regardless, we feel that parents are a critical influence in supporting their children's career exploration and always maintain an open door for parental involvement in *Here Today... Where Tomorrow?* 

#### **The Changing Process**

Many factors have contributed to changes with the program. These include: increased demand for participation; facility limitations including the availability of physical resources; conflicting and busy

schedules of participating school systems; transportation; financial resources; availability of resource staff; and in-school support.

The infrastructure has become more formalized to include a Steering Committee of sponsoring partners: representatives of participating school boards, Teachers' Association, local colleges, local business and industry, a local Canada Employment Centre, and Community Industrial Training Committees. A permanent coordinator position was established in the third year to facilitate program planning liaison, continuity and implementation.

In response to demand, the number of participants has increased from 100 to 600, and the number of days over which the event is held from one to six. Schools select team members to attend and each team is accompanied by an adult, most often a classroom or a learning resource centre teacher. In the second year of the program, secondary students requested involvement and as their participation increased over the years, it became evident that a different experience was needed for each panel. In the fifth year (1990), a special day was set aside for high school students, who by then represented one-sixth of the total registration.

As students come from both rural and small urban communities within the catchment area of the college, their interests, experiences, expectations and aspirations differ significantly. These differences reflect what are the unique characteristics of any community. Unfortunately, designing a singular event to accommodate this important reality has met with varying degrees of satisfaction on the part of participants and organizers alike. Moreover, a system has not been developed to follow up locally any interest generated on the part of students attending the event at the college. In fact, there is currently no way of measuring the "success" or influence of the program.

Feedback indicates that the college site is a more relevant exposure for high school

students and most elementary students relate more readily to their forthcoming high school experience. Initially, providing a central location with facilities and resources which' were unavailable in most schools was a significant factor in transporting students to the college for the day's program. However, as secondary schools become interested in attracting students and their technical departments are upgraded, feeder school linkage becomes increasingly important. The local high school has a vested interest in actively pursuing elementary school students but much encouragement is needed to formalize this relationship at the school level.

Feeder school activity, where elementary students visit a high school and high school students visit an elementary school, has great potential. It will help influence course selection in grade 8 and more directly involve parents in the career decision-making process; it will likely attract the support of local industry (and consequently female mentors). Feeder school activity also often encourages the development of programs more responsive to community needs and interests. From the standpoint of fulfilling *Here Today... Where Tomorrow?* objectives, we can see that the local high school, with a progressive and committed technical department, can playa significant role particularly with leadership supportive of gender specific programs.

The initiative that began in 1985 has become a comprehensive program that incorporates mentors as resource staff in project-based hands-on workshops, delivers pre-training to teachers, delivers specialized seminars to selected groups of students, hires a coordinator to develop and maintain liaison with all interested groups and individuals in order to sustain the program, and responds to feedback by regularly developing new curriculum.

We wonder if there are institutional pressures put upon the teachers that have influenced their latest assessment

#### **The Present-A Review Process**

At this time the future of *Here Today... Where Tomorrow?* is being explored. A review process has been initiated primarily to evaluate the merit of and demand for the existing program. A secondary objective is to assess community-based program delivery itself. To facilitate this discovery process, our coordinator has been holding a series of meetings in regional locations for interested teachers. The participation, while disappointing in numbers, is substantial in commitment.

A questionnaire has been used as a stimulus for discussion. When asked to identify the most important aspects of the current program, the teachers listed hands-on activities, team activity, student involvement with female mentors/instructors, link with industry, and age-group focus. What is obviously missing is the gender-specific feature of *Here Today... Where Tomorrow?* As we have been determined to maintain this feature as a main focus of the program, this present evaluation is disappointing to say the least. We wonder if there are institutional pressures put upon the teachers that have influenced their latest assessment. Also missing in the evaluation are the girls own voices, as the meetings have been attended by teachers only.

The review process has also revealed specific communities where community-based delivery, incorporating industrial sponsorship, is being considered. In one particular community (Midland, Ontario), significant leadership is being provided by staff from the local Industrial Training Committee, a technical director from a high school which offers girls-only technical courses, and the regional Women Teachers' Association representative. This configuration of linkages might serve as a future model. While a gender-specific community-wide activity is not seen to be the most important objective, consideration is being given to addressing the need to support females differently from males within the classroom setting. One practical suggestion, within this context, is to form working groups of girls-only and boys-only and wherever possible involve local female mentors in the program activities.



Providing a central location with facilities and resources unavailable in most schools was significant

Great interest has been expressed in teachers' hands-on workshops, organized by the *Here Today... Where Tomorrow?* program resource team. The content and format would be designed to assist the delivery of the project modules by classroom teachers, with mentor assistance, in their own schools.

The Steering Committee has agreed that the following activities should be supported for the next year: development of a video that is project-based and covers the generic skills workshop including the discussion with teachers, students, and women mentors; development of a mobile tool kit that contains all the tools required to complete a project; development of support material such as a teacher's kit and local resource list; involvement in professional development with Boards of Education; continued support of local demonstration projects like the one in Midland. All schools are being advised of these activities, and their support, advice, and guidance is being sought.

#### The Questions

Why does the issue of a girls-only event remain ever present?

In order to ensure continuation of this project, we are left with serious questions. How to provide on-going support to those dedicated people and local communities who want to maintain and further develop the philosophy of *Here Today*. *Where Tomorrow?* What is the role of a central Steering Committee with a decentralized program? And what is the role and what are the implications of the position of coordinator?

Does the program's title confuse a fundamental focus of self-esteem and confidence with a greater emphasis on career orientation, and is a change of title necessary for the inclusion of activities and philosophy into regular curriculum materials? And why does the lingering issue of a girls-only event remain ever present? For five years we have been presenting research, data, and practical examples that support a female-only event as an introduction for girls entering unknown territory. Finally, what is the possibility of influencing the delivery of the new Design and Technology curriculum for the elementary

level so that the particular needs of girls are taken into consideration (2)?

We have some general suggestions. A research project, where girls co-investigate with a researcher whether they want a female-only event, should be undertaken and perhaps this will settle the controversy once and for all. As well, a research project to investigate an existing secondary level technical program for girls-only should be set up. The importance of the hiring of female role models, particularly in Technical departments, and the participation of Here Today... Where Tomorrow? resource staff in providing leadership for professional development workshops must be promoted.

**Barbara Leek** was an instructor with Women Into Trades and Technology. She is presently Coordinator of Here Today... Where Tomorrow? and instructor in "Muskoka Women Into Trades", a program of the Muskoka Women's Advocacy Group. She is also developing employment skills training programs for institutionalized special populations.

Jane Dalton is a member of the Program Committee for Here Today... Where Tomorrow? She has developed and implemented several programs at the college level for women considering entry into trades and/or technical fields and has developed and acts as a consultant to a literacy program for institutionalized special populations. She is completing her Ph.D. in Curriculum Studies at Ontario Institute for Studies in Education.

- 1. Sandra Segal's important research breaks learning styles into three types: mental, emotional/relational, and physical. Carol Brooks has incorporated Segal's work into the development of various educational programs.
- 2. For information on the Design and Technology curriculum, see the articles by Sheila Rhodes and Nancy Moore in this issue.

# Female Scientists Are Real People! Introducing Girls to Science Careers

#### BY ANDRA MCCARTNEY

The residential Science and Technology Careers Workshop held in Peterborough, Ontario, in May, 1990, was a collaborative venture coordinated by Trent University and Sir Sandford Fleming College. Developed as a three-day workshop in 1989, it was expanded to six days in 1990, and attracted 40 girls in grades 9 to 11 from areas in Ontario as far apart as Sioux Lookout and St. Thomas.

Over 200 young women were nominated by their science teachers to participate in the workshop. They were chosen not on the basis of outstanding academic achievement in high school science labs, nor were they necessarily consistent winners at science fairs. On the contrary, these young women had expressed a genuine desire to explore science either because of a lack of exposure in high school, or because of stereotyping imposed by family, friends or teachers. The opportunity to study science in a university or college setting provided the girls with a challenging environment to comfortably and creatively explore careers in science. The program emphasized small group interaction and cooperative peer learning. The girls worked daily in labs with female undergraduate students who served as role models and mentors.

Girls were chosen for the workshop because they felt hindered by traditionally male-dominated careers, family beliefs, and peer pressure.

The topics were geared to be challenging, stimulating, and representative of university and college level work. A completely hands-on approach was used to tackle such topics as nuclear radiation, stream ecology, forestry, toxicology, fluvial geomorphology (the geological study of rivers), robotics, archaeology, spectroscopy, cartography, and art conservation. Indeed, in evaluation, the students preferred active projects to those which were more theoretical. One student said the projects "helped to take the complexity from certain problems and show that much of science is within the grasp of a logical, curious mind."

One of the main emphases of the workshop was an attempt to break down the barriers caused by gender stereotyping. As I mentioned, many of the girls were chosen for the workshop because they indicated that they felt hindered by factors such as traditionally male-dominated careers, family beliefs, and peer pressure. A gender stereotyping panel discussion was held early in the workshop.

The presenters, who included a female electronics student from the college, posed questions to encourage students to think about gender and science such as: How many famous women scientists can you name? Why are there so few? What is the ratio of male science teachers to female science teachers at your school? Why? Are science and

# Les scientifiques femmes sont des vraies personnes! Mettre au courant les jeunes filles des carrières scientifiques existant

#### PAR ANDRA MCCARTEY

En Ontario, depuis 1989, l'Atelier sur les sciences et la technologie a permis à quarante jeunes filles de la neuvième à la onzième année d'étudier les carrières scientifiques existant pendant plusieurs jours à l'Université Trent et au collège Sir Sandford Fleming. On choisit davantage les participantes en fonction de leur envie d'explorer les sciences que de leurs résultats scolaires.

Ces élèves du niveau secondaire travaillent tous les jours avec des étudiantes du premier cycle et du collège. Elles acquièrent ainsi une expérience sur le tas à propos de sujets aussi divers que la radiation nucléaire, la robotique, l'industrie forestière, etc. Au tout début du programme, est organisée une discussion avec un échantillon d'experts pour analyser les clichés attachés à chaque sexe. Les réalités que cette discussion met au jour sont le point du départ de la soirée consacrée aux carrières scientifiques. Au cours de cette soirée, des femmes de la localité parlent de leur éducation et de leur cheminement professionnel en tant que médecins, ingénieurs ou dans d'autres domaines scientifiques.

La clé de l'immense stimulation ressentie par les participantes est due au fait que le programme est axé sur elles. Les commentaires des jeunes filles sont encourageants : «Oui, je suis capable de devenir ingénieur et je suis certaine que j'aimerais beaucoup cette profession».

The students discussed these questions, and others which arose. They then separated into smaller groups. Each group invented, and described in detail on paper, a day in the life of a woman scientist. As they did this, they started to discuss issues such as the relationship between work and child care, family life, interests and housework. Each small group presented their work. Finally, the presenters introduced a questionnaire about statistics on women in the work force. After the students completed it collaborative, they discussed the implications of these statistics.

Gender stereotyping appeared to be an excellent point of departure for the other aspects of the careers workshop. The young women were genuinely thrilled by the realizations exposed by the session, to which their comments attest:

"Many of these discussions related an inspiration, a pride in the achievement of women and freed me of certain gender stereotype borders that I thought might limit me."

- "Female scientists are real people!"



Andra McCartney, left, talks with Tracy Metcalfe who is preparing for an experiment in an environmental science workshop.

The speakers were living proof that their gender was not a burden

- "[I have] more faith in my ability as a woman."
- "I reassured myself that yes, I am capable of becoming an engineer, and that I probably will enjoy it."

The lack of role models for many of the participants was addressed by a careers seminar one evening. The speakers were all local women in science: a doctor, an optometrist, a chemist, a psychology professor, and a computer systems analyst. Each speaker described herself, her background and her working conditions, and an extensive question period followed where students asked about professional demands, stereotyping, and personal challenges. The experience was enlightening and stimulating for the students.

Many left the seminar with a renewed feeling of confidence in themselves as females, and as potential female scientists. The speakers were living proof that their gender was not a burden. As one student said "They weren't really intimidated by maledominated fields; they said it just takes determination to make it." After meeting some women in "non-traditional" fields another student commented that she was "extremely impressed by their qualifications and the success they have achieved, and the respect they seem to generate from the community."

Other seminars and sessions covered such topics as engineering, environment issues, and graduate studies. Engineering proved to be popular: "Engineering is a very possible career for me since this workshop," commented one of the participants. As a result of the broad scope covered, numerous career possibilities were opened up to the students. Many of these were new and exciting.

Student interaction was the key to the success of the workshop. Participants discussed issues openly from the beginning, and student and residence advisors assisted with every aspect of the workshop. The students felt cared for and responsible, and left with new friendships and broader perspectives. One student described the advantages of the student-centered approach: "It does not only provide you with excellent scientific education but it also permits the girls to grow within themselves and develop emotionally as well as intellectually through the close relationships and memorable experiences with other participants." Some planned a camping trip for the summer, others are in regular contact by letter.

The participants who were from the area have also volunteered to assist with future workshops. The third Science and Technology Careers Workshop to be held in May of 1992 will be open once again to 40 students. The structure will be similar to that of the 1990 workshop, but new additions will include a keynote address and discussion, an extended session on environmental concerns and opportunities, and an alumni science careers panel.

1991 is the first year that participants in the 1989 Science Career Workshop may graduate from secondary school. Many will be contemplating college or university for their post-secondary education; several, undoubtedly, will be seriously considering science and technology. We can now begin to assess the long-term effects of the girls' experience. How have their career plans been affected? What attitudes do they have about science and technology? The answers to these questions will unfold as the girls embark on their careers. As the student cited below indicates, the prospects for some real impact seem to be very good:

"Women have made a lot of progress in lots of areas but there are still other areas where there are very few women; I hope I can be one of the women to forge ahead in unexplored areas."

As Trent's Coordinator of On-Campus Liaison,
Andra McCartney planned and successfully
coordinated the inaugural Science Careers Workshop
in 1989, expanding it to include Science and
Technology for 40 girls in 1990. In the same year, she
received a Masters of Adult Education degree from
St. Francis Xavier University, concentrating on
respectful intervention in adult computer learning.
She has recently returned from working in the
Caribbean as a volunteer. This article was compiled
on Andra's behalf by Martin Boyne, Admissions
Counselor at Trent University.

#### **BALANCING ACT**

between office and home women are squeezed onto the taut wire of a supermarket line-up coated with laudamum of the 80s: a gallery of self-help (p)leading to the checkout counter.

Psychologists, therapists, counsellors, (armed with statistics and case studies), all anxious to disclose the secret to female success use words like "juggle" and "acrobatics" as if women were circus performers walking tightropes without safety nets.

There are pointers on: how to cook quickly (but well) how to housekeep efficiently (but perfectly) how to speak eloquently (but softly) how to walk firmly (but lightly).

Women, they say, make excellent workers, efficient as men; women, they say, make excellent mothers, better than men; women, they say, can have it all: just work out learn proper posture pick up the balance beam and start walking.

Genni Gunn
White Rock, B.C.

# Not Onwards and Upwards: Enrolment of Young Ontario Women in Secondary School Science, Math, and Technology Courses

#### BY RACHELLE SENDER BEAUCHAMP AND GEORGINA FELBERG

Recent gains in the proportion of females enrolled in high school math and science courses result from a decrease in total male enrolments.

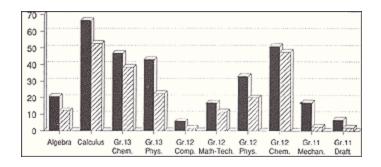
<u>Recent</u> statistics obtained from the Ontario Ministry of Education (1) indicate that young women in Ontario continue to opt out of optional science, math, and technology courses at a rate which exceeds that of their male classmates (Figure 1).

For example, there are twice as many boys as girls in Ontario Academic Credit level (OAC, previously grade 13) physics and four times as many boys in computer science and drafting.

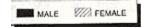
Figure1

Participation of Males vs Females in Non Traditional Subjects (Ont., 1988

#### PERCENTAGE



#### **SUBJECT**

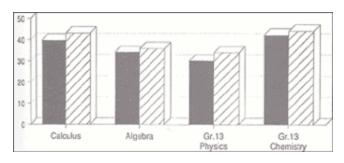


Ontario Ministry of Education, 1988 Percentage of Total Enrollment Although the percentage of female students enrolling in OAC mathematics and science courses (that is, the percentage of total course enrolment which is female) has been inching upwards (see Figure 2), female participation rates (the percentage of total females enrolled in a school who are taking a particular course) actually declined between 1983 and 1988.

Figure 2

## Trends in the Percentage of female Course Enrolment, Ontario, 1983 and 1988

#### PERCENTAGE



Ontario Ministry of Education Percentage of Course Enrollment

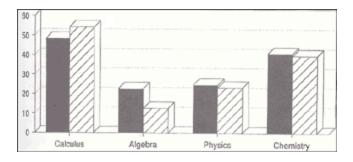
#### COURSE

As illustrated in Figure 3, this decline occurred in all courses surveyed with the exception of calculus (2). In other words, recent gains in the proportion of females enrolled in high school math and science courses result from a decrease in total male enrolments rather than an increase in female enrolment. The number of female math and science students is shrinking, but less rapidly than the number of male students.

Figure 3

# Trends in Participation of Females Ontario, 1983 and 1988

#### **PERCENTAGE**



Ontario Ministry of Education Percentage of Total Enrollment

#### **COURSE**

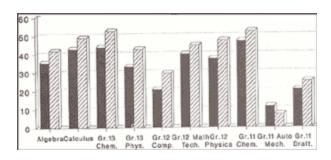
It appears that culture rather than genetics keeps girls out of math, science, and technology. Ministry of Education statistics support the report of Sharon Haggerty (3) that Francophone high schools in Canada have higher percentages of females enrolled in math, science, and technology courses than comparable Anglophone high schools. For example, in Ontario in 1988,43% of Francophone grade 13 physics students were female as compared with 33% of Anglophones (Figure 4).

This is a striking example of the tremendous impact of culture on girls' participation in math, science and technology. Two important factors may be: first, the legacy, among Francophones, of Madame Curie (hence physics does not appear as the all-male bastion it is for anglophones) and, second, the lower overall participation of male Francophone students in math and science.

Figure 4

## Percentage Enrolment of anglophone vs Francphone Females, Ontario 1988

#### **PERCENTAGE**



#### **SUBJECT**



#### Ministry of Education 1988

- The statistics cited in this article are from an unpublished report entitled "Time for a Different Game? The Participation of Ontario's Girls and Women in Medicine, Math, Science, Engineering and the Technological Trades" prepared by Rachelle S. Beauchamp and Georgina Feldberg for the Ontario Advisory Council on the Status of Women. All opinions cited are those of the authors alone.
- 2. Calculus is a prerequisite for many University business and economics programs, as well as for science, math and engineering. The increase in calculus enrolments probably reflects the increasing number of students in the 1980s who have opted to study business.
- 3. Haggerty, Sharon, M. "Secondary Science Education in Canada: Participation of Girls in Elective Science Courses," GASAT 5 *Proceedings*, I. Ravina and Y. Rom, eds., Haifa, Israel: Technion, 1989, pp.154-161.

#### **POETRY**

# BY JESSIE'S BABYSITTER

She is Daddy's girl he informs me he is possessive of her his little girl, it is a threat

her little body clenches when I change her diaper, she eyes me warily as I wipe her clean, when I clothe her she goes limp relief on her forehead

Mommy comes to take her home
Jessie runs to greet her,
when Daddy arrives at my door
Jessie cries
her beseeching eyes
scorch my skin

Jessie sobs bleakly when pushed by my son she does not fight for toys. Her eyes cloud, she has learned it is pointless to object

Jessie picks at her food. Her mother bemoans that she will not eat, she has no appetite. Jessie is already two but has few words, something is blocking her throat

except at night
when she screams against
bedtime,
her mother tells me.
Nightmares terrorize Jessie's
dark,
she only sleeps
if Mommy lies beside her,
What could she be afraid of?

The child protection people tell me they need evidence before they can investigate, they need disclosures witnesses medical signs

he does not meet my eyes,
he clutches her hand
as tears flow mute
down her face,
she leaves wordless with
him,
his body towering beside her
as they walk down my lane
out of view

Marion Van den Boomen London, Ontario

## Mr. Brown's Math Class and Other Stories of Exclusion

#### BY MAGDA LEWIS

<u>As</u> much as any other factor, feminists have identified women's unequal access to and experiences of education as the basis of women's social, political and economic subordination. These seem like strange words at a point in western history when compulsory and universal education requires equally that girls and boys enter the school system. Stranger still when we can finally say that there are as many women as men enrolled in university undergraduate programs, albeit with some significant differences in program selection.

Gone are the days when women mathematics students were required to sit behind a curtained section of the lecture hall so they would not distract men from their intellectual work. Gone are the days when an alumni of the University of Toronto could bequeath the funds for a student centre with the stipulation that only men be admitted to its oak panelled rooms or its marble walled and tiled swimming pool where bathing without constraint of swimming attire was the standard practice. Gone are the days when women were admitted to the university but denied access to the library.

Mr. Brown seldom acknowledged my hand; I don't recall him ever encouraging my questions or classroom responses to mathematical problems.

Women today apply to and are sometimes admitted into traditionally male faculties where it may seem there are no structural restrictions on their participation. Women no longer sit veiled behind curtains.

Yet the answer to the question of whether equal access to education translates into equal outcome for girls and boys - for women and men-is not a forgone conclusion. Looking about our society-doing what Rosemary Brown calls "eyeball research" - it seems that while for most men education fulfills their aspirations, for the women sitting next to them - completing the same assignments, listening to the same lectures, reading the same materials - hopes and aspirations vaporize in the face of social reality.

In my experience, schools are not sites of equality and possibility. What is learned at school is framed within gendered, classed, raced, and homophonic ideologies. As women we know our education has served us poorly. We don't know our history, we know nothing about the work women have done, and sometimes we are made to believe that women are insignificant to the creation and organization of life on our planet.

That such forms of negation continue to be the experience of women in the academy speaks of the paternalism and misogyny that permeates schooling at all levels from elementary through high school, to post-secondary education, professional schools and post-graduate institutions and programs. Yet the power of paternalism lies not just in how we are made invisible even to ourselves, but in how women are judged incapable if we do not fit masculine versions of social practice, and inadequate if we do. In order to understand the inhibiting force of educating us against ourselves we need to explore

beyond the curriculum to the social relations in the classroom: the stuff of human interaction.

# La classe de mathématiques de M. Brown et quelques autres histoires de rejet

#### PAR MAGDA LEWIS

Magda Lewis remet en question la notion selon laquelle la plus grande participation des femmes aux mathématiques entraîne des résultat semblables chez les garçons et les filles, ou les hommes et les femmes. Si le système d'enseignement répond aux aspirations de la plupart des hommes, les espoirs des femmes se trouvant dans la même classe qu'eux s'évaporent devant la réalité sociale. Mme Lewis affirme que ce que les élèves apprennent à l'école est régi par une idéologie se fondant sur le sexe, la classe sociale, la race et la misogynie.

Magda Lewis s'inspire de sa propre expérience dans la classe de maths de M. Brown pour expliquer les méthodes paternalistes auxquelles le professeur avait recours pour apprendre à ses étudiantes à être convenablement féminines.

En dépit de son amour des maths, elle éprouvait souvent un malaise et de colère à la sortie des cours de maths. Dans les histoires que lui racontent ses élèves actuelles, Mme Lewis se rend compte que des méthodes semblables ont toujours cours dans les classes de maths et qu'elles empêchent les files d'acquérir des connaissances en maths et en sciences.

L'auteur souligne que les enseignants se doivent de transmettre leurs connaissances et d'imaginer un avenir qui ne se limite pas à des rôles sociaux prescrits. L'espoir : échanger des stratégies pour modifier les programmes (contenu et prestation de façon que ces derniers tiennent compte des aspirations des filles.

Although I didn't know it at the time, the question of women and our education has been of particular interest to me as far back as my grade nine math class. I was in an all girls' class in a large co-educational urban high school. The potential for that all girls class was indeed great (1). Yet the experience of it has burned its intentions into my consciousness in ways that only recently became clear to me.

Mr. Brown (a pseudonym) was a teacher recently out of a university teacher education program. Misogyny was not a word I knew at the time. Nor was I able to fully understand the practices intended to marginalize us, his female students, from the intellectual environment of our school. Not able to set us off against male students more deserving of his attention in matters mathematical, Mr. Brown engaged in a practice of teaching us appropriate femininity. His particularly favourite student was a young woman named Lydia (again a pseudonym). Lydia personified feminine acquiescence.

At the time I could not make sense of Mr. Brown's favouritism. Lydia never spoke above a whisper. She always sat near the back of the room, a position which emphasized her quiet voice and self-effacing manner. There hung about her an aura of vulnerability which nevertheless seemed to vaporize in our all girls' physical education class where we were joined by a female teacher. Mr. Brown kept a watchful eye on Lydia and never missed responding to her raised hand.

His favourite student was a young woman named Lydia. Lydia personified feminine acquiescence.

She offered a measured pace of whispered wrong answers - wrong answers which were always rewarded by Mr. Brown's bemused and positively reinforcing attentiveness. I, in contrast, always sat in the front row. I let it be known that I loved math. I never had difficulty projecting my voice and never thought I had to contain it. Mr. Brown seldom acknowledged my hand; I don't recall him ever encouraging my questions or classroom responses to mathematical problems. I often left the class feeling angry.

In retrospect, it seems to me that even as a thirteen-year-old I knew at that subconscious level that made me feel uneasy and often angry, that Mr. Brown was teaching mathematics secondarily to what we were meant to learn in his class: that good girls speak softly, good girls master the fine art of making themselves visibly invisible, and above all good girls never ask or answer questions that suggest they take their education seriously.

It is only now that I understand how my unwillingness to participate in particular forms of feminine behaviour was seen by Mr. Brown as insubordination. My refusal to embody his debilitating version of femininity was read by him as a personal thwarting of his power to define me as a woman - and find me wanting. As young women in his class, not only were we asked to adjust to patterns of behaviour which in our culture are judged to be deficient (and which are not required of men) but to provide the evidence of our own deficiency.

The result was that I knew my intellectual ability was not judged by how well I performed as a student but by how well I performed as a woman. And it was clear to all of us (even-or perhaps especially - to Lydia) that what Mr. Brown considered appropriate femininity was a learned and demonstrated feebleness both intellectual and physical.

Four years later I entered the University of Waterloo as an honours math student. Despite my apparent success, it is significant that this is the story I carry with me about my educational experience. The stories of other women connect with my own, beyond the surface, creating the compounded resonations of a shared knowledge spoken often for the first time. As part of the requirement for many of the courses I teach, both in the Sociology Department and the Faculty of Education, I ask my students to reconstruct their educational experiences in the form of weekly reflective journals. It is through our stories we can explore how young women experience education not as a transformative and liberating process but as a way of reinforcing their subordination and lack of possibility within a patriarchic system of privilege (2).

The stories are stunning in their familiarity. One woman relates that she was told by her high school math teacher not to worry about her grade because "Women don't need to be good at math since they are going to get married and become housewives." Another woman told of a teacher who announced to the senior high school math class that he didn't like girls and he particularly didn't like teaching the m math. This vignette I want to quote at length:

Another woman told of a teacher who announced to the senior high school math class that he didn't like girls and he particularly didn't like teaching them math

My grade 11 math teacher was also the coach of the boys hockey team. He openly favoured the guys in the class and he saw them as his buddies. My female classmates and I felt excluded and were very intimidated to ask questions or seek help. I felt as though I was interrupting their locker room talk. We were all called by our last names. It was not very encouraging to be asked "What do you want, Lawrence?" when I needed help with a math problem. The guys used to laugh if girls got a question wrong. The teacher certainly did not discourage their behaviour. (Student journal, quoted with permission).

It is not enough to say that women are part of the educational scene unless we also look to see what our newly achieved access to education has gained us. Women's economic marginality has not

diminished and the feminization of poverty continues to be an indicator of women's degenerating economic status. The average annual net income of university educated women is - equal only to the average annual net income of grade eight educated men. In an era of increasing single income families headed by women, the economic constraint for women and their children is chronic. Most significantly, women are, in all significant respects, absent from the realm of economic decision- making.

In my context in a Faculty of Education, but certainly not peculiar to it, women students experience women's exclusion both routinely and vividly. One young student teacher described it poignantly:

When we get out to the schools [for practice teaching] you can see it right away. We get assigned to our classrooms and the principal takes us down. He drops me off at the door of my room and then I watch him and the male student walk down the hall together, chatting, [the principal's] hand on [the male student's] shoulder. And you just know, he is already on the inside and I am not. Another student's story is this:

No one ever told me how to get from where I was to where I might have wanted to go. I was in science but I dropped out. It's like there was information there about how to prepare for a career and what were the important things I needed to know but no one ever told me. And by the time I figured it out it was too late. I had already chosen the wrong courses and missed other important things I should have done. The boys in the class seemed to know what to do. It's like they already had the information.

Whether this vital information is parleyed to boys and men overtly or whether it is acquired by virtue of the models readily available to them, boys and men have the opportunity to acquire knowledge they cannot possibly miss. A young woman professor recently told me that she was potentially up for tenure in a year but hadn't been aware of the kinds of things she should have been doing all along to make her candidacy acceptable. "And now," she lamented, "it's already too late. I wish someone had just said to me at the beginning, Here is what you need to do if you want to go on." And she articulates the effect of closure on desire: "I don't think I want to go on in the academy anyway."

None of this is to deny that the presence of large numbers of women on university campuses, in professions, and in employment outside the home has had an effect on how the work is done and how programs are rationalized and organized. Over the past twenty years-since the beginning of the second wave of the feminist movement - women's concerns have been expressed relentlessly. And if no one else is hearing us, at least we are beginning to hear one another, to support one another, to acknowledge that our stories are not made up but the result of a social organization that has never taken women's aspirations seriously.

There are no prescriptions here for classroom practices that might accomplish our ends. How we go about our work is of our own making. But we have an obligation to tell what we know and to share what we know with our daughters and our sons. We have an obligation to image a future not bounded by prescriptive social roles designed to limit possibilities; designed, ultimately, to harness the work, energy, intelligence, hopes, and dreams of one segment of the population to serve the needs and interests of another. We have the obligation to pass on information, to share with our women students the strategies they need to know in order to do what they want to do. We have the obligation to mentor our women students and to pry open doors that have been bolted shut for centuries even as we are struggling to hold our own doors open for ourselves.

And we have the obligation to provide women students with a curriculum that includes them, in which they can see their own image as women capable of acting in the world. This is where hope for change lies. Even today, with the violence and violation that continues to rage in the Persian Gulf, I hold some hope in the ongoing struggle to make real a vision of the world that is not yet.

Madga Lewis is assistant professor of Sociology in the Faculty of Education, Queen's University, where she also teaches in the sociology department and the Women's Studies Program. Her present research work is in the area of women and education and feminist pedagogy. She has published a number of articles on the su

Our stories are not made up but the result of a social organization that has never taken women's aspirations seriously.

feminist pedagogy. She has published a number of articles on the subject and is presently preparing a book manuscript.

1. See R. Deem, (ed.), *Co-Education Reconsidered*, (1984), Milton Keynes: Open University Press; D. Spender, and E. Sarah. (eds.), *Learning to Lose: Sexism and* 

- *Education*, (1980), London: The Women's Press Ltd; and G. Weiner, (ed.), Just a Bunch of Girls, (1985), Milton Keynes: Open University Press.
- 2. I use the term 'patriarchic' in contrast to the more common term 'patriarchal' because I wish to refer to the significant role, not of gendered social actors, but of specific social practices.

#### POETRY

#### **GOOD-BYE BRASS BAND**

Today I lost my mind in the crosswalk that joins our house to the City of Light. I crossed the yellow brick road, my tongue hanging out, the almost invisible lines banana flavoured, the bread I made for the journey flattened in traffic, my glasses smashed, my good-bye brass band blooming loud in our family tree, playing upside down, their blood exhausted, their ruby tunes confused by carbon monoxide.

Today they murdered children in the Forbidden City, a totem fell in the forest, and one of my sons decided to suck his thumb again.

#### Linda Rogers

## Technology for kids: A Photo story

#### BY MEGAN GARDINER & NANCY MOORE

In a world of rapid change, primary and junior education continues to be challenged to identify and provide relevant curriculum. Elementary school children naturally tend to an investigative style of learning; their inventive urge is not inhibited by notions of what is acceptable and they have the desire to communicate about what they have been involved in.

We need to provide our students with opportunities to open their world to commerce, manufacturing, and creative aspects of industry around them, through a holistic and integrated approach. Design and Technology involves looking at what is already happening and putting it together differently. It is about designing, communicating, making, testing, evaluating, and encouraging children to go beyond their first ideas and seek more effective models that can influence and control the environment in which they live.



It was with this in mind that a group of consultants and teachers from the Toronto Board of Education formed a study group to develop meaningful and realistic ways to bring Design and Technology to the classroom. The excitement and enthusiasm of the students as they became involved in the process is captured in a series of photos highlighting such areas as Pulleys, Take Apart, Invention, Construction, Wonder Table, Kitchen Gadgets, Tool Shed, and Wheels.

**Sand:** "We made a construction site with hills of sand and a thin layer of sand for pavement. The sand from the little container went to the big container and poured out into a pipe to make the pavement."



Wheels: "We wanted to show our teacher how to make a conveyor belt. You put the tubes in a box and paper around the tubes, when you turn the tubes the paper circulates."



Inventions: "I made a car with spools for wheels, cardboard for the body and straws for an axle. I did a roof by using 2 toilet paper rolls and a Styrofoam plate. I tested it on a see-saw that was our ramp and it worked."



Construction: "We had to make something that moved. We were trying to spin one wheel and then all the other wheels would turn. It was like cogwheels, they all spin together until the first one stops."

**Megan Gardiner** is currently a consultant for the Toronto Board of Education and was a teacher involved in the project. **Nancy Moore** is a free-lance consultant and was the coordinator of the Design and Technology Project.

# Women Do Math and Ms Infinity: Two Projects for Girls Who Like Math

#### BY LIN SZPITUN

It was September of 1966. Kathy and I took our places in the first class of Physics 11. Our teacher walked into the room, stood on the platform at the front and surveyed the class. He announced, "I will have no girls in my physics class. Go to the office and sign up for a different course." Only by insisting were Kathy and I allowed to remain.

This type of direct discrimination may have disappeared, but more subtle discouragements for young women trying to enter the sciences remain common. In the nine years since I returned to school as a mature student, I have had only one women instructor, in an English course. After grade 8 I had no women teachers for any math or science course. My experience is not unusual. Even where they do not encounter rejection, girls and women who study mathematics or the sciences find few role models and even fewer mentors. Because they do not see a place for themselves many young women do not even consider careers in the sciences and technology. Two attempts to remedy the situation are Ms Infinity

Because they do not see a place for themselves many young women do not even consider careers in the sciences and technology.

and Women Do Math, projects begun in 1987 at Simon Fraser University (SFU).

Women Do Math is a one day conference on scientific careers for young women in grades 9 and 10. It has been held in November of each year and has attracted between 350 and 400 young women, their parents, and teachers from the Greater Vancouver and Fraser Valley regions of British Columbia. Ms Infinity began last year under the under the name Women Do Math B.C. and Yukon, as an attempt to spread the idea to more areas and smaller centers. Five Ms Infinity conferences were held in May of 1990 and five more are planned for May of 1991.

Women Do Math began under the direction of Tasoula Berggren, a mathematics lab instructor at SFU. For several years she observed that the proportion of women in calculus courses was considerably lower than the proportion in the university in general. Discussion of her concerns with others at the Entrance to Women do Math/BC and Yukon. Cariboo College. Kamloops B.C. university and with members of the Canadian Mathematics Educators Study Group at their annual conference convinced her that intervention must be attempted before young women reach the university level. She initiated the first Women Do Math conference in November of 1987.

## Deux projets à l'intention de jeunes filles qui aiment les maths

#### PAR LIN SZPITUN

Deux projets (Women Do Math et Ms Infinity) sont parrainés par l'Université Simon Fraser, la Société de Canadienne dans les sciences et les technologies et le gouvernement de Co1ombie-Britannique. Ces programmes, qui sont destinés à des étudiantes de neuvième et dixième année, présentent les mathématiques comme un sujet extrêmement agréable et accessible à tous et à toutes. On insiste aussi sur le fait que les mathématiques ouvrent des débouchés professionnels dans le domaine scientifique et technique. Les étudiantes se rendent ainsi compte que, si elles laissent tomber les maths à l'école secondaire, elles se ferment nombre de portes du point de vue carrière.

Women Do Math cons iste en une conférence annuelle d'une journée sur les carrières scientifiques. Y assistent plus de 350 élèves ainsi que des parents et des enseignant(e)s. Pendant la conférence, les élèves rencontrent des scientifiques femmes, des mathématiciennes et des techniciennes qui jouent le rôle de modèles à imiter. Parmi les participants, on trouve des as en mathématiques, mais aussi des élèves du niveau secondaire que le mathématiques découragent bien qu'une carrière scientifique ou technique les intéresse.

Dans les centres de moindre importance de la région de Vancouver, le pendant du programme Women Do Math est Ms Infinity programme périscolaire se fondant sur les mêmes principes. L'un des avantages inattendu de ce programme a été de créer un sentiment communautaire parmi toutes les femmes dans les sciences de la région.

On peut obtenir des renseignements sur les ateliers en s'adressant à: Women Do Math, Département de mathématiques et de statistiques, Université Simon Fraser, Burnaby (Colombie V5A 1S6 ou à Ms Infinity Société des Canadiennes dans les sciences et les technologies, C P 2184, Vancouver (Colombie-Britannique) V6B 3V7



Entrance to women do Math/BC and Ukon. Cariboo College, Kamloops B.C

Sponsored by the Dean of Science and the Department of mathematics and Statistics at SFU and depending almost entirely on volunteers, this first conference attracted about 350 young women of high school age. Subsequent conferences have been sponsored not only by the university but by Society for Canadian Women in Science and Technology (SCWIST) and through grants from the B.C. government.

Although details have changed over the years, the structure and philosophy of the conference have remained constant: mathematics is intrinsically beautiful and enjoyable, and accessible to all if the psychological and social roadblocks are removed. Mathematics is the gateway to the sciences and technology. It is a prerequisite for entering such diverse

fields as engineering, biology, psychology, accounting, and nursing. For young women completing high school, mathematics opens the doors to many traditional and non-traditional careers. Dropping mathematics severely restricts their options.

Mathematics is intrinsically beautiful and enjoyable, and accessible to all.

The reason girls drop mathematics are probably as varied as the girls themselves; the conferences attempt to confront several of the most common. Often the girls simply do not see how math can be of any importance in their lives. Talks and workshops about careers give them an idea of how important their immediate studies may be for their future. There is a general belief in high school that math is difficult, especially for girls, and is not an enjoyable activity in its own right. Our science and math workshops are designed to show that math is beautiful, useful, and not so difficult as one may think.

Perhaps the most important barrier to be overcome is that young women often cannot see a place for themselves in the world of science and technology. They lack role models and the sense of a community to which they might belong. A full day of interactions with women scientists, mathematicians and technologists gives them a glimpse of this community and their potential place in it.

Women Do Math and Ms Infinity attempt to attract both the best mathematics students (who may already be committed to a scientific career) and, more importantly, those who may be in danger of ending their high school math study before completion. A mother phoned recently to enquire about having her daughter attend Women Do Math this year. Two years ahead of her grade level in math, the daughter had lost interest and stopped talking about becoming a scientist. Her mother believed social pressures and expectations were undermining her daughter's ambition. It is for this young women and many others like her that the conferences are held.

Lasting one day, conferences are a mixture of talks, workshops, and opportunities for informal discussions among women professionals and participants. The number and type of talks given have varied considerably since 1987. Until this year, the day opened with a talk about careers, a discussion of the necessity for young women to realize that they will work most of their adult lives and that their choice of a career is crucial. This year, when the conference is held; for the first time in March instead of November, a careers workshop will replace the talk. Developed at Kwantlan College, the career workshop gives students the same information but with more personal impact.

Each girl is assigned a life scenario: a single parent of two children, married with no children, etc. Based on this scenario, each one is asked to calculate what it will cost her to live as she would wish. The result comes as a shock. The girls then choose various careers and look up the average income for their chosen occupations. This produces a second shock as they quickly discover that traditional "women's work" is usually the lowest paid and that careers that pay adequately are often in the sciences, in technology, or in a profession.

A science talk of one of two types is also part of the initial career workshop. In one, a women scientist discusses, in a general and informal way, what a scientist does. She may describe a typical day in her life or she may illustrate her talk with pictures of women at work in the classroom or laboratory, in front of a computer or in the field. This type of talk usually elicits many questions from, "How much money do you make?" to "Who takes care of your children while you work?"

The second type of talk describes a particular woman's research. Speakers for this talk are carefully chosen, not just for their scientific expertise but also for their ability to convey their enthusiasm to a young general audience. The intent is to give the young women a personal look into the world of scientific research. In general it is hoped that the science talks give the girls an overview of the world of scientific research and a feeling that they too, as women, can be a part of it.

The various workshop sessions which follow the opening introduction are always the heart of the conference. Each young women attends two or three math and science workshops chosen from a selection of twenty or more. These are designed to be stimulating and challenging without being intimidating. Since our intention is to foster interest and increase confidence, it is important that each participant can be successful in her chosen workshop.

Cooperation rather that competition is promoted by having the girls work in small groups. Leaders emphasize the visually beautiful and interesting, and applications not normally thought of as mathematics. Some workshops have used origami as an application of geometry; others involve symmetry, tilling, or pop-up engineering. The workshops in greatest demand are those involving computers. A particularly rewarding workshop is one in which the participants crowd around to see inside the opened casing of a personal computer.

In Fort St.
John, the
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in the
process.

Last May, in Fort St. John, the girls in one workshop prepared and took home a small jar of hand cream, learning about ratios and proportion in the process. Other workshops, have drawn from geology, statistics, engineering, and electronics. Most (though not all) are led by women, and this gives the girls a chance to interact with a woman scientist in a small group, which often leads to discussions that carry over into lunch and snack breaks.



Girls and women who study the sciences find few role models and even fewer mentors.

Workshops for parents and teachers are held concurrently with the science and math workshops for the girls. These have included discussions of various ways to encourage girls in mathematics, explorations of the roadblocks to full participation of women in the sciences, and reports of successful programs to increase the participation of girls in high

school math classes. We have also often included successful panel discussions in the conference. Panelists in mathematics-related careers discuss the place of mathematics in their lives and encourage questions from the audience.

From the beginning, the conference attracted numerous enquiries from outside the Vancouver area. In 1989, a limited number of participants from other regions came to Vancouver, and this year we will be able to sponsor up to fifty out-of-town students. However, we believe it is more effective to take the program to the girls in their own communities, because in this way we can include many more girls and make better use of resources and facilities. In 1989 SCWIST received a grant from the Secretary of State of Canada to organize five Women Do Math conferences in smaller centers.

In May of 1990, conferences were held in Campbell River, Kamloops, Fort St. John, and Terrace, in B.C., and in Whitehorse, Yukon. These locations vary in population from about 10,000 in Terrace to over 60,000 in Kamloops, and all have resource-based economies (mainly lumbering, mining, and ranching). The project will be repeated in 1991, with conferences in Nanaimo, Kelowna, Prince George, Castlegar and Cranbrook, under the direction of Mary Vickers of SCWIST and under the new name Ms Infinity. Whitehorse and Kamloops intend to repeat the project on their own this year, and we have also received enquiries from Yellowknife in the Northwest Territories.

An unexpected benefit has been the feeling of community development among women in the sciences all around the province.

The Ms Infinity conferences closely follow the format established at SFU. Three women speakers are sent from Vancouver to each community, and other speakers and workshop leaders are recruited locally. The support has been strong, with community colleges and school districts supplying facilities and transportation and with plenty of women to volunteer even in the smallest localities. Last year's speakers included geologists, mining engineers, pharmacists, college instructors and electronics technicians. An unexpected benefit of this outreach has been the feeling of community development among women in the sciences all around the province. Girls who have met no scientists and few professionals have discovered not only that women work in mathematics and science

but that there are women working in science in their own communities.

Kathy Heinrich, a professor in the Department of Mathematics and Statistics at SFU and a member of the Women Do Math organizing committee, reports that at an awards ceremony at the University of B.C. earlier this year, the mother of one of the award winners approached her. She recounted that the Women Do Math conference of 1987 had been a turning point in her daughter's life. We hope to hear more such stories of success as other students who attended in 1987, and since then, make their progress thorough the educational system.

**Lin Szpitun** is an instructor in the Mathematics department of Douglas College in New Westminster and a Ph. D. candidate in the department of Mathematics and Statistics at Simon Fraser University. She is co-chair of the Women Do Math organizing committee, a

member of the Ms Infinity organizing committee, and a member, of SCWIST.

Information about Women Do Math can be obtained from: Women Do Math, Department of Mathematics and Statistics, Simon Fraser University, Burnaby, B.C. V5A 1S6. Information, about Ms Infinity can be obtained from: Ms Infinity, Society for Canadian Women in Science and Technology, P.O. Box 2184, Vancouver, B.C. V6B 3V7.

# A Ms Infinity Conference: Notes North of 60

#### BY MADELEINE SAUVÉ

Our second Ms Infinity conference just wrapped up in Whitehorse, Yukon, and the reviews are wonderful. Over 120 women were involved, with a full third of students, coming to Whitehorse from rural communities.

Developing a conference of this nature in a small community, located prohibitive distances from "expert" resources, has been a unique experience. The women of science were out there, but how to find them was itself a challenge. Going to universities and reviewing lists of science professors was not an option. Word of mouth, tracking, guessing, and networking uncovered an entomologist in Contract Administration for the government, a nuclear physicist in Northwester's upper management, and an engineer in Transport and Communication Services.

They came, were interesting, and committed to encouraging young women to pursue studies they know are exciting and fulfilling. Twenty-eight women were involved, developing and delivering some seventeen workshops. A physician brought in ultrasound technology, a pregnant woman, and her expertise in genetics; a cartographer demonstrated high tech digitized satellite imagery to produce maps identifying the habitat of Yukon wildlife; a psychologist lead a group of students through a social science experiment; a veterinarian brought in her dogs and discussed care of sled dogs on the Yukon Quest; and an environmental biologist led participants through an examination of Yukon River water (particularly relevant to this community since an Environment Act and the requirements for adequate sewage treatment are under review).

Reaching out to a dozen tiny rural communities in outlying areas and attending to crosscultural differences also contributed to our unique situation and are concerns we continue to address as we plan next year's conference. We hope that those who attend then will reap the same reward as did this year's students:

"This is a remarkably good program to attend. Each year I learn more. It has made me want to take science and math all the time and not want to quit either."



The intent is to give young women a personal look into the world of scientific research.

"Fantastic idea! I didn't really enjoy math and science before today."

"I really enjoyed 'Science Goes to the Dogs' since I am an animal lover. Why not have a course to do with cats? Maybe explaining a pregnancy of a cat. I could even bring in my own cat (if needed). On the whole, I think the conference was one of the most interesting and worthwhile ones that I have ever been to."

The Ms Infinity conference is designed to cheer on and encourage young women to go after the future-and it works! Even north of 60.

Madeleine Sauvé has been the coordinator of the Ms Infinity conference in Whitehorse since its inception in 1990. She has been a teacher of gifted/talented students at the junior secondary level and is a member of CCLOW.

# ANNOUNCING ARMAGEDDON

The sky is falling.

I bury the bodies with silver shovels and beautiful language, send paper airplanes to mend the holes in the sky.

But the lost women, wearing inflatable wings. continue to crash, their air escaping.

I try to catch them
before they hit the ground.
I want to gather them up
like broken
branches,
the winter songs of a fragile
tree,
their broken arias
announcing
Armageddon.

**Linda Rogers** 

## "Go For It"

#### BY RACHEL ZIMMERMAN

That was the attitude that Bill White, the teacher of my grade seven class, encouraged each of us to have. He urged us to develop our own ideas and carry them as far as they could go. Every spring, as the snow melted and the birds migrated northward once again, my school buzzed with activity and anticipation of the approaching science fair. Some students saw the fair as just another project, something to be completed as quickly as possible with just enough effort to get a passing mark. I have always taken a different approach.

I have done projects in school science fairs every year since grade one. The annual Science fair is an opportunity for students to pursue their own interests and explain their findings to parents, friends, and the community. My elementary school had mandatory science fair participation in the senior grades, but I have done projects every year since grade one. Early projects on adhesion ('What Things Stick Together?") and vibration (musical pop bottles, rubber bands, etc.) soon led to more advanced studies on astronomy (The Planisphere), incandescent light, and the properties of glass which make it behave

like a fluid rather than a solid.

One of the turning points in my life came when I was in grade six. At the time, I had been reading books about Helen Keller and Louis Braille, and I came across a book in the same section of the library about a language called Blissymbolics. This pictographic language is used by people who cannot control their muscles well enough to speak or write; for example, people with cerebral palsy or who have had a stroke.

In order to access the language, Bliss users point to symbols on a board, and someone else must be present and attentive (and very patient) in order to see what the Bliss user is pointing to. Although Blissymbolics was a great breakthrough, it did not allow for communication with someone who was not in the same room at the same time or for recording ideas for later reference. After reading the book on Bliss, I decided that I wanted to improve this system of communication to allow the Bliss user to write messages independently. My grade six science fair project was the perfect opportunity for me to learn how to use computer graphics to draw Blissymbols on the screen, and to educate the public about Bliss and the people who use it.

#### «Foncez!»

#### PAR RACHEL ZIMMERMAN

Rachel Zimmerman est en treizième année en Ontario. Une invention informatique, à laquelle elle pensait déjà en sixième année, lui a valu d'être applaudie sur la scène internationale. Rachel a toujours participé avec enthousiasme aux foires scientifiques de son école et en a tiré parti pour explorer de nouvelles idées.

Alors qu'elle travaillait à un projet, Rachel est tombée sur un livre traitant des symboles Bliss, langage auquel ont recours les personnes (celles souffrant par exemple d'infirmité motrice cérébrale) qui ne contrôlent pas suffisamment leurs muscles pour parler ou écrire. Ce langage ne permettait pas de communiquer avec une autre personne se trouvant ailleurs ou de noter des idées pour les consulter plus tard. Rachel a programmé son ordinateur de façon qu'il réagisse à un clavier sensible au toucher et affiche en anglais la signification des symboles Bliss. Dès la septième année, elle a trouvé le moyen de faire imprimer sur papier le message en symboles Bliss.

Son projet a été présenté à une foire nationale scientifique au Canada. Par la suite Rachel s'est rendue à Plovdiv en Bulgarie à la Foire internationale des jeunes inventeurs. Rachel est à la fois surprise et heureuse de l'attention dont a fait l'objet son invention. Elle rend hommage à son professeur de septième année qui encourageait tous les élèves a traiter leurs idées avec sérieux et à « foncer » Elle a remporté plusieurs prix, mais sa plus belle récompense a été le sourire qui éclaira le visage d'un enfant le jour où elle s'est servie de son dispositif avec lui.

By grade seven, I had designed and developed a system which printed the English meanings when a sequence of Blissymbols was touched. I made a Bliss board overlay to fit onto a touch-sensitive board and programmed my home computer, an Atari 800XL, to respond such that the meaning of the symbols appeared on the computer screen. After the message was composed and edited, a small plotter could print the message on paper. My system was inexpensive and uncomplicated. Bliss users did not have to learn any new physical or mental skills in order to use it. I entered the project in my grade seven science fair.



Rachel Zimmerman

I was honoured when the project was chosen as one of ten that year to go on to the citywide science fair. At the London District Science and Technology Fair, my project received a first place in the computing category and was chosen as one of five projects in the city to compete nationally. My project was also awarded the IBM Regional Junior Computing Technology A ward.

At the age of twelve, I was the youngest person from London at the Canada-Wide Science Fair. The opportunity to meet the 300 participants from all across the country was one of

the best aspects of the week, not to mention guest speakers such as Steve McLean, one of Canada's astronauts, who encouraged us to pursue our interests in science and technology.

At the Canada-Wide Science Fair, my Bliss project received a silver medal and an IBM National Computing Technology Award. Three months after the science fair, I received a letter from the Youth Science Foundation in Ottawa, saying that my project had been chosen to represent Canada at the World Exhibition of Achievements of Young Inventors in Plovdiv, Bulgaria. I was surprised that my project was receiving international recognition.

While I was in Bulgaria, I was interviewed by Farag Moussa from the World Intellectual Property Organization, a United Nations organization which oversees international patents and copyrights, and he included a chapter about me and my work in his book about women inventors, published in Geneva. When I returned to Canada, the Blissymbolics Communication Institute (BCD) invited me to present my invention to professionals in the field of Bliss.

Shirlly McNaughton, the director of BCI was very encouraging and helped me by providing books and by giving me a tour of their facilities. I was only thirteen when I visited BCI and I really appreciated being taken seriously and treated as a peer. Shelly Beauchamp of The Women Inventors' Project in Waterloo, Ontario, heard about my work and invited me to be a member of their organization. I have had an opportunity to participate in several of their conferences and workshops. The Youth Science Foundation invited me to display my invention at the Canadian High Technology Show in Toronto. I participated in the Inventors' Forum at a medical technology conference in London, Ontario.

The government of Canada chose to include my Blissymbol printer in their "Bravo Canada!" exhibit at the Canadian National Exhibition in Toronto, the Pacific National Exhibition in Vancouver, and Expo-Quebec in Quebec City. I never expected that my project would result in opportunities for so many exciting experiences, but I found that whenever someone showed interest in my work, I was encouraged to continue with it.

In 1990, I received a YTV Youth Achievement Award for Innovation for my invention and the Blissymbol Printer, and this year I was nominated for the Ernest C. Manning Award for Innovation. For me, the best and most exciting award is the smile on the face of a young Bliss user when he or she tries out my device for the first time.

Although I have continued to work on my Blissymbol Printer, I have used my annual science fair participation as an opportunity to pursue my interests in other areas of science as well. My other projects have included "Equitational Physics," "Disposal of Domestic Nuclear Waste," "Harmonographics: The Physics of an Artistic Novelty of the Victorian Era," "Tipping the Balance of Nature: The Absence of Zebra Mussel Predators in the Great Lakes," and "Clean, Green Power: Converting Light to Electricity through Photosynthesis of Algae."

Participation in science fairs has taught me how to conduct independent research and how to explain scientific concepts to the public. It has given me a chance to travel and has introduced me to my best friends. It has helped me to decide to study sciences in university next year.

Someday, I'll phone Bill White and tell him how much his grade seven advice has meant to me. Every time I lead a workshop of young women inventors, I think of him when I encourage them to "go for it!"

Rachel Zimmerman is a grade 13 student at London Central Secondary School in London, Ontario. She has been a student of the London public schools since kindergarten, in a segregated gifted class in grades 5-8, and on a gifted individual program in secondary school. In addition to science fairs, science Olympics and mathematics competitions, her interests include art, music, debating, Native Canadian culture, and environmental issues



# Design and Information Technology in the Elementary Classroom

#### BY SHEILA RHODES

It is our obligation as educators to prepare our students with the skills and attitudes they will need to be responsible and productive citizens. Curriculum needs to be modified and made more appropriate for today, when the integration of technology into society is far more visible than in the past. In this ever changing world, students must learn about new technology, how it will affect their lives and how to use it to their best advantage.

In the Board of Education for the City of York, we are actively pursuing approaches that address the need for technologically aware pupils. Students from Kindergarten to the Ontario Academic Credit (previously grade 13) level are involved in programs that are both relevant and participatory and involve using and learning about technologies. Two major strands that have emerged are Design Technology and Information Technology.

Whenever major change is expected, it is critical to ensure that there is adequate support for the individuals involved.

Design Technology can be viewed as creative problem solving. The components of design education lend themselves to an infinite number of solutions to the same problem and produce concrete

results by which the student draws on previously gained knowledge to develop new ideas. Students come to view difficulties as new opportunities, not disappointments. Few situations presently found in schools allow for this type of flexibility.

Information Technology allows students to grasp a working familiarity with technologies that handle data and information. It focuses on using microprocessor-based equipment; on using text, graphics, and video or audio equipment. Skills for using simple information technologies are developed in the lower grades and the program becomes fully integrated into curriculum with greater sophistication (1).

#### **Curriculum Applications**

The introduction of these programs and new technologies, such as the widespread use of computers, has had a major impact on the classroom learning environment. Teachers have been "expected to integrate these technologies into their curriculum and to develop diverse teaching strategies appropriate for today's world.

#### Informatique et techniques de conception au niveau élémentaire

#### PAR SHEILA RHODES

Les enseignant(e)s qui élaborent les programmes d'étude au Conseil scolaire de la municipalité de York ne perdent pas de vue qu'il faut former des élèves ayant des connaissances techniques, surtout en informatique et en techniques de conception. Le fait de présenter ces techniques à partir du niveau élémentaire à des répercussions des sur le milieu d'apprentissage en classe. Des lignes directrices sur les ressources et des unités thématiques dans le cadre des programmes-cadres ont été préparées pour aider les enseignant(e)s à intégrer ces techniques dans leurs cours. Quatre informaticiennes aident les enseignants du jardin d'enfants, dont beaucoup sont des femmes, à se familiariser avec les nouvelles techniques.

Des élèves et des enseignant(e)s visitent aussi le Centre de conception du conseil scolaire de York. Ce projet met en rapport des enseignant(e) qui enseignent avec d'autres qui n'enseignent pas et avec des spécialistes en technologie pour concevoir des programmes d'études. Au centre, les trois membres du personnel sont des femmes, qui jouent aussi le rôle de modèles à imiter.

Le succès de ce programme au conseil scolaire de York tient beaucoup au perfectionnement professionnel du personnel. Sheila Rhodes a mis au point un cours technique de onze semaines n'ouvrant pas droit à un crédit a l'intention des enseignant(e)s de l'élémentaire pour que ces derniers acquièrent les connaissances nécessaires pour créer leurs propres programmes. Ce programme aident beaucoup de femmes à surmonter le découragement que déclenchaient en elles les sujets techniques pendant leurs études et elles tirent parti de l'enthousiasme et de l'appui des animatrices des ateliers.

In the City of York, the need to support teachers with this integration was clearly identified. Several curriculum guidelines were developed. "The Teachers' Toolbox - A Resource Guide for Using Microcomputers in the Curriculum" was produced to show teachers how both Information Technology and Design Technology could be introduced into their programs. Two curriculum units for Kindergarten to Grade 8 have also been created. These are "Communities - An Integrated Unit" and "Icarus and Beyond - An Integrated Unit". Both of these theme-based guidelines direct teachers on ways to experiment with all aspects of technology while still incorporating the traditional areas of the curriculum.

**Computer Assistants** 

The aim is to make the teachers comfortable with creating and using various technologies with their students.

Whenever major change is expected, it is critical to ensure that there is adequate support for the individuals involved. Learning technologies has not been easy for many of our teaching staff and using the computer in the classroom was quite intimidating for some. The majority of the teachers in the Kindergarten to Grade 6 level are women who, historically, have had very little background in technology.

In order to facilitate the process, four Computer Assistants were hired to aid teachers and students with the introduction of Information Technology into the classroom program. Because all four Assistants are women, they serve as excellent role models for both the teachers and the students. No longer is the world of computers seen strictly as the "male domain". The female students are being encouraged to take leadership roles and are becoming more actively involved in developing an awareness and interest in technology.

#### The Design Centre

A second component of the technology initiatives within the City of York Board of Education involves visits by students to our Design Centre. This Centre is located in one of our Elementary schools and is staffed by an outreach teacher, a resident teacher, and a design technician.

The Design Centre program is divided into three stages. The first involves planning cooperatively between the classroom teacher and the outreach teacher for the three day Centre visit. A theme is selected and activities that will enhance the visit are developed and introduced into the classroom.

While at the Design Centre, the resident teacher continues the design activities which often involves the development of technological skills and attitudes that might not be acquired in the regular classroom situation.

The final stage of the Design Centre program involves follow-up visits to the classroom. The classroom teacher is supported as new topics are planned and developed so that the design activities will continue in the classroom for the rest of the year. The aim is to make the teachers comfortable with creating and using various technologies with their students.

The students work in groups while at the Centre. Because there is an expectation that all students will be involved in the activities, boys and girls share equally in the division of responsibilities. Since all three staff at the Design Centre are women, the students are exposed to female role models once again.

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All students are given the opportunity to develop their capabilities.

#### **Summer School Programs**

The Young Inventors' Program is a full-day summer program that runs for four weeks. It was developed for students in Grade 2 to Grade 8. Areas the children have investigated are robotics, space and the future, and the environment. One of the aims of the program is to ensure that all students are given the opportunity to develop their personal capabilities, which is achieved through practical problem-solving and using new concepts and skills in conjunction with design-and-make

activities.

The first year the program was offered the ratio of boys to girls was approximately 8:1. This was most disconcerting. An active recruitment was started to encourage more girls to become involved in this program and advertising for the second summer program was modified to make it more "attractive" to girls. There was a slight improvement but the ratio still overwhelmingly favoured the boys. For the third year, teachers at the home school were asked to try and



The introduction of new technologies has had a major impact on the classroom environment.

promote this program particularly to the girls in their classes. The ratio improved again, to approximately 8:5. More still needs to be done.

#### **Professional Development**

One of the reasons why the York Board of Education has been successful in introducing new technological topics is the amount of professional development offered to our teachers. There is a large staff development component in the Design Centre program, where the class teachers are given an opportunity to plan together with a colleague and develop a project that encompasses technology in an integrated fashion. As well, the City of York Board of Education, in conjunction with the University of Toronto, offers an eleven week non-credit course in Elementary Technology.

This course assists classroom teachers by giving them the necessary background information to develop their own programs. Most of the participants in this course have been women because most women have been discouraged in their own schooling from becoming actively involved in these areas. This lack of experience often means that topics of technology are overlooked by these teachers in the classes they lead today.

The Elementary Technology course was developed by a woman (myself) and is taught by two women. I feel this is a major reason for its success. The participants are more comfortable with a woman leader, and the course leaders, new to the material themselves, have a greater understanding of the risk involved in trying these new areas. Previous attempts to introduce technology to women teachers was less than successful. Early workshops were conducted by men who lacked an understanding of the real issues involved. There was a tendency for them to slip into "jargon" and make assumptions about the level of understanding of basic technological concepts. When the

Previous attempts to introduce technology to women teachers was less than successful.

workshops are conducted by women, there is a feeling of acceptance on the part of the female teachers. Group spirit and enthusiasm develop as the participants and leaders realize new talents together.

The role of technology in our lives can not be overlooked. It is our obligation as educators to develop an awareness and understanding of the importance of technological skills with all our students and students must be encouraged to investigate these areas and to develop their personal capabilities. In this way, positive attitudes towards technology will be fostered. Our future depends on it!

Sheila Rhodes is currently a computer applications consultant for the Board of Education, City of York. She has been actively involved in developing programs and curriculum units related to Design Technology and Information Technology, and teaches Computers in the Classroom at York University. In 1990 she won the Marshall McLuhan Distinguished Teacher Award for designing an integrated curriculum unit involving technology.

1. "Technology in the City of York Schools". The Board of Education for the City of York, 1990.

# Daughters of Invention

#### BY RACHELLE SENDER BEAUCHAMP

"Being an inventor you don't have to be a genius, but just have a little imagination and determination."

"The simple ideas turn out to be the best successes.".

"You can start with nothing and end up with something."

"I didn't know before how creative I was."

Inventing is fun! That sums up the reactions of the young women who have attended workshops based on the Daughters of Invention format developed by the Women Inventors Project.

Throughout history, women have been important inventors. But they have frequently been anonymous: credit for the cotton gin, a machine that revolutionized the economy of the U.S. South, has gone to Eli Whitney even though the device was first imagined by his landlady, Catherine L. Greene. Ellen Eglui invented a clothes wringer in 1888 but sold her patent cheaply to a man (who subsequently made a great deal of money from it) because, she said, "if it was known that a Negro woman patented the invention, white ladies would not buy the wringer" (1).

Today in Canada, women inventors still fight an uphill battle. According to the Patent Office, only about 1 % of Canadian patents issued to Canadians go to women. This is a small piece of a small pie, representing only about ten patents annually. It makes even the number of women engineers look huge by comparison. Organizations mandated to encourage innovation in Canada, such as the Canadian Industrial Innovation Centre, have largely ignored women entirely, as clients or as technical staff.

For the past four years, the Women Inventors Project, a unique, non-profit, organization, has worked with Canadian women of all ages to improve this dismal situation (2). The workshops and talks we have developed for young women have been particularly exciting because we feel that, in the long run, encouraging young women to opt for science and engineering will increase the number of women inventors in Canada. Indeed, a recent report from the U.S. Patent Office (3) suggests that the proportion of women receiving U.S. patents closely follows the proportion of women engineers in the work force. (Both are now at 5%, higher than the 1% figure for Canada.)

Role models for women inventors are in short supply. Even recent books on inventors aimed at elementary and secondary students show few, if any women inventors (4). A poster entitled "Canadian Scientists and Inventors," which greeted me on a recent visit to

my daughter's grade seven classroom, has not a single female face.

## Des esprits inventifs

#### PAR RACHELLE SENDER BEAUCHAMP

«Pour être inventeur ou inventrice, inutile d'être un génie. Il suffit d'avoir un peu d'imagination et de persévérance».

D'après le Bureau des brevets du Canada, parmi tous les brevets accordés aux Canadiens seul 1% le sont à des femmes, ce qui ne représente que dix brevets par an. Pendant quatre ans, Le Women Inventor's Project a travaillé avec des Canadiennes de tout âge pour améliorer la situation. Nous estimons que si le nombre des jeunes femmes qui choisissent de prendre des cours de sciences, celui des inventrices au Canada augmentera à la longue.

«Des esprits inventifs» est un atelier d'une journée destiné aux élèves filles de là septième à la dixième année. Les élèves écoutent l'exposé d'une inventrice, discutent des clichés sexistes dans les médias et participent à une invention sur le tas. Des séances mixtes et des séances ne regroupant que des filles ont été organisés, mais les filles ont indiqué qu'elles préféraient être entre elles. Comme l'a dit à juste titre une fille: « Les garçons gâchent là magie de l'expérience". Certes, les ressources et les ateliers mis sur pied par des groupes comme Women Inventor's Project sont importants, mais il faut que nous restructurions fondamentalement l'enseignement des maths, des sciences et des matières techniques.



The Daughters of Invention workshop was developed by the Women Inventors Project as full day session for girls in grades 7 to 10. In addition to providing female role models, we hoped to improve the confidence of young women in hands-on work, and, by emphasizing the creative aspects of science and technology, to make these fields more attractive to young women.

Presenting students with information on women inventors and demonstrating to young women that they can use their creativity to solve practical problems has many benefits. It builds self-confidence, increases interest in science and technology and ultimately

increases the level of innovation in Canada.

The workshop consists of three main parts:

- Tales of a woman inventor, a talk by a woman inventor about her invention and what it has meant in her life.
- *Inventing inventors*, a small group activity in which participants talk about stereotypes of women in the media and how these affect their own lives. They then make collages illustrating a woman inventor.
- Hands-on inventing, a session in which participants are given a wide choice of found" materials and the chance to invent. The immediate response of participants at the original (and subsequent) workshops has been very positive. About 75% have rated it as excellent and all indicate that the workshop would help other girls. In addition to having fun, participants have come up with a lot of good ideas, including a solar- heated rabbit hutch, an organizer for sheet music, and a device for holding the receiver in a wall- mounted telephone so it doesn't dangle while on "hold".

Since the original workshop, we have tried many variations on the general theme, including a shorter version that takes only an hour and a half. In this version students see a variety of inventions by women, watch a brief video clip on how new products get to market, do some brainstorming exercises, and then participate in a short hands-on inventing session. Both all-girls and mixed sessions have been run, but most girls have indicated a preference for the all-girls format. Their reasons are revealing:

Some girls also felt that it was unfair for them to have an opportunity the boys did not have, and hoped that sessions could be run for boys too.

The Women Inventors Project has developed many materials on women inventors which can be helpful in developing girls' and women's inventive creativity. These include:

Daughters of Invention, a teachers' manual and resource guide for organizing and running invention workshops (\$10). What if? Women Inventors and Entrepreneurs, a video which profiles a diverse group of women and their inventions, from "high-tech" products like genetically engineered yeast and computer aids for the disabled to potato chips and make-up mirrors (\$149.95 to buy, \$50 to rent).

The Book For Women Who Invent or Want To, a manual for inventors covering the steps involved in getting an idea on the market (\$15).

<sup>&</sup>quot;Girls can be more themselves with other girls and not boys."

<sup>&</sup>quot;They [boys] wouldn't work as seriously."

<sup>&</sup>quot;They'll confuse us and nothing would be done right."

<sup>&</sup>quot;Boys spoil the moment."

*Profiles of Women Inventors*, a collection of one-page profiles covering a variety of women inventors of all ages (available this spring).

All materials can be ordered directly from the Women Inventors Project: P.O. Box 689, Waterloo, ant., N2J 4B8, (519) 746-3443.

The project has also helped to develop a portable exhibit, Women of Invention, which is traveling across Canada through the support of the National Museum of Science and Technology (Ottawa). Photocopies of the text and photos in the exhibit can be ordered at cost from the Project. Several now grace the wall of my daughter's classroom.

As "outsiders" to the educational system, one of the most difficult barriers we faced in organizing the first pilot workshop (held on a Saturday) was getting the cooperation of the local Board of Education. In the end, most of the students were recruited through two very committed teachers who had helped to develop the workshop originally. The general question of how parents and other concerned "outsiders" can help to bring about change in large, beaureaucratic and often indifferent educational systems is an important one. I think we need to start by building alliances with concerned "insiders" and perhaps CCLOW could somehow facilitate the process.

It is important to increase career options by facilitating the participation of young women in science, math and technology courses and their entry into related professions. I am convinced that the materials developed by the Women Inventors Project and other groups will help with such recruitment. But I think we would be negligent if we stopped there.

We also need to begin a fundamental restructuring of the teaching and practice of science, math, technology and engineering, as urged by Dr. Ursula Franklin, Sheila Tobias and other feminists (5). The fact remains that science, math and engineering, as they are I taught and practiced today, are demonstrably harmful to the mental health and self confidence of young women (6).

The Women Inventors Project's funders are gratefully acknowledged for their support of our program: Science Culture Canada, the Innovations Program of Employment and Immigration Canada, and the Ontario Women's Directorate.

**Rachelle Sender Beauchamp,** Ph.D., co-director of the Women Inventors Project, is a biologist with a background in molecular biology, occupational health, and technology transfer. She is the co-founder of the Canadian Association for Women in Science.

- 1. Amram, Fred. "The Innovative Woman". New Scientist. Vol. 102, 1984, pp.10-14.
- 2. Brooks, Carol and Rachelle S. Beauchamp. "The Women Inventors Project". *Women's Education des femmes*. Vol. 6 (4), 1988, pp.22-24.

- 3. Buttons to Biotech: U.S. Patenting By Women, 1977 to 1988. Washington D.C.: U.S. Patent and Trademark Office, 1990.
- 4. For example, *Small Inventions That Make a Big Difference* Washington, D.C.: National Geographic Society, 1984; and Wyatt, Valerie. Inventions: An Amazing Investigation Toronto: Greey de Pencier Books, 1987.
- Franklin, Ursula, "Will Women Change Technology or Will Technology Change: Women?" The CRIAW Papers, No. 9,1985; . Tobias, Sheila, They're Not Dumb, They're Different: Stalking the Second Tier. Tucson, Arizona: Research Corporation, 1990; and Wylie, A., K. Okruhlik, S. Morton and L. Thielen-Wilson, "Philosophical Feminism: A Bibliographic Guide to Critiques of Science." Resources for Feminist Research, Vol. 19 (2), 1990, pp. 2-36.
- 6. Widnall, Sheila E. "AAAS Presidential Lecture: Voices from the Pipeline, *Science* Vol. 241,1740 -1745,1988.

# The Best Thing That Ever Happened: Choosing Engineering

#### BY KIM MIKKELSEN

When I consider what it is like to be a woman engineer, I find myself thinking of what my life would be like if I had chosen a different career. Would I have had all the incredible opportunities that engineering provides, such as financial independence, and career advancement and diversity? Engineers specialize in disciplines: civil, mechanical, chemical, and electrical. But regardless of the discipline, an engineer is taught to be a team leader, a technician, builder, and financier. Unfortunately, engineering is also a predominantly male profession with all the subsequent problems for a woman professional.



If I had known at the beginning all the opportunities and difficulties, would I still have chosen engineering? It's hard to say, but I would never reconsider that choice now.

I made my career decision in high school, where the choice would determine much of my future. It seems incredible that I could make such an important decision at that age. I was young and wanted to conquer the world, but I didn't know how. All that was clear was that I needed a secondary education.

Initially, I felt that the four years required by the University would be unbearably long. It seemed that whatever could be accomplished by a four year degree could also be easily attained through a technical diploma. So I made plans to begin a two year program in drafting. I had always enjoyed creating technical drawings and felt that this would be a challenging career. At that time, those subjects that were to be the key to my future - physics, mathematics, and chemistry - seemed boring and useless. My high school drafting teacher intervened by suggesting that I work for a trial period in a local

engineering firm as a drafts person. What I found out was that I hated the job after the first week.

#### Le meilleur choix de ma vie: devenir ingénieure

#### PAR KIM MIKKELSEN

Kim est ingénieure principale dans une compagnie de pétrole et de gaz a Calgary (Alberta). Elle adore sa profession, et trouve qu'en tant qu'ingénieure elle se doit d'être aussi technicienne, constructrice, négociatrice, chef d'équipe et inventrice. Elle a choisi de faire des études d'ingénieur car elle pensait que ce serait excitant. Mais, elle s'est aussi butée à des difficultés car elle travaille dans un milieu à prédominance masculine.

À l'université elle s'est rendu compte que le travail en équipe était la meilleure façon de s'en sortir, vu le nombre d'étudiants par classe et le peu de femmes inscrites. Aujourd'hui quand elle se sent découragée elle se rassure en se disant qu'elle n'aurait pu faire de meilleur choix professionnel. Chaque jour apporte sa dose de défi et elle ne s'ennuie jamais. Elle estime que davantage de filles devraient se sentir attirer par toutes les possibilités qu'offre l'ingénierie et elle espère que les changements survenant dans sa profession rendront celle-ci plus hospitalière pour les femmes.

My lack of aptitude in drafting came as a shock, which was softened by the discovery that there was interesting and exciting work going on around me. Although it was not clear just exactly what it was engineers did, it was obvious that they were where the action was. I left work that day and submitted my application to the Faculty of Engineering at the University of Alberta - much to the delight of my parents.

At that time, those subjects that were to be the key to my future - physics, mathematics, and chemistry seemed boring or useless. I remember how frightening the first days of University were. Here is a world in which your identity consists of a number. Classes of 150 students are taught by professors who do not care if you haven't studied for a final or that your course load is too heavy. And they definitely do not have time to encourage your efforts. This is a world where you have to make it on your own and where the fear of failure is strong for every student. For those women entering engineering, it is in the first year that they decide whether they can compete in a male dominated faculty.

Many get discouraged, lose faith in their own abilities and feel that it is impossible to continue. They were the casualties. I was lucky, I had the support of friends and family. I remember my father's encouragement and comfort after a grueling day, when he told me that whether I could calculate the volume of a sphere was not as important as whether I could succeed in acquiring the degree. He was right.

Initially it was difficult being one of the few women in engineering, mostly because I had never been taught to compete in a male way. The first and most basic lesson for me was

how to be a team player. No, I did not always have to agree on how the game was being played, but by being a team member I benefited from the support of those people who worked with me. Once this become clear, it was very easy to continue in engineering. Teams of students formed study groups provide support and to ensure that no one fell behind in their courses. Those women who did not join such groups fought an uphill battle on their own.

I now work as a Senior Engineer for a medium sized oil and gas Company in Calgary, where my job is nothing like I had imagined it would be. Here I oversee projects from initiation to completion, acting as a project manager, coordinator, negotiator and inventor. The knowledge developed through my engineering training has created opportunities to advance in several different directions. Yet the biggest question that still remains for most women is whether or not they can successfully compete in this male dominated field.

Success is a relative term. To some people I am successful but for me success is achieving that next promotion. Some days it seems that women will never be accepted by the male infrastructure, especially within upper management. There are a very few women who are Vice Presidents of major corporations, but there are also several established petroleum clubs which have yet to accept female members. Many attitudes have changed during the time I have been working and will, I hope, continue to change as long an increasing number of women can be encouraged enter the field.

Discouraging days still materialize when it seems impossible to ever succeed, but then I remember that this is the best thing that ever happened to me. Every day is a challenge and there is no room for complacency or boredom. More and more women should be drawn by the opportunities in engineering, but we must insist that women have a place and can excel in the profession. For me this is the best that life has to offer and I know that the freedom to choose this career has come from education.

**Kim Mikkelsen** received her B.Sc. in Petroleum Engineering from the University of Alberta in 1984 and is currently a Senior Area Engineer with North Canadian Oils Limited in Calgary.

### Summer Science for Girls

#### BY MARY VICKERS



The workshops are designed to show girls that science is interesting and entirely appropriate for women.

In 1984, The Society for Canadian Women in Science and Technology (SCWIST) presented in Vancouver the first "Summer Science" program for girls aged 9 to 12 years. This initial program was so promising that the project was continued under SCWIST sponsorship for the next four summers. In 1989 SCWIST published Imagine the Possibilities, a resource book for other groups wanting to present similar workshops. The basic program consists of a series of half day hands-on science workshops. The classes are small, about 16 girls in each. The three or four instructors are all women scientists or science students and a high teacher/student ratio allows for a significant development of skill and confidence. Most activities result in a product which can be taken away and shown to friends and family.

At the heart of the program are workshop activities. These have been designed to show the girls that science and technology are interesting, relevant and entirely appropriate for women. When a young girl learns to build a birdhouse, fix her bicycle or mix cement for a flower pot, her confidence and interest in these traditionally male activities increases. And when her instructor is a woman scientist or technologist, she learns about the kind of role she may occupy as an adult.

The effectiveness of the program has been measured by an attitude questionnaire completed by each girl at both the beginning and end of each workshop series. Analysis of these questionnaires demonstrates that the workshops, are indeed achieving their goals. We found that the girls' attitudes towards science/technology careers changed, as did their general sense of self-worth. Highly significant positive changes were recorded in their attitudes towards science/technological jobs as possible career choices, in their interest in non-traditional careers, in their understanding that women can work in non-traditional areas, and in their confidence to build, repair, and to do science. There is a demonstrated overall empowerment of young girls when they assert "I can do any of these careers if I want to."

### Les sciences: un atelier pour les filles âgées de neuf à douze ans

#### PAR MARY VICKERS

À Vancouver, en 1984, la Société des Canadiennes dans les sciences et les technologies a mis au point pour l'été un programme scientifique à l'intention des filles. Le programme a connu un vif succès pendant cinq ans. En ce moment, la Société cherche des fonds pour pouvoir l'offrir en permanence.

Le programme dure une semaine, la moitié de la journée étant consacrée tous les jours à un atelier scientifique. Les filles y apprennent par exemple à fabriquer une maison pour les oiseaux ou à réparer une bicyclette. Quand une fille acquiert ce genre de compétences, surtout sous l'égide d'un mentor féminin, sa confiance augmente et elle s'instruit sur le rôle qu'elle aura peut-être à jouer à l'âge adulte. On fait remplir aux jeunes filles un questionnaire au début et à la fin du programme; on a remarqué des changements d'attitudes radicaux à l'égard des sciences et de la technologie en tant que carriè res professionnelles possibles; elles ont davantage confiance en elles pour construire, réparer, faire des sciences; dans l'ensemble, elles se sentent plus puissantes.

En 1989, la Société a publié *Imagine the possibilities*, un livre de référence à l'intention d'autres groupes qui désirent organiser un programme semblable. On peut se procurer le livre au prix de 15,00 \$ auprès de la Societe des Canadiennes dans les sciences et les technologies, C.P. 2184, Vancouver (Colombie-Britannique) V6B 3V7.



When a young girl learns how to fix her bicycle or mix cement, her confidence and interest in these activities increases.

We received a great deal of grassroots support for the program. Schools made space available, community centers helped with registration and publicity, and the University of British Columbia gave us space and facilities to develop workshops and to train our instructors. The Government of British Columbia, Women's Program, was our major financial supporter over the five years we worked on the project, supplemented by Employment and Immigration Canada's Challenge Summer Employment Program and a one time grant from Science Culture Canada.

At the completion of the summer '88 program we were confident in the success of the Girls in Science program. The workshop units had been improved and polished over the five years and the evaluations told us of the program's effectiveness in changing the attitudes of young girls towards careers in science and technology.

We decided that it was time to make the program more widely available. With funding from Canada Employment and Immigration, we were able to hire a writer, editor, and an artist to put the workshop activities together in a format which would be useful to community groups wishing to put on Girls in Science programs. Since Imagine the Possibilities was printed in 1989, over 200 copies have been requested from allover North America. Based on this book, a six week program was given in the summer of 1989, and a year later about half a dozen week long series were presented in various communities in British Columbia.

When her instructor is a woman scientist or technologist, a girl learns about a role she may occupy as an adult.

It would be interesting to hear from other groups who may have used the book as inspiration for their programs. We, at SCWIST, continue to process requests for the book and provide advice and support to thosesetting up new Girls in Science programs. We are currently seeking funding which would allow us to promote and administer this and other related programs on a long term basis.



There is a demonstrated empowerment of girls when they say 'I can do any of these careers if I want to,"



Mary Vickers, is currently the Chair of the Girls in Science Committee for the Society for Canadian Women in Science and Technology. Imagine the Possibilities is available for \$15.00 from SCWIST, P.O. Box 2184, Vancouver, B.C., V6B 3V7.

### **POETRY**

TECHNOLOG	λY.
Moving sor atching sor atching rumbling Turbbling wheels Timing. Twisty springs spring agout:	Twisty bolts and squeaky wheels. Pling Handles Pushing buttons. That's What Technology is about!
wire for axies to use. Sluny oil Masty Chain.	by:Jespica Millar and Rauhul Beuttie

Hammers Tapping
Wheeks equeaking
Springs springing
Pulleys pulling
cars rolling
construction working
chiTLin

#### **REVIEWS**

### A Girls in Science Bibliography

#### COMPILED BY ELAINE HARVEY AND JAN CLARKE

Editor's Note: A short annotated bibliography of texts relevant to the education of girls in science fills this issue's Reviews section. Publisher's name and address are given where available, as well as approximate prices.

Alic, Margaret. *Hypatia's Heritage: A History of Women In Science from Antiquity to the Late Nineteenth Century.* London: The Women's Press, (1986) \$13.25.

One of the best historical overviews of women mathematicians. Of particular interest is chapter 11: The Nineteenth-Century Mathematicians: The Mathematical Contributions of Sophie Germain; Ada Lovelace and the Beginnings of Computer Science; The Mathematical Mind: The story of Sophia Kovalevsky.

Ashton-Warner, Sylvia. *Teacher*. New York: Simon & Schuster, Inc. (1986) \$12.50.

"A vivid journal of incidents, personalities, sudden moments of insight, and a philosophy of education which emerges through reflection upon experiences. It should have great value not only for those interested in the problems of education in old cultures and new nations, but also for those concerned with the future of civilization..."

Bleier, Ruth. *Science and Gender: A Critique of Biology and Its Theories on Women.* The Athene Series, New York: Pergamon Press, (1984) .\$19.95.

The Athene Series is an international collection of feminist books that focuses on the construction of knowledge and the exclusion of women from the process. "This book is concerned with the role of science in the creation of an elaborate mythology of Women's biological inferiority as an explanation for their subordinate position in the cultures of Western civilizations."

Burns, Marilyn. *The I Hate Mathematics! Book*. Toronto: Little, Brown and Company (1975).

"This book is for nonbelievers of all ages. ... This book says that mathematics is nothing more (nor less) than a way of looking at the world and is not to be confused with

arithmetic."

Cajori, Florian. A History of Mathematical Notations: Volume 1: Notations in Elementary Mathematics. La Salle, Illinois: The Open Court Publishing Company, (1928, reprinted 1974) \$7.15.

This classic on mathematical notation provides interesting historical nuggets for the classroom teacher. Topics are Numeral Symbols and Combinations of Symbols; Symbols in Arithmetic and Algebra: groups of symbols used by individual writers, topical survey of the use of notations; Symbols in Geometry: ordinary elementary geometry, past struggles between symbolists and rhetoricians in elementary geometry.

Cheek, Helen Neely et al., ed. *Handbook for Conducting Equity Activities in Mathematics Education*. National Council of Teachers of Mathematics, 1906 Association Drive, Reston, Virginia 22091, U.S.A. (1984).

Ching, Hilda. *Girls and Science: Making the Connection*. B.C. Teachers Status of Women Journal, February 1987.

Connelly, F. Michael, Robert K. Crockner, and Heidi Kass. *Science Education in Canada Volume* 2: Achievement and its Correlates. Toronto: OISE Press, 1989.

This study is a result of the recommendations in Who Turns the Wheel from the Science Council of Canada (see below).

Culley, Margo & Catherine Portuges, ed. *Gendered Subjects: the dynamics of feminist teaching.* Boston: Routledge & Kegan Paul, (1985) \$17.95.

"... a rich sample of theoretical and practical reflections on classroom experience by teachers of Women's Studies... raising provocative questions which apply broadly to many areas of progressive teaching."

Gilligan, Carol *In a Different Voice: Psychological Theory and Women's Development.* Cambridge, Mass: Harvard University Press. (1982).

"My goal is to expand the understanding of human development by using the group left out in the construction of theory to call attention to what is missing in its account. Seen in this light, the discrepant data on women's experience provide a basis upon which to generate new theory, potentially yielding a more encompassing view of the lives of both of the sexes."

Gilligan, Carol, Nona P. Lyons, & Trudy J. Hanmer, eds. *Making Connections: The Relational Worlds of Adolescent Girls at Emma Willard School*. Cambridge: Harvard University Press, 1990.

This is an excellent study on the relational learning styles of girls.

Jacobs, Judith E., ed. *Perspectives on Women and Mathematics*. Eric Clearinghouse for Science, Mathematics and Environmental Education, College of Education, Ohio State University, 1200 Chambers Road, Third Floor, Columbus, Ohio 43212, (1978) \$1.75.

Papers presented in the Women and Mathematics strand of the 1978 conference of the National Council of Teachers of Mathematics held in California form the core of this book.

Kaseberg, Alice et al. *Use EQUALS to Promote the Participation of Women in Mathematics*. Math/Science Network, Lawrence Hall of Science, University of California, Berkeley, California 94720. (1980) \$9.00.

The EQUALS program is part of the Math/Science Network's elementary and secondary focus. This book contains resources for classroom projects, teaching strategies, problem solving activities, career information, resource materials, model workshops and bibliographies.

Keller, Evelyn Fox. *Reflections on Gender and Science*. New Haven: Yale University Press, (1985).

"This ground-breaking work explores the possibilities of a gender-free science and the conditions that could make such a possibility a reality."

Perl, Teri. *Math Equals: Biographies of Women Mathematicians + Related Activities.* Don Mills, Ontario: Addison-Wesley Publishing Company, (1978). \$9.45.

This book is a must for teachers and students. The biographies are interesting, and the related activities imaginative.

Resnikoff, H.L. and R.O. Wells, Jr. *Mathematics in Civilization*. New York; Dover Publications, Inc. (1973) \$14.95.

This is a well-written book dealing with Mathematics in Antiquity, the Adolescence of Computation, the Rise of Geometrical Analysis, and Twentieth- Century Mathematics. It contains some excellent ideas for the secondary teacher. It is a traditional work without a feminist perspective.

Robertson, Heather-Jane. *The Idea Book: A Resource for Improving the Participation and Success of Female Students in Math, Science and Technology* Canadian Teachers' Federation, 110 Argyle Avenue, Ottawa, Ontario, K2P 184.

The Idea Book is meant to "serve as a catalyst for information exchange among teachers and enrich the quality and quantity of scientific education for female students."

Rosser, Sue Vilhauer. Female Friendly Science: Applying Women's Studies Method and Theories to Attract Students. New York: Pergamon Press, 1990.

Russell, Diane E.H. ed. *Exposing Nuclear Phallacies*. The Athene Series, New York: Pergamon Press, (1989) \$20.75.

"Exposing Nuclear Phallacies is a powerful international collection of articles which tackles a subject of the utmost urgency and importance to us all, taking as its theme the significance of socialized gender differences in the origin and perpetuation of the nuclear threat."

Science Council of Canada. Who Turns the Wheel? Ottawa, Ontario, 1982.

Proceedings of a workshop on the science education of women in Canada. Available free of charge from the Council, 100 Metcalfe Street, Ottawa, Ontario, KIP 5M1.

SCWIST. *Imagine the Possibilities: A Workshop Program for 9-12 year old girls.* Step-by-step instruction on how to deliver a Girls in Science program, including teaching units and a teacher's guide. Available for \$15.00 from SCWIST, Box 2184, Vancouver, B.C., V6B 3V7.

Shaw, Evelyn & Joan Darling. *Female Strategies*. New York: Simon & Schuster, Inc., (1985) \$10.95.

"... two biologists explore the astonishingly diverse courtship, mating, and nurturing behaviour within many species of the animal kingdom to show that there are as many ways to be "female" as there are animals."

Spender, Dale. *Invisible Women: The Schooling Scandal*. London: Writers and Readers Publishing Cooperative Society Ltd. (1982) \$8.95.

This book is a must for teachers. Read about The Old, Old Problem; The Knowledge of Males; In the Classroom; The World According to Men; Women's View.

Spender, Dale, ed. *Men's Studies Modified: The Impact of Feminism on the Academic* Disciplines. The Athene Series, New York: Pergamon Press, (1981). \$23.50.

"Fundamental to feminism is the premise that women have been 'left out' of codified knowledge, so that the world has been explained in terms of men but not women. Essays on the following academic disciplines explore not only how this happened but why: language, literary criticism, philosophy, history, sociology, political science, anthropology, psychology, economics, media studies, education, law, medicine, biology, and the scientific ethic.

Thompson, Jane. Learning Liberation: Women's Response To Men's Education. London

& Canberra: Croom Helm, (1983) \$19.50.

Thompson looks at the education system as "an important regulator of social and economic class relations and a powerful ideological instrument in the battle for the hearts and minds of dutiful workers, who need to be conformed to the rules of order required by class domination if that oppression is to be continued." A chapter is devoted to the schooling of girls.

Walkerdine, Valerie, and The Girls and Mathematics Unit. *Counting Girls* Out. London: Virago Press, 1989.

An excellent study on girls and math education in Britain.

Weiler, Kathleen. Women *Teaching for Change: gender. class & power*. Massachusetts: Bergin & Garvey Publishers, Inc. (1988) \$18.15.

"Challenging accepted critical educational and feminist theories, Weiler reveals the dayto-day struggles and achievements of feminist teachers who invite their students to become more conscious of the political and social forces that are shaping their lives."

Whyte, Judith. *Girls into science and Technology: The story of a project.* London: Routledge and Kegan Paul, 1986.

Williams, Linda Verlee. *Teaching for the Two- sided Mind: a guide to right brain/left brain education*. New York: Simon & Schuster, Inc. (1983) \$13.98.

"Students need right-brain strength to achieve balanced thinking skills and to activate a full range of cognitive and creative abilities."

Women of Power: A Magazine of Feminism, Spirituality, and Politics. Issue Eleven, Fall, 1988.

"This issue explores the theme, Science and Technology. We are proud to investigate with you...some of the women's issues, and women visionaries, and activists significant to the theme."

"Women's Development and Education". *Journal of Education* 167, no. 3 (1985), Boston University, 605 Commonwealth A venue, Boston, Mass. 02215.

Of particular interest in this women's issue is Dorothy Buerk's article, "The Voices of Women Making Meaning in Mathematics."

# Trying to Teach Technology: A Matter of Certification

#### BY JANE WILL

<u>When I was thirteen years old, I went to a guidance session designed to assist elementary school children in choosing their courses for high school. My girlfriend and I asked what "Industrial Arts" meant. The guidance counsellor replied "Oh, that's the boys' course. Young ladies take Home Economics." I wish I could say that we were outraged and demanded to know more about the course, but we didn't. In fact, I remember being embarrassed that we had even asked about the "boys' course."</u>

Now I teach drafting in a high school. I love being surrounded by the sounds and activity in a shop class, but more than that I love watching young people experience the thrills of manipulating all kinds of machines to produce dramatic results.

We have just finished a two day event to introduce students from grades five and nine to the activities that go on in the math, science, and technology courses. One of the major goals of this event was to encourage girls to feel comfortable in and excited by these courses. As well as hands-on tours of a variety of classes, the students saw videos about science and technology and heard a female engineer talk about her experience in her field.

The new Ontario NDP Minister of Colleges and Universities was recently quoted as saying that we need to remove the "subtle and not so subtle barriers" to women in education. The Society of

Having a female teacher in a shop class is like putting a sign on the door that says "Women have the right to be here and are welcome

Manufacturing Engineers has introduced an incentive grant to programs which encourage women to enter engineering. Boards of Education are actively trying to increase female enrolment in science and technology courses. Still, girls hesitate to take technical courses and many drop most of their math and science courses before the Ontario Academic Credit (previously grade 13) level.

Obviously just saying that science and technology are open to women is not enough. It is great to encourage girls to consider technology but once they have chosen to enroll, they must feel comfortable. A technology course with a male teacher and an all male student population is very intimidating but it is a common scenario.

We need more female teachers in technology. Having a female teacher in a shop class is like putting a sign on the door that says "Women have the right to be here and are welcome." Even though I am a new teacher and still have a lot to learn, I think that just my presence in the class has encouraged many girls in the school to take another look at technology. A few times this year girls have come to the shop with their boyfriends to see

what the boys are doing. I show them the equipment and talk to them about what we do. I think it is much easier for me to convince them that technology is a viable option than it would be for a man.

# Essayer d'enseigner des matières techniques: une question de diplôme

#### PAR JANE WILL

Jane Will enseigne le dessin industriel dans une école secondaire. Elle estime qu'elle donne l'exemple aux filles qui s'intéressent aux sujets techniques. Elle aimerait continuer à enseigner, mais elle n'est pas certifiée. Elle a fait une demande pour suivre le programme de formation des enseignants à l'Université Queen's, mais en raison du Règlement 69 dans la Loi sur l'éducation, elle n'y est pas admissible. Le règlement stipule que les candidat(e)s doivent compter cinq ans d'expérience dans l'industrie ou l'équivalent. Mme Will affirme que ce règlement empêche les femmes de devenir professeurs de matières techniques car très peu d'entre elles ont une vaste expérience dans le secteur industriel.

Le nouveau ministre des collèges et Universités a dit que les barrières éducatives qui se dressent sur la route des femmes doivent être supprimées. Il a affirmé à Jane lorsqu'elle luttait pour que sa demande soit à nouveau étudiée que le règlement 269 serait peut-être amendé. Ces amendements arriveront trop tard pour elle, mais elle prie instamment tous les organismes qui s'intéressent à l'équité dans le domaine de l'éducation de faire des recommandations au ministre pour que la situation s'améliore.

Although I enjoy teaching and I believe I provide a good role model for the girls in the school, I may not be coming back next year. I am not a certified teacher. I have applied to the teacher training program at Queen's University but because of Regulation 269 in the Education Act, I have been turned down. Regulation 269 states that five years industry experience (or two years industry experience with three years of related education) is required for people wishing to obtain a technical teaching certificate. This sounds like a reasonable pre-requisite to ensure expertise in the field but, in effect, it bars many women from teacher training. Not many have extensive experience in technological industries.

The pressures of being one of the few female teachers is enough without the added pressure of being uncertified I have a B.A. in history, I am raising teenaged children of my own, I have six years experience working with computers at the federal government, and a mechanical engineering certificate from a community college (a two year course). I have also completed a four month course about women in technology and advanced courses in computer drafting. But I have only twenty-one months of experience in the drafting industry. Even without most of my education and work experience I am very close to meeting the qualifications under the Act. But I have not been accepted.

The administration of both my current and my previous schools have written to Queen's with glowing recommendations. The principal and teachers and members of the Board of Education have been very supportive of my application, to no avail. I am now forced to make a decision about my teaching. I want to stay, but should I make the financial and security sacrifices that uncertified teaching entails for another two years? I could teach on a letter of permission again next year but the pressures of being one of the few female teachers in the field is enough without the added pressure of being uncertified.

The Minister of Colleges and Universities informed me that the Regulation 269 is being reconsidered. The amendments will take too long to help me but I encourage groups involved in education equity for women, such as CCLOW, to make recommendations to the Minister so this barrier to female participation in technology can be removed.



**Jane Will** has received final notification that she will not be accepted into the program, and has decided to return to full-time work in computer drafting.

#### **POETARY**

#### NIGHT MONSTERS

Whining his excuses, the father prowls the small hours. An impersonal lust has invoked his daughter: the child wakes to the red eye in the dark, her frail frontiers ravaged by a recurring nightmare his hands arriving like a marauding army his penis forcing its savage history in her mouth; afterwards, wearing his daughter like a small, split flower

Thus rent, she is forced to divide, her mind fleeing to a terra intacta of teddy bears, dolls, a Noddy-Nodkins land where daddies are not allowed and elves take her hands flying her to the protected side of the moon...

Her body left behind, pinioned to a dread

where Mummy turns resolute eyes from the claw that comes in the night from deaths that must be lived over and over.

**Jancis Andrews** 

West Vancouver, C.B.

#### RESOURCES/RESSOURSES

#### **CALLS FOR SUBMISSIONS**

Encyclopedia of Reproductive Technologies Contributions are sought for a single volume encyclopedia on reproductive technologies, to be a combined sociological and technical reference where techniques, scientific and medical terms, etc., are contextualized within sociological and historical settings. The writing should be as accessible as possible, and contributions from a feminist perspective are sought, as well as from people of colour, lesbians and gay men, and the physically challenged. For more information contact Annette Burfoot, Sociology, Queen's University, Kingston, Ontario, K7L 3N6, (613) 545-2162, Fax (613) 545-2871.

#### Women and Education

*Spirals* 

*Spirals* is a series of feminist research papers to publicize research results, conference proceedings, and other topics related to the women's movement and to feminist research. Published by the Women's Studies Program at the University of Ottawa, the goal of *Spirals* is to develop and disseminate feminist research in both the university and the community. In 1991 *Spirals* will publish a research paper in women and education. Submit papers to Spirals, Women's Studies Program 143 Seraphin Marion, Ottawa, Ontario, K1N 6N5, (613) 564-4019.

#### **SOUMISSIONS DE TEXTES**

#### Les femmes et le développement

Spirales

Publié par le Programme en Études des femmes à l'Université d'Ottawa, *Spirales* se veut un outil de communication et de développement de la recherche féministe à l'université et au sein de la communauté. Les textes présentent des résultats d'études et d'actes de colloques. En 1991, les membres de *Spirales* préparent un numéro pour la série Colloques sur le thème des femmes et le développement. Veuillez faire parvenir les textes à *Spirales*, Programme en Études des femmes, 143 Seraphin Marion, Ottawa (Ontario) KIN 6N5,

#### **GRANTS/SCHOLARSHIPS**

# International Council for Adult Education Dame

Nita Barrow Award Fund

The ICAE created this award to honour Dame Nita Barrow (past- President of ICAE) and to recognize and support regional or national adult education organizations who have made a significant contribution to the empowerment of women in the adult education movement. The organization must show that women's participation has increased in leadership and decision-making roles and in planning and policy advisory positions, and that discussion of gender issues has been promoted and gender issues are included in all aspects of the organization. The award is open to organizations only. For more information or to forward nominations, contact Dame Nita Barrow A ward Fund, ICAE, 720 Bathurst Street, Suite 500, Toronto, Ontario, M5S 2R4, (416) 588-1211, Fax, (416) 588-5725.

#### Ontario Federation of Labour

Annual Scholarship Fund

The OFL has created an annual scholarship to honour and remember the 14 women murdered in Montreal December 6,1989. In the amount of \$2,000, the award is available to a female member of the Federation to attend the Labour College of Canada.

#### **Montreal Assault Prevention Centre**

The Centre has established a Aggression Prevention Scholarship fund in honour of the 14 women murdered in Montreal and to help make assault prevention more accessible to groups with special needs. Funds will be awarded to girls and women who cannot afford to take safety skills courses or to schools raising funds for assault prevention workshops. For more information, contact the Montreal Assault Prevention Centre, C.P. 237, Succ. Place du Parc, Montreal, Que., H2W 2M9, (514) 284-1212.

#### **Canada Scholarships Program**

Industry, Science and Technology Canada awards 2500 scholarships annually of \$2,000 each to students from any province or territory who are entering first year studies in a post-secondary institution in science or a related field. A minimum of 50% of these scholarships must be given to female students. More information is available from the Association of Universities and Colleges of Canada, 151 Slater Street, Ottawa, Ontario, KIP 5NI, (613) 563-1236.

#### **Canadian Women's Foundation**

CWF was established in 1989 to increase the funds available to help women across

Canada achieve greater self-reliance and economic independence. Grants ranging in size from \$2,000 to \$20,000 are available for imaginative, results- orientated programs that seek to empower women and girls. CWF funds only registered charitable organizations, but applications from other organizations can be considered if submitted by a registered charity on behalf of that organization. CWF is especially interested in funding programs that address the needs of women and girls economically disadvantaged or at risk. For more detailed application guidelines, contact CWF, 48 St. Clair Avenue W., Suite 500, Toronto, Ontario, M4V 223, (416) 975-1703, Fax (416) 961-3543.

#### McMaster Association of Part- time Students

The McMaster Association of Part-time Students has made available bursaries to part-time undergraduate students attending McMaster University. From \$350.00 to \$700.00, the bursaries are to cover the cost of fees, books, or child care. Applicants are judged primarily on financial need, and repeat awards are possible. Short-term emergency loans are also available. More information is available from MAPS, Kenneth Taylor Hall 102, McMaster University, Hamilton, Ontario, L8S 4M4, (416) 525-9140, ext. 2021.

#### **SUBVENTIONS**

# Conseil international d'éducation des adultes

Prix Dame Nita Barrow

L'objectif du prix est de rendre hommage et de soutenir les organisations nationales ou régionales d'éducation des adultes qui ont activement contribué a la responsabilisation des femmes dans le mouvement d'éducation des adultes. L'organisation devra montrer que les femmes occupent davantage de postes de direction et joue un rôle important au niveau de la planification et de l'élaboration des politiques. Veuillez contacter Fonds du Prix Dame Nita Barrow, CIEA, 720, rue Bathurst, bureau 500, Toronto (Ontario), M5S 2R4, (416) 588-1211, télécopieur (416) 588-5725.

#### **Bourse Agression-Prévention**

Le Centre de prévention des agressions de Montréal a créé une bourse à la mémoire des femmes qui ont été assassinées le 6 décembre 1989. La bourse sera décernée à des enfants et à des femmes qui n'ont pas les moyens financiers de suivre des cours d'auto-protection et aux écoles qui ont du mal à rassembler des fonds pour organiser des ateliers sur la prévention des sévices sexuels ou physiques subis par les enfants. Pour de plus amples renseignements, veuillez contacter: Centre de prévention des agressions de Montréal, C.P. 237, Succ. Place du Parc, Montréal (Québec), H2W 2M9, (514) 284-1212.

### FILM/VIDÉO



# Rap-O-Matics: Catch the Beat of Science and Math

Industry, Science and Technology Canada Science Sector 235 Queen Street 8th Floor W. Ottawa, Ontario KIA OH5

The video encourages girls to keep their science and mathematics courses through high school with an entertaining message aimed at changing both girls' and boys' attitudes towards girls' abilities in these subjects.

#### **Fires of Transformation**

Voice Film Productions 152 Arlington Avenue Toronto, Ontario M6C 2Z2 (416) 656-4949

Available in 16mm & 1/2" VHS, this film documents the experiences of VOICE (Violence Overcome in Creative Ensemble), who collectively wrote and perform a play based on their own experiences of wife assault and other forms of violence against women and children.

#### **Real Women Don't Do Math**

Centre for the Support of Teaching York University 4700 Keele Street North York, Ontario M3J 1P3

Sponsored by the Public Awareness Program of the federal government, this 10 minute video breaks down the stereotypes of women and math. Contact Pat Rogers at the Centre.



## Soft Sell: The Image of Women on Television

Media Watch 250, 1820 Fir Street Vancouver, B.C. V6J 1B1 Rental: \$25.00/individual \$30.00 / organizations

With a discussion guide, this video is a collection of clips of TV advertising and programming, organized thematically. The guide provides additional information to be presented to the audience.

#### FILM/VIDÉO

#### Rap-O-Matiques:

Suivez la cadence des sciences et mathématiques Industrie, Sciences et Technologie Canada Science Sector 235 Queen St., 8th Floor Ottawa (Ontario) KIA OH5 (613) 990-9658 Télécopieur (613) 991-0363

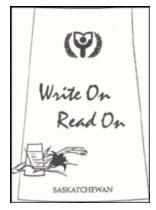
Ce film incite les filles à continuer de prendre des cours de maths et de sciences. Le message, qui se veut divertissant, vise à ce que les filles et les garçons changent d'attitude en ce qui concerne les aptitudes des filles dans ces matières.

#### **BOOKS/PUBLICATION**

#### **Learners' Voices**

Movement for Canadian Literacy 500, 800 Wellington Street Ottawa, Ontario KIS 6K7 (613) 563-2464 Fax (613) 563-2504 \$7.00

This is the final outcome of the Canadian Book Voyage, lauched by MCL in January,



1990. Blank books traveled to literacy programs across Canada, gaining new pages and stories at each stop.

#### Write On, Read On

Dale Anderson Carleton Box 1420 Moose Jaw Sask. S6H 4R4 \$20.00, 240pp.

The Saskatchewan Adult Basic Education Association has published the Provincial submissions to the MCL Book Voyage

as a moving record of literacy needs and work in Saskatchewan.

#### **Just Wages**

Women's Research Centre 101,2245 West Broadway Vancouver, B.C. V6K2E4 4 issues/year \$10/individuals, \$15/institutions

A new bulletin on wage discrimination and pay equity from the Women's Research Centre in conjunction with the Trade Union Research Bureau.



#### **Fact Sheets on Sexual Assault**

Ontario Women's Directorate 480 University Avenue 2nd Floor Toronto, Ontario M5G IV2 free

This set of seven fact sheets covers topics such as sexual harassment, pornography, reporting issues, impacts on health, and includes an annotated bibliography. Maximum order is 100 sets.

# From Victims to Survivors: New Options for Women Sexually Abused in Childhood

CCLOW-Quebec c/o Greta Nemiroff The New School, Dawson College 3040 Sherbrooke Ouest West mount, Quebec H3Z lA4

This is the second edition of the handbook produced by the Quebec network, with an updated bibliography and a list of resources in Quebec.

#### The Inuit Way: A Guide to Inuit Culture

Pauktuutit Inuit Women's Association of Canada 804, 200 Elgin Street Ottawa, Ontario K2P lL5 (613) 238-3977 \$7.00, 59pp.

This cultural orientation publication contains information on Inuit culture, values and traditions, covering topics such as traditional law, family, child rearing, and diet.

#### **Resources for Educational Equity**

Women's Educational Equity Act Publishing Center Education Development Center 55 Chapel Street Newton, MA. 02160 U.S.A. free

The catalogue describes over 250 nonsexist, multicultural materials for all age groups, covering subjects such as equity in school curricula, social studies/women's history, math and science, physical education, teacher training, etc.

#### **Working in Ontario**

Ontario Ministry of Labour 400 University A venue 14th Floor Toronto, Ontario M7 A 1 T7 1-800-267-9517 free

A plain-language guide to the major workplace laws of the Ontario Ministry of Labour produced through a collaboration of government, community organizations, labour, literacy and ethno-cultural groups. Available in English, French, Chinese, Greek, Italian and Portuguese.

#### LIVER/PUBLICATION

#### Cahier d'idées:

Un guide pour accroître la participation et la réussite des élèves de sexe féminin dans le domaine des mathématiques, des sciences et de la technologie Fédération canadienne des enseignantes et des enseignants 110, avenue Argyle Ottawa (Ontario) K2P 184 (613) 232-1505

Le Cahier d'idées "permet de stimuler la production d'idées dans les écoles et fournit des points de contact utiles pour les personnes qui envisagent de créer des projets novateurs".

#### Femmes en tête, femmes en fête

Relais-femmes 1265, rue Berri Bureau 810 Montréal (Québec) H2L 4X4 (514) 844-4509

Vous pouvez vous procurer gratuitement cet album souvenir du 50e anniversaire du droit de vote des Québécoises en en faisant la demande à Relais-femmes.

#### La parole aux apprenants

Rassemblement canadien pour l'alphabétisation 880, rue Wellington, Bureau 500 Ottawa (Ontario) K1K 6K7 (613) 563-2464 Télécopieur (613) 563-2504 7 \$ l'unité

Le Rassemblement canadien pour l'alphabétisation lançait Le Voyage du livre canadien en janvier 1990. Douze livres ont parcouru le pays tout entier, voyageant d'une centre d'alphabétisation à un autre, s'enrichissant à chaque étape de nouvelles pages. Un choix de ces textes sont présentés dans La parole aux apprenants.

## Feuillets de renseignements sur l'agression sexuelle

Direction générale de la condition féminine de l'Ontario 480, avenue University 2e étage Toronto (Ontario) M5G 1V2 (416) 597-4500 gratuit

La Direction générale de la condition féminine de l'Ontario a préparé une série de sept feuillets sur l'agression sexuelle dont les titres sont : Le harcèlement sexuel,

Pornographie, Signaler l'incident, Ses répercussions sur la santé, et Bibliographie annotée.

#### Travailler en Ontario

Ministère du Travail de l'Ontario 400, avenue University 14e étage Toronto (Ontario) M7A 117

Le ministère du Travail de l'Ontario, avec des organismes communautaires, des groupes représentant la main-d'oeuvre et des minorités ethnoculturelles, et des groupes d'alphabétisation, a préparé ce guide, facile à comprendre, qui traite des principales lois du Ministère du Travail. Travailler en Ontario est offert aussi en anglais, en chinois, en grec, en italien et en portugais.

#### AGENDA

#### **Critical Issues Facing Today's Counselors**

Summer Institute for Counselors July 17-19 Ottawa, Ontario

Co-sponsored by Employment and Immigration Canada and Algonquin Management Centre, the institute will address: new concepts and practices, tapping community resources, aboriginal healing, non-violent crisis intervention, laughing as therapy. Contact The Algonquin Management Centre, Conference Services, 200 Elgin Street, 10th Floor, Ottawa, Ontario, K2P, IL7, (613) 232-0900, Fax (613) 239-2010.

#### **Human Rights Summer College**

August 11-23, Ottawa, Ontario

A two-week summer course offered at the University of Ottawa for social activists. Topics include: collective rights, building solidarity, confronting privilege, using law for social change, world economy, and human rights. Contact Human Rights Centre, University of Ottawa, 57 Louis Pasteur, Ottawa, Ontario, KIN 6N5, (613) 564-3492.

#### 100 Years: Foundations for the Future

Canadian Education Association September 24-27 Calgary, Alberta

At the CEA's 100th anniversary celebration discussion will include: corporate partnerships, education and the law, Native education, Women in education, teacher education, pay equity, etc. Contact: CEA Suite 8200, 252 Bloor St. W, Toronto, M5S 1 V5.

#### Canada's Children: The Priority for the 90s

October 27-30 Ottawa, Ontario

Jointly sponsored by the Canadian members of the Child Welfare League of America, the Canadian Child Welfare Association, and the Canadian Council on Children and Youth, the . symposium will address: child poverty, children and the law, education, child welfare, child care, and health. Contact: Sandra Scarth, National Steering Committee, 33 Charles Street East, Toronto, Ontario, M4Y 1R9.

#### Global Vision/Local Action

Canadian Research Institute for the Advancement of Women November 8-10 Edmonton, Alberta

The 1991 CRIAW conference will look at linking local action with global issues. For more information contact, CRIA W Conference Committee, c/o Misener/Margetts Women's Research Centre, 11043-90 Avenue, Edmonton, Alberta, T6G 1E6.

#### **World Women's Congress for a Healthy Planet**

November 8-12 Miami, Florida

The Women's International Policy Action Committee on Environment and Development have organized this conference to ensure women have an equal say in decisions made at the 1992 UN Conference on Environment and Development. Issues include: earth ethics; restoring natural systems; science, technology and reproductive freedom. Contact: IPAC Secretariat, c/o Women's Foreign Policy Council, 845 Third A venue, 15th Floor, New York, N.Y., U.S.A., 10022, (212) 759-7982, Fax (212) 759-8647.

### **MEMBERSHIP**

(G.S.T. included)

Membership in CCLOW is open to individuals, organizations, or agencies.

N	ИEI	MB	$\mathbf{F}\mathbf{R}$	SHIP	FE	ES

□Low-income/student/un/underemployed/retired	\$10.70
□Individual	\$30.70*
□Sustaining Member	\$250.70**
□Organization with an annual budget up to \$100,000	\$48.25
□Organization with an annual budget \$100,000 to \$500,000	\$80.25
□Organization with an annualbudget over \$500,000	\$133.75

Associate Member (receives Women's Education des femmes only)

Individual	\$18.19
Organization	\$32.10

<sup>\*</sup> A \$20.00 income tax receipt will be issued.

Additional donations will be receipted for income tax purposes.

Enclosed, payable to CCLOW, is my cheque for:

Membership	\$
Additional Donation	\$
TOTAL	\$

Please return form and payment to CCLOW, 47 Main Street, Toronto, Ontario, M4E 2V6.

Name			
Address			

<sup>\*\*</sup>A \$240.00 income tax receipt will be issued.

Postal Code	
Telephone:	
(Home)	
(Business)	
Occupation	
Area of Interest	

[] I do not give CCLOW permission to trade, or sell my name and address to other like-minded social action groups for the purpose of fundraising or as a means of networking.

#### INSCRIPTION

(T.P.S. incluse)

L'inscription au CCPEF est ouverte aux particuliers et aux organismes ou associations.

#### DRITSD' ADHESION

Etudiante/sans emploi Retraitée	10,70 \$
Inscription personnelle	30,70 \$*
Membre commanditaire	250,70 \$**
Organisation: budget annuel inférieur ou égal à 100 000 \$	48,25 \$
Organisation: bud get annuel entre 100 000\$ et 500 000\$	80,25 \$
Organisation: budget annuel supérieur à 500 000 \$	133,75 \$

#### Abonnement seulement

Women's Education des femmes

Particulier	18,19 \$
Organisation	32,10 \$

<sup>\*</sup>Un reçu de 20,00 \$ aux fins de l'impôt sera remis.

Les dons supplémentaires feront l'objet d'un reçu aux fins de l'impôt.

Veuillez trouver ci-joint un chèque payable au CCPEF d'un montant de:

<sup>\*\*</sup> Un reçu de 240,00 \$ aux fins de l'impôt sera remis.

Adhésion ou abonnement		\$
Donation		\$
TOTAL		\$
Veuillez renvoyer le formulaire et le paiement au 0 47 rue Main, Toronto (Ontario), M4E 2V6.	CCPEF,	
Nom		
Adresse		
Code postal		
Téléphone:	(Res)	
D. C. :	(Bur)	
Profession		
Intérêts		
[] Je N' AUTORISE PAS le CCPEF a échanger, prêter ou vendre mon nom ou mon adresse a d'autres groupes d'action sociale aux fins d'une campagne de souscription ou a des objectifs de		

reseau.

The Canadian Congress for Learning Opportunities for Women (CCLOW) was founded in 1979 and is a national, voluntary, feminist organization with networks in every province and territory. CCLOW advocates equality between women and men by promoting equal participation in our educational, political, economic, legal, social and cultural systems.

To overcome discrimination based on gender, age, race, class ethnicity, and sexual orientation, CCLOW focuses on improving educational and learning systems. Our work and research includes maintaining a Women's Learning Resource Centre, publishing a quarterly magazine (Women's Education des femmes), advocacy, program development in local areas and involvement in educational related activities and events.

Le Congrès canadien pour la promotion des études chez la femme (CCPEF) a été fondé en 1979. C'est un organisme national, bénévole et féministe qui a des réseaux dans chaque province et territoire. Le CCPEF prône l'égalité entre les femmes et les hommes en promouvant une participation égale de tous et de toutes à notre système éducatif, politique, économique, judiciaire, social et culturel.

Pour surmonter la discrimination qui se fonde sur le sexe, l'âge, la race, la classe sociale, les caractères ethniques et l'orientation sexuelle, le CCPEF s'attache à perfectionner le système éducatif et celui de l'apprentissage des femmes, publie une revue trimestrielle Women's Education des femmes, se fait le défenseur des femmes, s'occupe d'élaborer des programmes dans différentes régions du pays et participe à des activités et à des manifestations dans le domaine de l'éducation.