
# The Focus on Information Technology (FIT) Program: Gender-based Analysis

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# Executive Summary

This study reviewed the ICTC's Focus on Information Technology (FIT) program, materials and website in order to make recommendations about what could be done to increase the participation of girls in FIT. This "gender-based analysis" focused on the needs and circumstances of girls in high school that might affect their decision to participate (or not participate) in the FIT program. Since this decision could be affected by the beliefs and concerns of parents, teachers and counselors, these were also included in this analysis. The study was conducted in schools in the Toronto District School Board, where FIT is being piloted, and other jurisdictions where FIT will soon enter into pilot offerings.

Any gender-based analysis aims to learn how the experiences of males and females might or might not be different under similar circumstances to ensure that their different experiences are taken into account when developing or designing policies, programs and materials. Ideally, any program or initiative should benefit both sexes, but in practice, they are often unconsciously designed so that the value derived is unequal. When there is a substantial under-representation or absence of one gender, a gender-based analysis looks specifically to determine why this might be the case and what could be done to address this differential. In the case of FIT, it is girls that are under-represented in the program by their choice of other courses of study. The research shows that when it comes to technology, gender matters, and there are important differences between males and females in their technology use and choices. A gender-based analysis of the FIT program can therefore be useful in guiding how the FIT program is further developed.

This study was conducted between January and March 2009. It included a literature review of materials relating to women in technology (with a particular focus on high school girls and technology), and materials related to gender-based analysis. Previous ICTC research on gender and diversity was also incorporated into this analysis. Interviews were conducted with seven FIT high school teachers and several FIT experts, as well as subject matter experts in gender-based analysis and women in technology. Four focus groups with high school girls (two groups of girls in the FIT program and two of girls in Grade 9 technology) were conducted. An in-depth analysis of the FIT website and FIT materials was also conducted.

The study found that female underrepresentation in IT work and school programs is a global phenomenon that has been documented for at least three decades. In short, males dominate computer-related schooling and the IT sector is therefore predominantly male. Females are actually *declining* in the IT workforce. Furthermore, the percentage of women in Computer Science programs is declining at a time when their participation in other scientific disciplines is increasing. Computer Science is only discipline where the percentage of women is lower than in 1992-93. Solving this complex problem is much bigger than the FIT program and this study cautions therefore that while it is a piece of the solution, the FIT program on its own will not be able to *solve* this problem.

High school technology courses can be critical for introducing girls to computers and ICT work. Unfortunately, in secondary schools, girls are more likely to enroll in clerical, data entry and business education courses, while boys take computer science and computer graphics courses. There are many reasons for these significant gender differences,

including: the lack of a supportive environment in IT classes; girls' different learning styles; the design of computer science curriculum; limited understanding of IT work and careers; and educator assumptions. Research shows that girls are *capable* of doing as well or better than boys in these computer classes. However, many girls have a "can do but don't want to" attitude about technology.

The focus groups and teacher interviews strongly supported what was found in the literature. They showed that the majority of the girls enrolled in FIT have parents in IT who encourage them to take these courses. Girls also have significantly different learning interests with respect to computers. The study also found that in secondary schools, the FIT program cannot be divorced from other technology classes. FIT begins in Grade 11, but technology classes begin as early as Grade 9. Thus, by the time they reach Grade 11, many girls have made up their minds about technology. In general, technology is perceived by girls as "too boyish" and "geeky" and they don't really see the value of studying it. Furthermore, most career exploration takes place in Grades 9 and10. By Grade 11, many girls have decided on an area of concentration, if not a specific career choice. The findings show that girls need a clearer understanding of technology courses and better guidance, as well as a technology curriculum in *all* grades (i.e., FIT and non-FIT courses) that respects their interests. There was general agreement that girls need to know more about careers that are available in IT.

Based on the stated FIT objectives, there are some serious unmet needs when it comes to girls. Girls are not attracted to the FIT program as it is currently designed. And there is little available to students to help them learn about ICT careers. Furthermore, many girls take a circuitous route into IT from other fields of study. For them, it may be more appropriate to ensure that they have a broad range of ICT skills on graduation from secondary school so that they may be encouraged to take some post-secondary technology courses, even if they don't major in computer science. The current design of the FIT program is problematic for girls who, as we found from the focus groups, approach their career selection very systematically and earlier in high school than boys and who, if they are going to experiment with technology courses, will do so in Grades 9 and 10, when it doesn't "count" towards university entrance. As presently taught, FIT is very technology-centric, and focuses on only a limited number of IT skills, i.e., hardware, software and programming. These skills have low interest for girls.

While its *goals* are still very relevant, FIT needs to be adapted to more effectively meet the needs of girls (and likely, boys who also do not fit the typical "boy computer geek" mold). It is important to send clear messages to girls in all FIT materials. This report recommends that the focus of FIT should be on **attracting them to IT work,** not on explaining the importance of IT in the world today. Simply integrating technology with the other curriculum is not a solution. Further and more detailed recommendations for the program and its materials are included in the report.

Attracting more females to IT work is a complex challenge and requires the commitment of the education system, colleges and universities, and the industry. In its role of acting as a catalyst to effect positive change in the ability of these stakeholders to address ICT human resources needs in Canada, the ICTC is in a key position to make a difference to girls. Through further, sensitized development of FIT, it can help address systemic barriers in each of these arenas, and encourage stakeholders to "do IT differently".

# Introduction

The purpose of this study was to review the ICTC's Focus on Information Technology (FIT) program, materials and website and to make recommendations about what could be done to increase the participation of girls in FIT. This "gender-based analysis" was designed to focus on the needs and circumstances of girls in high school that might affect their decision to participate (or not participate) in the FIT program. Since this decision could be affected by the beliefs and concerns of parents, teachers and counselors, these were also included in this analysis.

The study was conducted in schools in the Toronto District School Board, where FIT is being piloted, and other jurisdictions where FIT will soon enter into pilot offerings. It also examined previous research on girls and technology. Wherever possible, existing ICTC work was incorporated into this analysis.

# What is Gender-based Analysis?

Gender-based analysis is the study of particular policies, practices, programs and materials in order to better understand their impact on the different sexes (1). It seeks to learn how the experiences of males and females might or might not be different under similar circumstances and helps to ensure that their different experiences are taken into account when developing or designing such policies, programs and materials (1,2). Ideally, any program or initiative should benefit both sexes, but in practice, they are often unconsciously designed so that the value derived is unequal. When there is a substantial under-representation or absence of one gender, a gender-based analysis looks specifically to determine why this might be the case and what could be done to address this differential (2). In the case of FIT, it is girls that are under-represented in the program by their choice of other courses of study.

Although a gender-based analysis can suggest ways to improve female representation, there is no "generic girl" and therefore no quick fixes(3). Real girls need a variety of options that address different aspects of their circumstances. Sometimes a gender-based analysis, particularly in the health care field, will also include the impact of poverty, disability or ethno-cultural factors on participation. However, because of the short time frame of this study and the significant disparity in the participation of girls and boys in the FIT program, this analysis was limited to gender only.

It is important to understand two key concepts that underlie the goals of a gender-based analysis:

1. *Equality* is concerned with equal access to resources, i.e., the quality of an opportunity and experience should not be differentiated by sex (3). In schools, for example, computers should be equally available to both boys and girls.

2. *Equity* recognizes that what is fair is not necessarily equal since removing obvious barriers to access for females does not address inequitable treatment once they are

> given access, nor the culture which created inequities (3). For example, in schools, simply stating that computers are available to all does not mean that they will be equally used by both sexes because boys tend to dominate computer labs and their behavior in these labs can greatly inhibit girls' participation. Inequities can therefore be unconsciously built into policies, curricula and everyday school practices (3)

Efforts at addressing equity are often perceived as discriminating against boys (3). Many people, including teachers, parents and students, are uneasy with gender inequity discussions. However, without a gender-based analysis, females and males may be treated in the same way when it is inappropriate to do so, or they may be treated differently because of traditional stereotypes, when this is inappropriate.

Both of these situations were apparent in this study because, when it comes to technology, gender matters, there are important differences between males and females in technology use and choices (2,3). A gender-based analysis of the FIT program can therefore be useful to help guide the FIT Steering Committee in how it develops, evolves and implements FIT, sets priorities, and allocates its resources.

## Methodology

This study was conducted between January and March 2009. It included a literature review of materials relating to women in technology (with a particular focus on high school girls and technology), and materials related to gender-based analysis. Interviews were conducted with seven FIT high school teachers and several FIT experts, as well as subject matter experts in gender-based analysis and women in technology. Four focus groups with high school girls (two groups of girls in the FIT program and two of girls in Grade 9 technology) were conducted. An in-depth analysis of the FIT website and FIT materials was conducted. Further details on both the study methodology and the focus group methodology are available in Appendices A and B.

## Females and Information Technology

Female underrepresentation in IT work and school programs is a global phenomenon that has been documented for at least three decades (12). There is also considerable documentation on this "gender divide" in Canada (4, 10, 12). In short, males dominate computer-related schooling and the IT sector is therefore predominantly male (76%). Females are actually *declining* in the IT workforce (24.7% in Nov. 2008 vs. 26.3% in 2000 according to the ICTC's November 2008 Labour Market analysis). Furthermore, the percentage of women in Computer Science programs is declining at a time when their participation in other scientific disciplines is increasing. Computer Science is only discipline where the percentage of women is lower than in 1992-93 (5).

> ***"While women are more likely than men to work in an occupation requiring significant amounts of computer* use*, girls in secondary school are only one-fourth as likely to complete a computer education course as boys"*** (4)

There is also a gender gap in IT occupations. Women are more visible in database analysis, data administration, systems testing, web design, technical writing and training, and as

analysts, graphic designers, project managers (5). They are underrepresented as technicians and in computer engineering. The well-documented "leaky pipe" begins in elementary school and continues into the workforce. Not only do girls drop out of technology courses, women exit from IT jobs at twice the rate of men (5).

Solving this complex problem is much bigger than the FIT program. It is going to take a concerted effort from all stakeholders: employers, universities and colleges, educators, and industry groups to increase female participation to proportional rates. It is important to remember, therefore, that the FIT program on its own will not be able to *solve* this problem, but it should be seen as one piece of the solution.

## Girls and Information Technology in High School

High school technology courses can be critical for introducing girls to computers and ICT work (5). One study found that one-third of female Computer Science majors were influenced in their choice by a high school computing course (6). Unfortunately, in secondary schools, girls are more likely to enroll in clerical, data entry and business education courses, while boys take computer science and computer graphics courses (4). In B.C., for example, boys dominate technology courses, despite an explicit gender equity program (see Table 1). Other provincial data is not available by gender, except in Ontario, where the situation is similar (4). In addition to the fact that fewer girls enroll in these types of course, the drop off rate between Grades 11 and 12 for girls is significant. The high number of girls enrolled in business and technology or technology-related "girl-friendly" courses, where computer *use* is emphasized is also noteworthy.

**Table 1. Enrolment in BC Technology Courses by Sex** (4)

| | Gr. 11 Info Tech | Gr. 12 Info Tech | Gr. 11 Computer Tech | Gr. 12 Computer Tech | Gr. 11 Info Management (business) | Gr. 12 Info Management (business) |
|---|---|---|---|---|---|---|
| **Boys** | 66% | 79% | 88% | 90% | 31% | 26% |
| **Girls** | 34% | 21% | 12% | 10% | 69% | 74% |

Research shows that the main reasons for these significant gender differences are numerous and include:

- **The lack of a supportive environment in IT classes.** There are "strong (albeit unconscious) misogynous messages in modern computer science education" (7). Male teachers, a male-designed curriculum, and boy-dominated classrooms are highly intimidating for young teenage girls. "Curriculum, teachers' expectations, and culture reflect boys' pathways into computing, accepting assumptions of male excellence in the field" (6). Often, teachers, the curriculum and class-mates make assumptions about what girls "should already know" about technology and girls often feel confused and insecure as a result. Classes typically reflect a masculine perspective on technology in language, approach and images, e.g., techno-speak, the "geek lifestyle" (7).

- **Girls' Learning Style.** Girls experience computing differently from boys. While many boys "burn with passion" for computers, girls tend to cede the field through disinterest and disaffection because the technical culture reflects values that don't match their own (6). When courses require long hours, building things, or computer hardware, girls tend to reject "computer culture" before it rejects them. This is often seen in school computing centers that have been claimed as the territory of a subset of male students who are the school's computer experts. Girls, as outsiders, don't see how they and what they value can fit into the computer culture and curriculum (6).

  Boys have a magnetic attraction for computers as young as kindergarten and their relationship with them is more intense and all-consuming than it is for most girls (6). Boys like to get inside the machine and tinker, learning it inside and out, while girls stay on the outside and limit their involvement. For them, computers are one interest among many (6). Boys have fun with computers and see them as big toys (6). For girls, the attraction is more moderate and gradual. Most girls come to computer science later in high school and don't have the same experience of falling in love with technology. Unfortunately, while girls consistently demonstrate that they are as capable of doing computer work as boys, the dominant computer science culture does not venerate lifestyle balance and the multiple interests of girls.

  "The singular and obsessive interest in computing that is common among men is assumed to be the road to success in computing" (6). However, girls are "connected knowers" (i.e., holistic learners) and are more interested in knowing how technology can be applied to real world needs than "how things work" (8). They don't relate to the study of technology in the abstract (7). Thus, girls enjoy story telling that builds their problem solving senses rather than learning technology details. However, once they are "hooked", essential details can be taught (7). Overall, girls need to be first introduced to computer knowledge in context (9). Unfortunately, most educational programs myopically focus on the computer as a machine and fail to "connect the dots" to the real world of IT work (5).

- **Computer science curriculum** in high school has traditionally reflected boys' interests and experience levels. Research shows that there has been practically no women's participation in curriculum decision-making about computer science curricula at either the secondary level or at college/university (6). In computer science classes, assignments and teaching examples often embed male-dominated interests and activities e.g., sports stats, card and number tricks (6). Texts tend to focus on technical details with little attention paid to the application and impact of the technology in meaningful, interdisciplinary problem-solving ways (6).

- **Limited understanding of IT work and IT careers in the "real world".** Students, parents and school counselors often do not understand how students can benefit from studying computer science and it is seen primarily as a vocational skill (6). All three groups have a poor understanding of the real world applications of computer technology and IT work. Girls know they will need to *use* computers but they don't understand what's really involved in developing applications and implementing them. In short, studying IT is seen as irrelevant to the "real work" they want to do.

**Educator assumptions.** Teachers and counselors are critical to identifying and recruiting girls but too many educators are looking for girls "who look like boys" in their talents so they look in all the wrong places for signs of being interested in computers (6). For example, they may believe that staying up all night programming is a sign of love for computer science and that not doing so is a sign one doesn't love it. The model of a successful computer science student is therefore viewed through a male prism (6). These assumptions are compounded by educators' inadequate information about the skills needed for IT work. "Concern for family, balance in life, novels, and a good night's sleep should not come at the cost of success in computing" (6).

Research shows that girls are *capable* of doing as well or better than boys in these computer classes. However, girls have a "can do but don't want to" attitude (6). While more of them (78%) than boys (75%) recognize that an understanding of IT is important to success in business, they continue to believe that IT jobs are boring, focused on coding (5). A recent study (2009) (10) reviewed 400 academic studies about girls and technology learning and concluded that it's not their ability that is different and that stops girls from pursuing careers in engineering or computer science, but it is a female preference for more people-oriented professions and significantly different lifestyle needs. As holistic learners, girls who are good in math also have many other strengths and therefore many career options (10).

## The Current FIT Program

The FIT program has four main objectives (13):

1. To attract students and their parents to the world of ICT and have them consider it more seriously as an option.

2. To develop learning outcomes and materials (i.e., a "curriculum resource") designed for high school curricula related to IT skills and knowledge, as well as essential and other useful business/entrepreneurial skills.

3. To increase the number of high school graduates choosing and qualified for IT occupations on graduation and the number of high school graduates choosing to enter IT programs at the post-secondary level.

4. To increase the number of females choosing ICT options in secondary and post-secondary school.

The FIT Resource Guide explains that FIT is a "vendor neutral secondary school program delivered through hands on learning… [It] engages students by having them work in teams to create and run a simulated business while completing projects in Grades 11 and12". The current FIT program focuses on: PC maintenance skills, network support capability, administration technical proficiency, employability/essential skills, and business/ entrepreneurship attitude. A major focus of FIT is the development of transferrable, employability skills. These skills include: understanding of the computer industry; assisting in routine functions of supporting a quality information service delivery; maintaining PCs and related peripheral components; knowing where to purchase computers and supplies;

communication; information management; thinking and problem solving; attitude and behavior; time management; continuous learning; working with others. The simulated business project involves developing a business plan for and operating a computer store. This project continues over the two years of the FIT program.

FIT has been designed to offer three different, but related concentrations:

- **Computers/networking concentration.** Here, students learn to trouble-shoot and repair computers to the software or hardware module level and perform first-line, basic technical support.

- **Database concentration.** Building on the first modules of the computers/networking concentration, the student works with a team to: design, plan, implement and manage a company data base and improve it efficiency and productivity.

- **Security concentration.** Building on the first modules of the computers/networking concentration, the student performs a basic security audit of networks, PCs and computer us policies to determine vulnerabilities; maintains and updates PCs in a manner that will harden them from computer viruses, pests, and malware

A FIT certificate is issued if the student completes two certifications, in addition to the courses needed for the above concentrations:

**The FIT Certificate**

**National FIT certificate**:
- CompTIA A+ OR CISCO IT Essentials
- AND CompTIA Network+ OR CISCO Certified Network Associate
- OR JAVA OR Equivalent Language

**National FIT Plus certificate**: all of above plus 200 hours of relevant work experience

- **CompTIA A+.** This certification validates the skills needed by today's computer support professionals. It confirms a technician's ability to perform tasks such as installation, configuration, diagnosing, preventative maintenance, and basic networking and covers security, safety and environmental issues and communication and professionalism.

- **CISCO IT Essentials** provides a comprehensive overview of computer fundamentals including describing the internal components of a computer, assembling a computer system, installing an operating system, and troubleshooting. It also covers laptops and portable devices, wireless connectivity, security, safety and environmental issues, and communication skills.

- **CompTIA Network + or CISCO CCNA** recognizes a technician's ability to describe the features and functions of networking components and to install, configure, and troubleshoot basic networking hardware, protocols and services, e.g., IP, Enhanced Interior Gateway Routing Protocol, Serial Line Interface Protocol Frame Relay.

The FIT Program is supported by a Resource Guide, a Skills Achievement Passport (to document skills acquired), and the Discover IT website.

FIT is presently in pilot in seven Toronto District Secondary Schools and two schools in BC. At least two of these are specialized schools, accepting only students with higher academic averages who wish to focus on math and science. As implemented in these schools, FIT is tied to four key courses in the Ontario curriculum: Grades 11 and 12 JAVA programming and Grades 11 and 12 Computer Engineering. Most teachers in the Toronto pilot schools stated that the certifications were very "heavy" for students to manage while going to school, especially the National FIT Plus certificate.

## The FIT Program and High School Girls: Findings

Senior girls in the focus groups and teachers were asked about how many girls were enrolled in the classes they took/taught. Table 2 illustrates a typical distribution of females from the sample in Toronto[1].

**Table 2. A Typical Distribution of Girls in Technology Classes**

| | **% Girls** |
|---|---|
| **FIT Classes** | |
| JAVA Programming (non-specialty school) | 12-30% |
| JAVA Programming (specialty school) | 45% |
| Computer Engineering (specialty school) | 0-2 girls |
| Computer Engineering (non specialty schools) | 0-2 girls |
| **Non FIT Courses** | |
| Gr. 9 Technology (non-specialty schools) | 35% |
| Gr. 9 Technology (required) | 45% |
| Gr. 9 Business & technology | 50% |
| Gr. 11 Business & technology | 76% |

### Girls and FIT

- **Teachers stated:** Many of the girls taking FIT courses have parents in IT who encourage them to take these courses. (In the focus groups, a very large majority of the girls taking FIT classes had one or more parents who work in IT.)

  Certification is a lot of extra work for the students. These are hard courses.

  Computer science is constantly changing and constantly challenging. It requires a lot of student work, strenuous hours and time.

  Boys are insane about computers; they get caught up with them and plough through. Girls are more multidimensional. Boys like toys and will do whatever it takes to play; girls are more practical about how and where they spend their time.

  The courses required for FIT are promoted at an annual course fair. The content is not gender-specific but it is not appealing to girls. The course descriptions are written in very

[1] Most of the senior students were not aware of their participation in the overall program. This has implications for communications about FIT in the future.

dry, technical language. Girls need to see the benefits of what they will get out of these courses.

The FIT Passport is not being used at present.

- **Student comments.** Both groups of Grade 11/12s understood they were or could be working towards a CISCO certification, though they said it was boring, "read only" and designed by CISCO. However, they felt certification would improve their marketability.

**Girls and Programming**

- **Teachers stated:** Girls may start out with programming but there's a major drop off in the higher grades. Girls don't really like programming. They want more options. Programming is more challenging than other Grade 12 courses. The kids get lower marks and it lowers their average. Therefore, not taking computer courses is a calculated decision by girls since universities will accept students with only math. Programming is seen as having a limited range of opportunities and as very isolating.

## High School Girls' IT Experiences: Focus Group Findings

In Secondary Schools, the FIT program cannot be divorced from other technology classes. FIT begins in Grade 11, but technology classes begin as early as Grade 9. Thus, by the time they reach Grade 11, most girls have made up their minds about technology. Furthermore, most career exploration takes place in Grades 9 and10. By Grade 11, most girls have decided on an area of concentration, if not a specific career choice. Information Technology classes (i.e., the FIT program) are options in Grade 11 and 12 and are not required for graduation or by any university or college for admission (even for Computer Science degrees and diplomas). Most university/college courses require six Grade 12 courses, of which English and two maths are typically required, leaving three options. If a student wishes to go into any science/math-based program, often two sciences are usually also required, leaving very little room for the two technology courses required by the FIT program in Grade 12. The comments below illustrate how information technology is currently taught in the Toronto FIT schools and some of the issues and challenges faced by girls when choosing technology courses (including FIT courses) during high school.

With regard to the complete technology curriculum throughout high school, the teachers interviewed believe that girls need a clearer understanding of what each course is all about and better guidance. There is a general recognition that Grades 9 and 10 are the "exploration years", while Grades 11 and 12 are the "preparation years" for university/college. The FIT teachers interviewed believe that students need more of a chance to experience information technology in earlier grades. One stated, "If you can get them to take a class early on in high school, there's a greater chance it will stick." In the higher grades, the curriculum gives students limited opportunities to explore an interest that isn't directly related to the career they see themselves headed for. For most students who are university-bound, courses need to be at or lead to a U (university entrance) level. Timetables are so full, there's not enough time to take anything not at this level and as one teacher pointed out, "Most students would prefer a spare."

## Girls and Other Technology (non FIT) Courses

In Ontario, technology courses in Grades 9 and 10 introduce students to computer-aided design, computer animation and some programming. Students may also take Business and Technology in Grades 9 and 11, which introduces them to basic office software. It was beyond the scope of this study to analyze provincial information technology curriculum offerings. However, it is important to know that technology-related courses are offered to students in Grades 9 and 10 and beyond, which are not currently tied into the FIT program.

- **Teachers stated:** In Ontario, Grade 9 and 10 business introductory courses introduce students to ICT in a business environment, e.g., web design, research, communication. These are not as intimidating as other computer courses so many girls take these classes *but* there is little integration with traditional computing skills.

- **Students stated:** Information Technology courses are less related to real world applications than the other courses girls take (e.g., math, science). Most girls did not understand how much computers are used in different careers (e.g., nursing, fashion design, the environment) nor did they "get" that someone with knowledge of *both* computers and a work field needs to design these applications.

## Girls' Learning Differences with Information Technology

Teacher interviews and the focus groups supported the findings in the literature that girls have different learning needs and interests when it comes to technology:

- **Teachers stated:** Girls want to see themselves in the story. They're not interested in pure computer science. There are few female role models for them in our culture. Computer science and engineering are seen as a male profession. Average girls do not take computer courses.

  Girls are uncomfortable if there are only a small number of girls or no other girls in a class. They find it very stressful and feel insecure. Girls are more likely to take technology courses if their friends recommend them.

  The computer area is dominated by boys playing games. Girls don't like these types of games. They are advanced network users and like impersonation applications and activities that require them to multitask. The ideal curriculum would blend some of these activities with more traditional computer training.

  Boys are kinesthetic learners and like to be hands on. Girls take a more systematic view of programming and concentrate on simplicity, process and marks. Boys want and need to learn individually; girls would learn better in teams.

- **Students stated:** Most girls in Grade 9 said they wouldn't take another computer course. Reasons included: "it's a heavy load"; "I hear it's too difficult", "you get engaged in it and forget about other work"; "we were shown the different types of courses we could take (implication they're not interesting)"'; "it's nerve-wracking when things don't work"; it's hard and frustrating"; "I'm not good at building things". All felt that science was more relevant. "Computers are a boy thing".

A smaller number of older girls felt computing courses gave you good skills. Asked what types of IT courses would interest them, the older girls wanted independent study courses while the younger girls were interested in graphic design and art, animation and video editing.

**An Illustration**

One Grade 9 technology course was taught by the body shop teacher. Girls had to go to the body shop and felt scared. It is focused on building things using CAD and basic programming. Girls stated they are not good with building nor interested in it. Projects included: building a rocket and building a car that floats. Neither was interesting to girls. They would be more interested in group projects that are more basic and don't assume prior technology knowledge. The terminology can be intimidating. One girl didn't know what "aerodynamics" was. Girls want more projects reflecting their interests. Because of starting behind their male counterparts, they found this course "frustrating" when they didn't know what to do.

Asked what could be done to make computing/ technology courses more interesting to girls, Grade 9 girls had few insights. They suggested using computers to do "makeovers". They also thought existing courses were "too isolating" and wanted more group projects and more involvement with people. Grade 11 and 12 girls suggested making the projects more "real world" and adding more girls. "No girl wants to be in a class by herself". Adding projects that would connect them more with people would help. Generally, their friends saw computing skills as "useless" that they "won't need". Classes with broader social interest and a real world context would be more interesting. At present, programming is taught as an abstract set of skills. More needs to be done to connect these skills with how they can be used in careers or in the world. Real life examples and applications are important. One girl noted: "All we are doing is what we're told to do".

Girls also suggested they would like more female teachers because their male teachers don't always understand how girls learn and think differently. They noted that boys know a lot more going into technology classes than girls. The girls complained that the boys often speak in "technobabble" and have a hard time communicating what they know. This is also true of male teachers who make assumptions about what girls should already know, particularly at the start of the class. Both make girls feel intimidated and stupid asking questions.

*Girls are willing to put up with tough courses but only if they help them get where they want to go.* In general, technology is perceived by girls as "too boyish" and "geeky" and they don't really know what is involved with it.

## Girls and IT Careers

There was general agreement among teachers and students that girls need to know more about careers that are available in IT. They would like to see a website describing them and suggested videos of males and females talking about their jobs. Links to the skill sets and courses needed might be helpful. All girls were interested in better understanding career paths they could take.

- **Teachers stated:** In person presentations to girls about future careers are "somewhat useful" but girls need to hear this from many different perspectives, not just one. You need to "bombard" them from many sources. Girls were shocked when they heard about how much money they could make in IT and they didn't realize the broad applications of IT jobs.

  Girls just don't see IT in their future so it's hard to encourage them to get their toes wet. Girls look at their future careers and professions differently than boys. Girls look at the "essence" of a job and determine if they want this for themselves. Most girls do not want to be computer support technicians.

- **Students stated:** All the girls in each group felt they were going to university or college. Most expected to *use* specialized computer applications while there, though some of the younger ones weren't sure whether this would be necessary. Girls are very serious about their courses and course selections from Grade 9 on. They are interested in future careers. Many have used "career cruising" software extensively. They are interested in getting good marks and having a balance in their schoolwork (i.e., not spending too much time on technology courses to the detriment of others). Girls appear to be more practical and focused on courses that will benefit their planned careers. They want to see more discussed about IT careers earlier in high school, e.g., Grades 9 and 10.

  ***"Do they use computers in nursing?"*** **-** Grade 9 student.

  Of the girls in the older groups, most expected to take one or more computer science courses in university, though none planned to major in computer science. A number of girls were planning to go into engineering and other sciences. Some of the reasons *not* to major in computer science are: "programming is hard"', "it's very challenging", "it's very time consuming", "the course work is heavy". Some older girls felt that being a girl might be an advantage in a technology career because there were so few of them.

  **None of the girls in any of the focus groups knew what systems analysis is.**

Table 3 summarizes the findings of both the literature review and the interviews and focus groups and compares these to the FIT Program.

**Table 3. A Comparison of Girls' Needs and the FIT Program**

| **What Girls Want:<br>A Summary of Literature, Focus Group and Interview Findings** | **What FIT Offers<br>As Implemented** |
|---|---|
| **More girls.** A critical mass of females in technology programs; girls don't want to be the only one in a class. Encourage gender specific experiences with technology. | **Largely Male Classes.** Classes assume prior technical knowledge, are dominated by boys, use male-oriented terminology and examples. |
| **More supportive teachers and counselors.** Remove the intimidation factor – better education and resources for technology teachers. More female role models and teachers. Eliminate assumptions about technology knowledge, technical language, and what it takes to be interested in computing. | **Predominantly male teachers.** One in seven FIT teachers are female. |
| **Enriched pedagogy.** Adapt all aspects of IT education to female learning needs and interests. Stop asking what is wrong with females and start asking about female interests in and uses of computer technology. Incorporate female interests into technology courses and activities. A broader view of computer science. Provide multiple ways to "be" in computer science programs. | **Male-centric pedagogy.** Extra heavy courses, largely designed for boys' "passions", i.e., for building, hardware and software configuration, and technical detail. |
| **Broader technology *curriculum*, more clearly linked to the real world and to jobs,** including more projects, analysis, web and data activities and their applications as well as a focus on soft skills like project management, technical writing etc. More awareness in both the curriculum and the culture of the many facets of computing. Girls want to see technology work in practice, contextualized, with role models and career information. Strong linkages between the relevance of IT and real world needs and jobs. | **Narrow curriculum with a technical focus**. "Soft skills" are designed for running a computer business. |

| **What Girls Want:<br>A Summary of Literature, Focus Group and Interview Findings** | **What FIT Offers<br>As Implemented** |
|---|---|
| **Opportunity to explore technology opportunities before choosing a career focus (i.e., in Grades 9/10).** | **Focused on Grades 11 and 12** |
| **Broad understanding of the variety of IT *jobs* linked to the real world of work and applications.** | **FIT materials** describe IT as "an exciting world where people *use* IT in a variety of ways and there are exciting gadgets. But do not adequately describe the full range of IT careers or link them to real world applications. |
| **Greater collaboration** between secondary schools, universities and colleges in adapting their curricula to female needs and interests. | **There is little collaboration between secondary schools, universities and colleges** – While ICTC is intending to explore articulation agreements and other forms of recognition of the FIT certification, it is not being done with a new more female-friendly view of the field, which might well help the flagging post-secondary ICT programs. |
| **Industry recognition and change**. Broader definitions of IT work to be more inclusive of multidisciplinary point of view and applications of IT. Explicit and visible recognition of the current imbalance by industry and a positive message to girls. Better definition of fundamental IT skills (industry and employers). | **FIT was originally designed for training computer support technicians** and this heritage is still apparent. The Discover IT website largely stresses technical skills and jobs over the full range of IT careers. |
| **Better labour market and career information** for girls, parents and counselors, widely available online. Better understanding of the variety of jobs and opportunities that exist in IT. Stronger emphasis on soft skills for certain IT positions. (e.g., analysis, project management, technical writing). | **Limited career information** about real IT jobs. FIT is not linked to standard ICTC career designations or IT competencies. Materials about IT do not effectively describe IT work and real world applications. |

# Conclusion

Based on the stated FIT objectives, there are some serious unmet needs when it comes to girls, When this study's findings are compared against the FIT program's stated objectives some major disconnects are apparent:

1. *To attract students and their parents to the world of ICT and have them consider it more seriously as an option.* This is not happening for girls.

2. *To develop learning outcomes and materials (i.e., a "curriculum resource") designed for high school curricula related to IT skills and knowledge, as well as essential and other useful business/entrepreneurial skills.* At present, FIT is predominantly a technology program, a legacy from its early days as a school-to-work program. Schools are still struggling with combining business and technology skills teaching. One teacher stated, "we don't have time to teach these skills". At the moment, teacher support materials are still in development, so there is only the certificate and the Teacher's Guide at present. There is no specific support for teachers in helping them to attract, encourage or teach girls.

3. *To increase the number of high school graduates choosing and qualified for IT occupations on graduation and the number of high school graduates choosing to enter IT programs at the post-secondary level.* As noted above, there is little available to students to help them learn about ICT careers and only a very small number of boys (about 20% according to teachers) or girls (none in this sample) carry on to ICT study at the post-secondary level. Furthermore, as noted above, many girls take a circuitous route into IT from other fields of study. For them, it may be more appropriate to ensure that they have a broad range of ICT skills on graduation from secondary school so that they may be encouraged to take some post-secondary technology courses, even if they don't major in computer science. The current design of the FIT program is problematic for girls who, as we found from the focus groups, approach their career selection very systematically and earlier in high school than boys and who, if they are going to experiment with technology courses, will do so in Grades 9 and 10, when it doesn't "count" towards university entrance.

4. *To increase the number of females choosing ICT options in secondary and post-secondary school.* As presently taught, FIT is very technology centric, and focuses on only a limited number of IT skills, i.e., hardware, software and programming. These skills have low interest for girls.

While these *goals* are still very relevant, FIT needs to be adapted more effectively to meet the needs of girls (and likely, boys who also do not fit the typical "boy computer geek" mold). It is important to send clear messages to girls and these must be clearer and more consistent in the teacher support materials, the descriptions of FIT, in the FIT materials and on Discover IT website. The focus of FIT should be on **attracting them to IT work,** not on

explaining the importance of IT in the world today. (While IT is used in many different occupations, those who simply *use* IT applications are not IT workers. As noted above, girls *already* dominate as users of IT applications.) Therefore, simply integrating technology with the other curriculum is not a solution. This approach "represents a naïve assumption that technology is merely a tool that students don't need to study"(4). While there is nothing wrong with this approach, merely informing students of how and where technology is used in a variety of fields, is *not* the same as learning IT skills.

Attracting more females to IT work is a complex challenge and requires the commitment of the education system, colleges and universities, and the industry. In its role of acting as a catalyst to effect positive change in the ability of these stakeholders to address ICT human resources needs in Canada, the ICTC is in a key position to make a difference to girls. Through further, sensitized development of FIT, it can help to address systemic barriers in each of these arenas, and to encourage stakeholders to "do IT differently" (7).

Recently, Carnegie-Mellon University set out to do just this and has increased the number of females in their Computer Science program from 7% to 42% in *just five years* (see Appendix C for details about how it did this). Thus, while difficult, change can be accomplished. However, as the leaders of the Carnegie Mellon program stress, changes must be made in a consistent fashion in many areas. Ensuring that the work done in the FIT program is aligned with other work the ICTC is doing with industry and colleges and universities would help achieve this consistency of messaging to girls.

## Recommendations for the FIT Program

Evolving the FIT program to make it more attractive to girls must therefore take a multi-level approach. These recommendations have been developed with three goals in mind:

1. **Clarity.** To ensure that a clear and consistent message about FIT and IT work is provided to students, teachers, parents, counselors, curriculum designers and employers.

2. **Simplicity.** To communicate this information in a simple, easy-to-understand format.

3. **Integration.** To ensure that FIT is consistent with other industry frameworks developed by the ICTC.

Some of the following recommendations are straightforward; others may take a longer time to implement. Some are suggestions for improved integration with other aspects of ICTC work in order to provide consistent messaging and prevent "reinventing the wheel". These recommendations are designed to *build on* and *extend* the existing FIT foundation, not undermine it. In making FIT a better program for girls, they will also make FIT a better program.

## As a Program

1. **Link FIT to ICT Careers.** Extend the FIT program and materials to ensure that all ICT career areas are covered by the program, not just technical support jobs, and make them internally consistent with newer ICTC work on ICT competencies and ICT careers. Specifically,

   - Map FIT learning outcomes to those in the ICTC competency and essential skills framework at an appropriate level. This would make FIT more internally consistent with the work being done for the industry itself.

   - Connect FIT competencies to major IT career designations. The ICTC's Pathways to Recognition initiative has a coherent set of four ICT occupational groupings that could be used for this purpose:
     - *ICT Designer/Developer.* FIT covers part of this in its programming requirement.
     - *Business and Information Analyst*. This is not currently covered by FIT.
     - *ICT Operations & Support.* This is the primary focus of FIT at present.
     - *Web/Data.* This is not currently covered by FIT.

   In the longer term, develop FIT concentrations for each of these career designations. Fortunately, courses related to these fields already exist in some of the high school curricula across the country, so this will not necessarily require original curriculum development work.

   This work would broaden the focus of the FIT program to include the full range of skills needed by IT workers, not just hardware, software and programming competencies. Identifying gaps between FIT competencies and broader IT competencies will highlight areas in IT work that are more female-oriented, and which are missing in the current FIT program, e.g., analysis competencies, applications, web development and working with data.

2. **Develop an ICT Overview Component** that would serve as an introduction to the broad range of ICT work and applications for all students earlier in secondary school, giving them a chance to explore the opportunities involved. Link learning outcomes to ICT competencies, work designations, and real world applications. Include opportunities to explore how different types of ICT work are done in different enterprises. This would assume no prior technology knowledge.

3. **Conceptually Broaden the FIT program** to include all grades of secondary school and all courses that develop ICT skills and understanding. Connected with the FIT passport (see recommendation 4), this would enhance awareness of ICT work and careers in Grades 9 and 10, encouraging girls in particular to explore these before focusing in on a specific career, without requiring additional work on the FIT curriculum resource.

4. **Shorten the FIT Passport** into a four page document (one for each career designation) showing the major competencies needed for each career designation. Link these to specific courses in each province (in conjunction with Departments of Education) and

automate (or semi-automate) the production of a FIT passport to be provided to students, each semester/annually. The new Passport should not only simplify the work involved but also ensure that each student taking *any* course that relates to IT skills is made aware of them and pointed to specific career opportunities and to the Career Resource Centre on the Discover IT website. This will reduce the "math and technology" centric thinking of students, curriculum developers, and counselors, illustrating continually all the broad range of skills that are needed for this work.

5. **Connect the FIT Passport to College and University Programs.** In the longer-term, the Passport could be extended to competencies learned at the college/university level in a variety of programs. Not only would this provide consistency between the different levels of education and levels of learning, it could also be connected to other lifelong learning initiatives. These connections would provide additional credibility to the FIT Passport (which effectively becomes an ongoing documentation of ICT skills). Attached to any resume anywhere in Canada, it would accurately describe the ICT skills acquired by a student. For girls in particular, who may take a more varied set of courses in Secondary and Post-Secondary School, this would offer them the ability to demonstrate the types of skills they have developed that might qualify them for ICT work, thus providing them with an entrée into the field at that point in their careers, (which is, after all, the ultimate goal of the program). While this is a longer-term goal, this Passport is relatively easy to implement (since it is based on evaluations of individual courses rather than on getting post-secondary institutions to change). It is also more attractive to girls and to those boys who might not wish to take a "direct route" into IT. It could be worked on with individual colleges and implemented gradually over time

6. **Develop a "Career Resource" on the Discover IT website** to provide information to students, parents, counselors, teachers and curriculum developers about IT jobs in each career designation. This would include real world examples of work, salary ranges, labour market demand, and video clips of males and females speaking about their jobs. It could be linked to other sites, such as the "career cruising" sites girls frequent in their early high school years, helping them become aware of the reach and variety of ICT work.

### As a Resource for Departments of Education

- **Develop Separate FIT Assignments.** Since the FIT program is a curriculum *resource,* not a curriculum in and of itself, Departments of Educations must implement FIT in specific courses. It is difficult to deliver FIT "in a simulated business environment" across four courses as originally planned because this requires considerable coordination between teachers and melding different teaching styles. Furthermore, students may only take one or two FIT courses and in a different order than originally conceived. Separate FIT projects designed for each type and level of learning would make it easier for teachers to provide a variety of real-world linkages within a single course and to offer more "girl-friendly" assignments.

- **Map FIT Competencies to Provincial Curricula.** ICTC staff should work with curriculum developers in each province to map revised FIT competencies, skill levels and concentrations to learning outcomes in *all* appropriate courses taught in secondary school, thus extending FIT conceptually to all business and technology courses, currently taught in Grades 9-12. Mapping work will also identify gaps in skills taught in their provincial curriculum.

This work should be considered to be an ongoing initiative as FIT and the different provincial curricula are developed, since IT is a rapidly evolving field. The result would be an ICT curriculum in each province that more comprehensively linked to a broader array of industry-validated IT competencies and career designations and which would give girls more awareness of their IT options.

### As a Resource for Teachers

- **Develop "girl-friendly" Course Descriptions** for each course that is linked to FIT in each provincial curriculum. This would include skills learned and their real world applications. Include these as part of each province's section on the Discover IT website. (Note: these would also be available for students, counselors and parents). Teachers could use these as part of their "course fair" materials.

- **Develop "girl-friendly" Assignments** for each FIT-linked course in each province. Teachers could be asked to submit sample assignments for posting on a "teachers only" website. Note: a range of assignments should be made available but those that are particularly "girl-friendly" should be flagged.

- **Develop a Tip Sheet** for technology teachers providing them with insights about girls and technology to make them more aware of girls' different learning needs.

- **Develop a model for a Girls' Computer Club** (in the longer-term) with ideas and projects that appeal to girls in Grades 9-10 and which uses girls in Grades 11-12 as mentors and coaches. This not only provides role models for younger girls, it also provides practical volunteer experience for the older girls that can be used on a resume. This could be particularly useful in distance learning.

### As a Resource for Students

- **Develop a "girl-specific" Area of the Discover IT website**. This would provide girls with a wide array of links, by province, to the large number of existing programs that encourage girls to explore technology. Many of these have already been identified by earlier Women in IT research done by the ICTC.

- **Explore Social Networking** (in the longer term) to get girls to recruit their friends into technology courses. Girls are the best recruiters of other girls, so explore how "friendship circles" can be recruited, particularly in Grades 9 and 10.

### As a Resource for Parents

- **No additional work is needed** since the Career Resource developed above for the Discover IT website should meet parents' needs and the revamped FIT Passport will help parents see how and where their individual child's skills fit with potential ICT careers.

### Linking FIT to Employment

**Find Opportunities to Educate Employers and Recruiters**, particularly those involved in the FIT Industry Advisory Committees and the Steering Committee, about female pathways into ICT. If the jobs aren't there or if employers are only hiring for technical skills, girls will not see a place for themselves in ICT and will not be convinced to aim for ICT careers. As the ICTC's report, "Diversity, the Competitive Edge" points out, the demand for such "female" skills as communications and business competencies is not always reflected in recruitment 6). This marginalizes females and reduces the productivity of IT departments. Work with employers and recruiters through the competency framework to ensure that the skills required of a job actually fit the real job requirements, which often require more hybrid skills than pure technical skills.

**A Cautionary Tale**

One girl told of how a friend with a newly-minted computer science degree was having great difficulty finding a job and was sharing his difficulties with all his friends' younger siblings via Facebook.

The moral of the story is that if the jobs are not there for graduates, younger students will learn about this rapidly and adapt their career choices in real time.

- **Promote Recognition of the FIT Passport** (as compiled in Secondary and Post-Secondary institutions) as appropriate documentation of a wide range of skills needed by ICT workers. Develop credibility for this document, in addition to standard educational **a**nd work experience qualifications provided by a resume.

## Materials Assessment

This section provides an overview of the study's findings and recommendations regarding FIT materials and the Discover IT website. A more detailed analysis and recommendations were provided separately.

### FIT Materials

In general, the FIT literature portrays girls as well as boys and doesn't use gender-specific language. It is well written and accurately describes the current FIT program. However, because the content of the program is not of interest to girls, the materials can't do a good job attracting them to FIT.

1. **Resource Guide.** This document has a hardware, software and networking focus, which is not of interest to most girls. Operations support is the least likely area of ICT work to be of interest to girls.

   **Recommendations.** Link FIT learning outcomes to appropriate, standardized learning outcomes listed in the ICTC competency framework. For each province, map the revised FIT competencies to existing course offerings. This will assist educators to identify gaps in their existing curricula and serve as a basis for the revised FIT passport (which will link competencies to ICT jobs).

   In the longer term, broaden this curriculum resource to include concentrations that will help girls (and boys) explore and understand the full range of ICT careers as identified by the ICTC. These might include: Introduction to ICT; ICT Design/Development; ICT Analysis; ICT Operations and Support; and Web & Data.

   These recommendations will ensure that the FIT program is more closely tied to real ICT careers and to all manner of ICT jobs.

2. **Skills Achievement Passport.** This document is long and complex and teachers state it is too administratively time-consuming to use.

   **Recommendations.** Redesign and simplify the FIT Passport into a single multifold document, with room to indicate competencies achieved in the ICT courses taken. Link these to the full range of ICT careers, as outlined above, so students can see how their courses are preparing them for ICT jobs. Map courses in each province and their learning outcomes to major ICT career designations. Automate or semi-automate production of the FIT passport (possibly with an ICTC industry partner) so that a student receives a new one after completing any ICT course.

   Position the FIT passport as both a valuable marketing tool *and* resume supplement. In the longer term, extend the FIT passport into colleges and universities to create a living

   document that has serious credibility and which recognizes the ICT skills and competencies acquired in educational paths that are not always Computer Science degrees.

   Linking all ICT-related courses in secondary school to ICT competencies and major career designations will more closely “connect the dots” for girls about how individual ICT courses prepare them for different ICT jobs. Providing a revised FIT Passport after every relevant course taken will continually remind girls and their parents of the skills they are developing and how these relate to real jobs. Advertising the website on the Passport will give them more information about these jobs, salary levels, and real world applications. Extending the Passport into colleges over time will a) add credibility to this document for employers and b) acknowledge the more multi-disciplinary and “snakes and ladders” learning path that most girls take, while linking their skills to ICT competencies.

3. **Jump-start your IT Career.** Reposition this document as a handout for parents to be given out on Parents Nights or sent home with report cards (and passports). This document should provide basic information about the full range of ICT careers and skills and how their daughter/son can acquire them. Directions to the Discover IT website will enable parents to obtain accurate information about all types of ICT jobs and how their children can have desirable and well-paid ICT careers.

4. **Give your students a jump-start in IT.** Since some teachers and non-technical curriculum developers may not understand the full range of ICT careers and the competencies needed for it, this could be a valuable overview document to explain the FIT program, FIT competencies, and links to ICT careers. It should also illustrate how these can be mapped to an existing curriculum.

   This handout for educators will aim to give them a brief overview of the FIT program and its content so they can speak appropriately about it to students and their parents and how it links to their particular curriculum. It should reinforce in educators' minds that ICT careers are about more than technology, point them to useful and practical support materials that will engage girls, and incorporate real world applications, examples and jobs.

5. **Learn More Earn More.** This information should be combined with the "Jump Start" document and used as a handout to parents and counselors to quickly educate them about ICT careers and why a broader range of students might be interested in them. This document would also be ideal for sending a proactive message to girls, via their parents and counselors, that IT and FIT are not all about math and science. Since it speaks to the kinds of things students are interested in, it could also potentially be used as a model for the first page of the Discover IT website.

## Discover IT Website

At present, this site is very technology oriented and won't appeal to girls. For example, only IT companies are listed on the front page and schools offering IT programs. And it's not geared to the full range of IT work. In general, the language used on this website should not assume any prior knowledge of IT and should be geared for students in Grades 9/10 since that is the stage at which they would elect to take FIT courses. Technical terminology should be avoided.

**Recommendations.** Target this site to students in Grades 9 and 10 and their parents. These are the key "exploration years", especially for girls and therefore the ideal time to encourage them to consider ICT work.

Develop tighter links to ICT careers and career paths. Use the same ICTC careers model as recommended above and then provide a breakdown to specific ICT occupations. Labour market information should provide a positive message about the need for all sorts of IT jobs, backed up with statistics and salary ranges. Use this to send a positive and reassuring message that all IT work is not being outsourced.

Broaden the *IT Innovation* section to describe how IT is used in many enterprises and how IT applications and databases are used in a variety of fields from healthcare to fashion. This is a chance to explain "real world" IT. Integrate all aspects of IT careers with video clips of girls/women talking about their jobs (boys/men too). A "Girl Zone" should be added with a) proactive messages to girls and b) links to existing girl-centered programs for science and technology listed by province.

Remove the teachers' component to a specialized educator website to enable the FIT program to provide more in-depth resources and functionality, e.g., assignments. Common material (e.g., the mapping of courses by province with ICT competencies) could be used by both the Discover IT website and the teachers' site. Add tips and articles about teaching technology to girls. Solicit or encourage teachers to provide real world assignments, activities and projects which they have found effective. Identify which ones are of high interest to girls.

## A Technology Gender-based Analysis (GBA) Tool for the Future FIT Program & Materials

As part of this study, a gender-based analysis tool was developed for use in evaluating future FIT initiatives and materials. A gender-based analysis tool is both a process and an outcome (1). Its goal is to identify the issues that are important to girls in technology and which of these are important to a particular facet of the FIT Program (2). The tool should also be used to ensure problem areas are addressed and insights are integrated into ongoing aspects of this project (2).

In addition, the tool can:

- Act as a guide for identifying when consultations are needed (2).
- Assist specialists in designing programs that consider the different needs of males and females (4).
- Identify what is already known about gender differences in this area (4).
- Serve as a mechanism for incorporating female views (4).
- Facilitate discussion about what can be done to encourage equitable participation (4).

Appendix D provides a Gender-based Analysis Tool for future use by the FIT Program.

## FIT Success Metrics

All measures of FIT success should be collected by gender as valuable information for future development.

# APPENDICES

# APPENDIX A: Study Methodology

## A. Time frame and scope

INITIATION

- Project review and methodology development
- Preparation of statement of work and work estimates
- Identification of other FIT stakeholders and projects that would use the GL review

DATA GATHERING

- Identification and review of FIT and WIT materials and website(s)
- Literature review (both gender lens tools and women in technology update)
- Interviews with WIT and gender lens SMEs
- Interviews with FIT and other high school teachers
- Interviews with IT staffing expert
- Focus groups with high school (FIT and other) students

*Completed February 16*

ANALYSIS

- Gender lens analysis of FIT materials and identification of key gaps
- Development of preliminary recommendations
- Development of a gender lens review tool(s) for future FIT materials (for students, teachers, parents, and ICTC professional staff etc.)
- Review of tools and recommendations with key stakeholders

*Completed: March 9*

REPORT and RECOMMENDATIONS
*Completed March 31*

GOVERNANCE Checkpoints of work with Tracy and Deborah

## B. Leveraging existing ICTC work

- *Women in Technology*
  - Interview with Sandra Saric, ICTC
  - "Breaking Down Barriers to Women in ICT"
  - "Women in ICT National Forum Summary Report"
- *Diversity:* "Diversity, the Competitive Edge: Implications for the ICT Labour Market"
- *Competencies Framework*
  - Interview with Derek Corneil, ICTC
  - "Competencies Dictionary"
  - Key Activities & performance indicators/learning outcomes
  - Occupational skills model profile and self assessment tool
- *Pathways to Recognition (PTR)*
  - Proposed model for independent level career designations

## C. Interviews

- Seven FIT teachers at five Toronto high schools
- Two curriculum developers in Alberta and New Brunswick
- FIT Project Manager for Toronto District School Boards

- Gender-based analysis SME, Health Canada

## D. Focus Groups

- Two groups of Grade 9 girls taking an introductory technology course. One group at a Secondary School specializing in Math and Computer Science; the other at a non-specialized school
- Two groups of Grade 11/12 girls taking classes that are part of the FIT program in their schools. One school specialized in Math and Computer Science; the other non-specialized.

  Appendix A provides the complete methodology and a summary of the girls' responses.

## E. Literature Review

Specialized review of studies of secondary school girls and technology. Review of several gender-based analysis assessment tools. Review of websites designed to encourage girls to use technology (see References).

# APPENDIX B: Focus Group Methodology

Four focus groups of high school girls participated in this research. All were from secondary schools in Toronto, where the FIT program is being piloted. Because we were interested in what motivates or didn't motivate girls to participate in FIT, two groups of Grade 9 girls, currently taking a technology course and two groups of Grade 11 and 12 girls, currently taking FIT course(s) were selected. One school had a specialized Math and Science focus, while the other was a "regular" Secondary School for students expected to go on to post-Secondary education.

This Appendix provides the complete methodology used to request and implement these groups. It may be used as a guideline for other researchers who wish to undertake focus group research in Secondary Schools. From initial request to implementation, these focus groups took six weeks to accomplish and this should be considered to be the minimum time to arrange such research. A more realistic time frame is about three months. We were fortunate not to have to present our methodology and rationale to the School Board's Research Committee, but this type of presentation should be incorporated into the timeline for any future research.

This Appendix contains the following documents:

- **Focus Group Methodology**, which needed to be preapproved by the Principals of the schools involved. This notes several pre-conditions that must be established, e.g., inclusion of another approved adult, anonymity.

- **Consent Form,** which must be sent home with each student participating in the focus group.

- **Focus Group Questions**, which represent the minimum group of questions to be asked of the students. A key value of a focus group methodology is that it allows the researcher to capture stories or to probe into issues that arise spontaneously. Thus, this is a template, not a questionnaire, and is designed to act as a guide for topics to be covered.

- **Thank You Letter to Participants.**

# FIT Program Gender-Based Assessment
# Proposed Preliminary Focus Group Methodology

**Objective:** To conduct two-three focus groups with high school girls to determine how the FIT program might be made more attractive to them. This would be an exploratory study to test the effectiveness of using focus groups as a means of assessing the FIT program and factors affecting their design. The outcome would be: recommendations as to how a more comprehensive study of high school girls might be conducted; and, an analysis of the ideas presented in these focus groups as part of a Gender-Based Analysis of the FIT program.

**Sponsoring Organization:** The Information and Communications Technology Council http://www.ictc-ctic.ca

**Contacts:** Tracy Biernacki-Dusza, FIT Program Manager 613-237-8551 ext. 125
Heather Smith, Senior Research Associate, School of Business, Queen's University, 613-771-0990

**Methodology:**

1. Identify and meet with two-three small groups of eight-ten high school girls with knowledge of the FIT program, including:
   - Girls in Grade 11 and 12 currently enrolled in the FIT program.
   - Girls in Grade 9, who have taken the introduction to technology course and who might be considering the FIT program.
   - (If time permits), girls in Grade 9 in a Specialized Math and Science Program.
2. Each group would, after receiving parental permission, meet with the researcher in a school classroom for about 45 minutes. A certified College of Teachers professional, who is not one of the girls' teachers, will be in attendance, in addition to the primary researcher. No photographs will be taken and only first names will be used. All data gathered will be used anonymously.
3. Groups would meet in the lunch hour or after school so as not to disrupt the regular school day.
4. Girls would be asked to discuss their attitudes towards taking technology courses in general and FIT courses in particular. While the discussion would be open-ended, sample questions might include:
   - What appeals to you about the FIT program?
   - Why would you not be interested in taking a FIT class?
   - What would make you more interested in taking a FIT class?
   - Do you feel that taking FIT classes in high school is helping to prepare you for your future career? Why or why not?
   - Would you be interested in taking a Computer Science/Information Technology degree at a university? Why or why not?
   - Would you be more interested in taking an Information Technology option in conjunction with another university program?
   - How has your school (or your teachers) encouraged you in taking a FIT class? Has this helped you to make a different choice than you might have otherwise made?
   - Do your parents have any concerns about you taking a FIT class? If so, what are they?

**Date and Location:** If approved, these focus groups will be conducted at Northview Heights Secondary School and (if time permits) one other secondary school in Toronto. The proposed date(s) would be Tuesday, February 10 and Wednesday, February 11.

# Consent for the Collection, Reporting and Use of Personal Views and Information related to the research associated with the Education/Sector Council Partnerships Project (ESCPP) and permission for student to participate in a focus group

**Purpose of the Focus Groups**
To collect information about the way in which young women view studies and career opportunities in the area of Information Technology and Communications

**Background Information**

A new nationally recognized program," Focus on IT (FIT)" is being implemented in four TDSB schools in partnership with the Information and Communications Technology Council of Canada. This program provides cutting-edge opportunities for students to gain credits and certification in this field.

Your daughter/student has been chosen to participate in this study because she is a student in one of the four schools piloting this new program. She will be asked for her views about the Focus on Information Technology Program so that the planning and research team can:

- Understand how young women view learning about information technology, computers and communications
- Understand and eliminate any barriers that might limit young women from participating in this program or careers in IT
- Learn what aspects of this curriculum they find engaging, worthwhile, useful to future goals

Their opinions will be very valuable to the Toronto District School Board and to the national sector council ,Information and Communications Technology Council (ICTC)in guiding the development of this program.

Note:
Individual student identities will not be collected or disclosed. The views collected will be reported on behalf of the focus group and not individually.
It is understood that the student will be identified to the researcher only by age/grade and will not have their individual names recorded as part of the data collection.

This information will be used by the school board and the sector council to refine the delivery of this program and will be used only for planning and research purposes.

The interviews will be conducted by a researcher from Queens University and will be supervised by a certified member of the College of Teachers. The interviews will take place

at lunch time or after school on February 25 or 26 so that your student's instructional time is not interrupted for this task.

Further requests for information or questions may be addressed to the principal of your daughter's school.

**Declaration of Consent**
By signing this document, I/we consent to the COLLECTION, USE and DISCLOSURE of views and opinions as presented by:
Student's Name _____ Grade/HF_____
School _____

I/we have reviewed this consent form carefully and I/we have given the following consent voluntarily.

**(a) For students under 16 years of age: signature of parent(s) or legal guardian(s)**

_____ _____ _____
**(SIGNATURE)** **(PRINT NAME)** **(DATE)**

**(b) For students 16 or 17 years of age: signature of <u>both</u> the student and parent or legal guardian**

_____ _____ _____
**(SIGNATURE)** **(PRINT NAME)** **(DATE)**

_____ _____ _____
**(SIGNATURE)** **(PRINT NAME)** **(DATE)**

**(c) For persons over 18 years of age or over: signature of individual**

_____ _____ _____
**(SIGNATURE)** **(PRINT NAME)** **(DATE)**

***Note: Only persons having lawful custody of the student may sign this consent form as parent or legal guardian. If both parents have lawful custody, one or both may sign.***

# Focus Group Questions
## February 25-26, 2009

**Introduction**

- The purpose of this group
- We want your honest answers
- There are No right or wrong answers
- What is said in this room stays in this room. No one else will know what you said.
- Time is short so we will try to keep moving

1. **Word Association**
   What words come to your mind when I say the following:

   - Information technology
   - Computer science
   - Programming
   - Computer support
   - Computer engineering
   - Web design
   - Systems analysis

2. **General Questions.** Please raise your hand if you agree or strongly agree with the following statements:

   - A strong understanding of information technology (IT) is absolutely essential in order to achieve success in the business world.

   - Computer proficiency will be a strong determining factor in my ability to gain employment.

   - How do you use computers in your life right now?
     - For school?
     - For fun?

   For girls in BTT:
   - Would you consider taking a technology or computer engineering course in Grade 10 or 11? Why or why not?

   For girls in the FIT program:
   - What technology/computer courses are you taking now?
   - Why did you take them?
   - Have they lived up to your expectations? Why or why not?

   Do you expect to go on to college or university?

   If so, do you expect to have to learn computer applications in your field of study? E.g., healthcare, business etc.

   Do you expect to take any information technology courses while you are there?

If so, what types of courses would interest you?

If not, why not?

3. **FIT Questions**.
   What do you know about the FIT program at your school?

   What interests you about it?

   What changes could be made to it to make it more appealing to girls?

4. **Other Technology Questions.** Please let me know if you would be interested in participating in the following by raising your hands:

   - A computer club at school
   - A computer club at school just for girls
   - A computer camp at a college or university to let you experiment
   - A computer camp just for girls
   - A web design class at school as a technology credit
   - Business technology as a Grade 12 university credit
   - A technology class that focused on how to use technology to solve social problems, e.g., healthcare, the environment.

5. Please share any other thoughts you have about computing classes in your school…..

# Thank You Letter to Participants

March 3, 2009

Dear ,

On behalf of the Information and Communications Technology Council (ICTC), I would like to thank you very much for participating in our focus groups for girls last week. Your ideas and insights will be extremely helpful to the ICTC in guiding how it works with schools, colleges and employers over the next few years. Our goal was to uncover some of the issues that inhibit girls from participating more fully in technology and computer science careers. My report will summarize the things I learned from the focus groups and make recommendations to the ICTC about how computer science skills development can be adapted to attract more girls.

While these recommendations will not be implemented overnight, I hope you will feel proud that your ideas and suggestions will help make technology programs more "girl-friendly" in the future. Thank you so much for taking the time to help us!

Vera and I both wish you all the best in your high school and future university programs. If you have any further ideas that you would like to share with me, you can contact me at: hsmith@business.queensu.ca.

Sincerely,

Heather Smith
Senior Research Associate
School of Business
Queen's University

# APPENDIX C:
# Attracting Girls to Computer Science – The Carnegie-Mellon University Experience

(After *Unlocking the Clubhouse,* J. Margolis and A. Fisher, 2002)

Carnegie-Mellon University increased the enrolment of female students in its undergraduate computer science program from 7% to 42% between 1995 and 2000, by implementing a comprehensive, female-positive series of changes to its curriculum, academic practices and teaching. This appendix outlines how they accomplished this. Readers are cautioned that approaches that are appropriate at the university level may not be so for secondary schools.

The university:

1. **Recognized and dealt with the "Experience Gap" between males and females.** Because relatively inexperienced females found it highly distressing to be in the same classroom as more experienced males, Carnegie-Mellon introduced a curricular change for first year students. This provided them with four different ways to enter the curriculum, depending on their level of experience. (Note: While this resulted in increased satisfaction for all students, it did require less experienced students to take an extra semester to "catch up".)

2. **Recognized that prior experience does not predict success.** Carnegie-Mellon changed its admissions policy so it would not necessarily give a strong preference to experienced students.

3. **Paid more attention to good teaching.** Better and more senior teachers were asked to teach the earliest courses in the curriculum, where females were having the most distress. A unit on diversity and gender equity was introduced into Teaching Assistant training.

4. **Contextualized computer science.** Carnegie-Mellon modified its curriculum to situate technology in realistic settings, exploit the connections between computer science and other disciplines and to offer diverse problems and teaching methods that would appeal to a broad variety of learning styles. Several courses were designed with these goals in mind:

    a. An "immigration course" to present students with a broader view of computer science.
    b. A software engineering course using the entire class (30-50 students) as a single development team to work with an outside "client" to define requirements, design a system and implement a prototype.
    c. A course on wearable computers that integrated elements of industrial, mechanical, electronic and software design and enable the class to work with an industrial client.
    d. A course on designing virtual worlds stressing the interdisciplinary nature of this work.
    e. A course on the social impact of computing that engages student with non-profit groups in the local community, applying their skills to community issues.

5. **Created an environment where alternate models of living and working are valued and respected,** i.e., student are not expected to spend abnormal amounts of time on their

computer science courses**.** Stress the multidimensional nature of computer science work and ensure that staff and faculty are aware of the difficulties females face in this area.

6. **Continually monitored curricular trouble spots.**

7. **Provided peer tutoring for courses that are particularly troublesome for females.**

8. **Held social and other events for females in the program to encourage cohesion and lessen social isolation.**

9. **Recruited female "friendship circles"**, so girls feel less isolated in their classes.

# APPENDIX D: A Gender-Based Analysis Tool for Girls and Technology

| | YES | Parti-ally | NO | N/A |
|---|---|---|---|---|
| **Equality Questions** | | | | |
| Does this item* portray females equally in IT roles? | | | | |
| Does this item use gender-inclusive language (e.g., student)? | | | | |
| Does this item use male and female examples equally? | | | | |
| **Equity Questions** | | | | |
| Does this item include examples and projects of interest to girls, e.g., textile, fashion design, as well as things like robotics? | | | | |
| Does this item include several real world examples? | | | | |
| Does this item equally reflect ICT activities of more interest to girls, e.g., web design, systems analysis? | | | | |
| Does this item reflect girls' career aspirations, i.e., relevance, helping people, security? | | | | |
| Does this item assume a knowledge of technology that someone not in the field would not know? | | | | |
| Does this item use technical terms and concepts that a technical novice might not know, e.g., hardware names, "aerodynamics"? | | | | |
| Does this project/program require hardware assembly or construction skills? | | | | |
| Does this course/activity require more time commitment than a similar non-ICT course/activity? | | | | |
| Does this item include "girls only" components where girls can participate without feeling intimidated by what they don't know? | | | | |
| Does this item support a "female style of learning", e.g., connected to the real world, collaborative? | | | | |
| Does this item provide links to existing programs that encourage girls in science & technology? | | | | |
| Does this item clearly link learning outcomes to real ICT jobs? | | | | |
| Does this item adequately reflect the business competencies required by modern ICT work? | | | | |
| Does this item provide resources for teachers, parents, counselors and employers that reflect how girls' skills and holistic learning style are required by modern ICT work? | | | | |
| Does this item provide supportive resources to schools that are reflective of girls' needs? (e.g., projects, career paths)? | | | | |
| Doe this item include specific initiatives to increase girls' participation? | | | | |

# APPENDIX D: A Gender-Based Analysis Tool for Girls and Technology

| | YES | Partially | NO | N/A |
|---|---|---|---|---|
| Have females participated in setting the objectives of this item and in its design and testing? | | | | |
| Does this item stress the development of technical skills only? | | | | |
| Does this item address girls' concerns about IT work? E.g., isolating, long-hours, insecure, geeky? | | | | |
| Does this item send a positive message specifically to girls? | | | | |
| Does this item stress the need and opportunity to include female role models? | | | | |
| Does this item draw the link between IT skills and jobs using these skills? | | | | |
| Is this item part of an overall systemic approach to attracting girls to try IT? | | | | |
| Is female participation in this program/website measured? | | | | |
| Does this item focus on "how things work" rather than "real world needs"? | | | | |
| Does this item stress "knowledge in context"? | | | | |
| Do girls themselves feel comfortable with this item? | | | | |
| Does this item reflect multiple career paths into ICT roles? | | | | |

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