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Report

Connecting Students to Tomorrow's ICT Jobs and Careers:

A Pan Canadian Dialogue with Grade Nine and Ten Students, Parents, and Secondary School Guidance /Career Counsellors

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EXECUTIVE SUMMARY

Connecting Students to Tomorrow's ICT Jobs and Careers

The Conference Board of Canada set out to uncover secondary school students' views about Information and Communications Technologies (ICT) and to learn why so few of them choose careers in ICT. The findings can be used to identify effective actions that businesses and others can take to increase the number of students choosing ICT careers.

From December 2008 to February 2009, Conference Board researchers visited 21 secondary schools and 46 classes across Canada to learn about students' views and interests in ICT careers, as part of the *Connecting Students to Tomorrow's ICT Careers* research project. Researchers talked with 1,034 Grade 9 and 10 students, in Halifax, Montreal, Toronto, Calgary, and Vancouver about their perceptions and attitudes towards ICT learning and ICT career pathways. In addition, 60 parents and 54 guidance/career counsellors offered their perspectives on ICT education and careers.

The Appeal of ICT

A minority of students are interested in ICT careers. 36 per cent of students say that ICT appeals to them as a job or career option, whereas 19 per cent of students say that ICT is unappealing. Nearly half either felt neutral about this career option or did not know how they felt—perhaps not surprising given their young age and limited exposure to discussions on ICT jobs and careers.

Grade 9 and 10 students are not turning away from ICT education and careers over concerns about job availability and security. In the first place, students overwhelmingly regard ICT jobs as easy to find and very secure/stable. Moreover, students' overall judgments about the appeal of ICT are only marginally influenced by their by perceptions about ICT job availability and security.

Whether students regard ICT-related careers as appealing or not appears to depend critically on whether they regard ICT jobs as interesting, fun, and cool. The more ICT is perceived as interesting, fun, and cool, the more appealing overall, and the opposite is true as well.

Students' Perceptions about ICT Jobs

Students' perceptions about jobs in ICT were a mixture of the positive and the negative. On the positive side, students think that ICT jobs pay well, offer good job security and are creative:

- Nearly 77 per cent of students believe ICT jobs offer average, or better than average, pay;
- 74 per cent believe ICT jobs offer average or better than average job security; and
- 37 per cent believe ICT jobs are above-average in terms of creativity.

On the other hand, the biggest negatives for students are that the jobs are seen as difficult, complex, not 'fun' and not 'cool':

- 34 per cent of students believe ICT jobs are difficult and complex (versus 16 per cent who regard them as straightforward);
- 31 per cent believe ICT jobs are not 'fun' (versus 20 per cent who regard ICT jobs as 'fun'); and

- 25 per cent believe ICT jobs are not 'cool' (versus 22 per cent who regard ICT jobs as 'cool').

Gender Differences

The research also confirmed long-held beliefs that girls' enthusiasm for ICT is lower than boys'. Boys are more than twice as likely to view ICT as appealing (41per cent) than unappealing (16 per cent), whereas 32 per cent of girls view ICT as appealing, and 25 per cent view ICT as unappealing.

The proportion of girls who regard ICT as *very* appealing (4 per cent) is less than half of the proportion of boys who regard ICT as very appealing (9 per cent).

These gender differences appear to be driven in large part by boys' and girls' differing views on whether they regard ICT as interesting, fun, and cool. For both male and female students, these three factors are strongly associated with judgments about the overall appeal of ICT. However, while boys generally rate ICT as interesting, fun, and cool (and therefore find ICT appealing), girls generally rate ICT as not interesting, not fun, and not cool (and therefore find ICT less appealing).

Regional Differences

Regional differences are significant. Students in Montreal and Vancouver, for example, are much more likely than their peers in other cities to regard ICT careers as appealing.

- Over 50 per cent of Montreal students and 44 per cent of Vancouver students regard ICT careers as somewhat or very appealing.
- By contrast, 35 per cent of students in Calgary, 31 per cent of students in Toronto, and 31 per cent of students in Halifax regard ICT careers as somewhat or very appealing.
- Students in Halifax and Toronto are much more likely than their peers in other cities to offer no opinion on the appeal of ICT–40 per cent of students in Halifax and 39 per cent in Toronto indicate that they have no opinion about the appeal of ICT).

Influence of Parents and Counsellors

Parents/Guardians

The vast majority of students (83 per cent) report that they consult their parents or guardians for education and career information and advice. As a result, students' awareness and perceptions of ICT education and careers, and their decisions about school and work generally, are likely influenced by the knowledge and attitudes of their parents/guardians.

While it is difficult to come to definitive conclusions about parents' views as a whole given the small number who responded (60), insights about parents' views can be drawn from their input.[1] As a group, the parents/guardians who responded to this research project regard ICT as *less appealing* than students. While only 19 per cent of students indicate that they think ICT careers are either very or somewhat *unappealing*, a third of parents express this view. Moreover, parents/guardians are:

- less likely than students to say that ICT careers are secure/stable; and
- less likely than students to say that ICT careers are creative.

Under these circumstances, there are many students who may be influenced by their parents/guardians to view ICT as unappealing.

Guidance/Career Counsellors

43 per cent of all students indicate that they consult guidance/career counsellors for education and career advice. In Toronto, the figure is 58 per cent.[2] In Halifax, the figure is 34 per cent.

While much lower than the number of students who turn to parents/guardians and friends, the potential for

[1] It was beyond the scope of the research project to study a larger sample of parents' perceptions.

[2] This figure does not include the Toronto private schools where 80 per cent of students consult guidance/career counsellors.

guidance/career counsellors to influence students about career choices is high. While it is difficult to come to definitive conclusions about counsellors' views as a whole given the small number of responses to the survey (54), insights about counsellors' views can be drawn from their input.[3]

Three-quarters of the counsellors who responded view ICT careers as a positive career option. A majority (58 per cent) indicate that ICT is a very positive career option while none see it as a very negative option.

Implications

Why does this matter?

Canada's ICT labour market is under pressure. Not only are many baby boomers on the cusp of retirement (in 2006, nearly 8 per cent of ICT workers were over 55), demand for ICT-related skills is growing, and more and more young people are turning away from ICT-related studies and occupations. For example, between 2002 and 2006, enrolments in undergraduate university computer science programs dropped by 30 per cent; and Canadian universities graduated 2,200 fewer computer scientists, software engineers and applied mathematics majors. The implications for the ICT sector of under-enrolment include significant and growing labour shortages, lost productivity, the underperformance of the sector, and a negative impact on the Canadian economy.

In addition, the changing character of ICT occupations has intensified the need to ensure that graduates emerge with skills that match employer demand. These demands shifts away from traditional ICT occupations (such as computer programmers) and towards business/ICT specialists, highly specialized ICT areas, and multidisciplinary ICT occupations (such as bioinformatics and industrial design), put increased pressure on educators and the sector to guide interested students into relevant ICT education and career paths.

Moreover, the persistent under-representation of women in ICT and ICT-related fields calls for renewed efforts to engage female students early and effectively. In February 2009, for example, women accounted for only 25 per cent of all IT occupations—the exact same proportion of IT occupations held by women in March 2000.[4] Understanding the drivers of women's ICT perceptions would contribute to the design of more effective and relevant attraction and recruitment strategies.

What can be done?

The industry needs to connect better with students, career counsellors, educators, and parents to promote ICT education and career paths.

Students may be receptive to a new and more accurate depiction of ICT work which emphasizes ICT as a dynamic, multi-disciplinary field rather than one stereotyped as offering narrowly-focused and often repetitive, cubicle-farm occupations. But raising awareness and interest will require new strategies such as having ICT workers visiting schools and making presentations that "myth-bust" the stereotypes of ICT jobs, and providing hands-on opportunities to explore today's ICT occupations.

A one-size-fits-all approach to engaging students is unlikely to succeed. Strategic use of the research results starts with recognizing that students view ICT through many different lenses (e.g., gender, regional, attitudinal, and pre-existing interests and skills sets); they do not share a single perspective. Students who show interest in, and an aptitude for, ICT can be motivated to move towards a career in ICT by different factors.

[3] It was beyond the scope of the research project to study a larger sample of counsellors' perceptions.

[4] Information and Communications Technology Council (ICTC), *The Canadian IT Labour Market Initiative: Labour Force Survey—February 2009* [online]. (February 2009), [cited April 30, 2009]. http://www.ictc-ctic.ca/uploadedFiles/Labour_Market_Intelligence/ICTC_Labour_Force_Surveys/LFS_February09.pdf.

Designing more uniquely tailored programs and initiatives requires sophisticated thinking about different 'market segments' within the student population. For example, different strategies are needed for those students interested in traditional computer science compared to those students interested in other creative careers such as bio-informatics, health informatics, industrial design, or automotive systems. Nothing less than such a sophisticated, multi-faceted approach is likely to turn the tide on low and declining ICT enrolment.

A strategic approach that customizes programs to the specific needs and attitudes of diverse student groups is needed. In some cases, resources can profitably be spent to sustain and swell existing enthusiasm and guide promising students towards well-designed educational programs and suitable occupations. In other cases, students with only moderate interest should be offered improved opportunities to try ICT for themselves in practical, hands-on environments in order to strengthen their level of interest. Additional resources should be targeted to address unique gender, regional, and attitudinal differences. For example, it may be an effective strategy to convince girls that ICT careers can be cool and interesting.

In all cases, listening to the diverse voices and concerns of students, educators, and parents is essential in order to craft concrete actions that will increase student engagement in ICT careers, which, in turn, is the key to improving the ICT labour outlook.

CHAPTER 1

Introduction

At a Glance

- While ICT employers already have difficulty filling positions, the impending retirement of many current employees threatens to make the situation worse.
- Post-secondary enrolment in ICT and related programs has dropped significantly over the past five years, and across Canada there is a notable trend of young people turning away from the field.
- To understand the reasons for low and declining enrolment, The Conference Board of Canada spoke with 1034 Grade 9 and 10 students in 21 schools and 46 classes across the country.

Canada's Information and Communications Technologies (ICT) labour market is under pressure. While employers already have difficulty filling many ICT positions with highly-skilled, business-ready individuals, the impending retirement of many current ICT employees threatens to make the situation even more challenging.

As employers try to fill existing vacancies and look towards future recruitment efforts, they are finding that ICT-ready candidates are in short supply. Post-secondary enrolment in ICT and related programs have dropped significantly over the past five years, and across Canada there is a notable trend of young people turning away from the field. Something about ICT education and career paths is failing to spark the interest of potential students and workers.

The fact that students are turning away from ICT education and careers is troubling for the ICT sector and for the Canadian economy. To the extent that Canadian firms rely on ICT and IT to achieve productivity gains and to ensure their competitiveness internationally, a shortage of ICT labour may limit improvements to Canada's GDP and its standard of living. We need to understand exactly why students are staying away from ICT education and careers and we need to develop strategies to reverse the trend.

In this report, the Conference Board conveys and analyzes the results of a large-scale study of students' attitudes towards ICT education and careers, as well as the attitudes of small samples of parents/guardians and guidance/career counsellors. Conversations with 1034 students in 21 schools from across Canada uncovered many of the factors that explain why students avoid or pursue ICT education and career paths. Additionally, they revealed a clearer picture of those things that students look for in careers generally. The report offers a detailed map of the terrain on which improved strategies to entice students to ICT can be pursued.

ICT and IT

Information and Communications Technology (ICT) Careers and Education Pathways

ICT occupations and educational pursuits involve the study, development, implementation, management, and support of computer -based information systems such as software applications and computer hardware. These include occupations and educational pursuits that are more traditional (e.g., network engineer) and those that are multi-disciplinary (e.g., bio-informatics).

Except when citing other sources, including Statistics Canada data, ICT and IT are used interchangeably in this report.

Sources: The Conference Board of Canada, 2009; Branham Group Inc., *Current Snapshot of the Canadian ICT Labour Market*, (ICTC) March 2007.

Increasing Demand and Declining Enrolment

Nearly 600,000 IT workers across all sectors of the Canadian economy make up 3.5 per cent of Canada's total workforce.[5] The IT workforce will need to grow to meet demand for the products and services they provide. In 2008, the Information and Communications Technology Council (ICTC) estimated that employers across the economy will be looking to fill between 126,400 and 178,000 ICT positions over the period 2008-2015.[6] The economic impact to the Canadian economy of not filling these ICT positions that will open up is estimated to be between $15-21billion, based on an average contribution of $119,335[7] made per worker annually to the economy.

Part of the explanation for such high demand comes from the need to replace retiring workers over the forecast period. It is estimated that there will be approximately 10,060 retirements in the ICT labour force each year.[8] But part of the explanation is also found in the low and declining enrollment of students in ICT-related education, and the fact that many ICT workers do not have the specific skills required by employers. In short, the ICT sector faces labour and skills shortages and a skills mismatch.

The current recession has led to increased unemployment of IT and ICT workers in some occupations, but the long-term trend is for growth.[9] Complacency regarding the need to reverse ICT enrolment trends and improve the appeal of ICT to students now may have long-term consequences. Although not the norm, some firms find it necessary to lay-off ICT workers in the current economic climate, reinforcing stereotypes about job insecurity in the sector, and making it difficult to attract and recruit future employees.

In a recent report, *Securing Our Future: Components of a Comprehensive IT Workforce Development Strategy*, the Conference Board identifies seven major factors that contribute to the IT talent gap:

1. mismatch between the skills of available workers and the requirements of employers making hires;
    - this is due in part to the changing nature of ICT occupations and the associated shift in the skill sets necessary to fill these positions;
2. technology-embeddedness and the growing need for multi-skilling;
3. declining enrolments in IT-related post-secondary programs;
    - the size of the university-age cohort is expected to decline in coming years, making recruitment more difficult for all disciplines;
4. population aging;
5. low fertility rate;
6. under-representation of several population groups; and
7. the need for flexibility and lifelong learning.[10]

Of those seven factors, two stand out more than the others. First, there is not only a labour shortage, but also a skills shortage due to the mismatch between the skills of available workers and the requirements of

[5] Industry Canada, "ICT Sector Employment" [online]. (October 2008), [cited May 8, 2009]. http://www.ic.gc.ca/eic/site/ict-tic.nsf/eng/h_it05840.html. See also, The Conference Board of Canada, *Securing Our Future: Components of a Comprehensive It Workforce Development Strategy* (Ottawa: The Conference Board, 2008), p. 1.

[6] ICTC, *Outlook for Human Resources in the Information and Communications Technology Labour Market, 2008 to 2015* [online]. (October 2008), [cited April 30, 2009]. http://www.ictc-ctic.ca/uploadedFiles/Labour_Market_Intelligence/The_Outlook_2012_-_2015/ICTC_Outlook_2008-2015_final_accurate(1).pdf.

[7] The Conference Board of Canada, *Securing Our Future*, p. 2.

[8] The ICTC notes that "replacing workers who retire will account for 45–64 [per cent] of overall hiring requirements, depending on the growth scenario. The highest projected retirement rates will be for electronics engineers and for electronics technologists and technicians. Web designers, along with software engineers, will have the lowest retirement rate." ICTC, *Outlook for Human Resources in the Information and Communications Technology Labour Market*, p. 13.

[9] ICTC, , *The Canadian IT Labour Market Initiative: Labour Force Survey—March 2009* [online]. (March 2009), [cited May 8, 2009]. http://www.ictc-ctic.ca/uploadedFiles/Labour_Market_Intelligence/ICTC_Labour_Force_Surveys/LFS_March09.pdf.

[10] The Conference Board of Canada, *Securing Our Future*, pp. 5-7.

employers making hires. As ICTC notes, "there will be a skills shortage in most ICT occupations, where applicants for jobs will have the required educational qualifications but not the 'package' of specific technology skills, industry experience, and satisfactory communications and other business skills that employers need."[11]

Second, enrolments in IT-related post-secondary programs have been declining since the dot-com crash of 2000. Significantly, between 2002 and 2007, enrolments in computer engineering, computer science, and software engineering declined by 22 per cent.[12] Another study indicates a decline of as high as 33 per cent in these fields over a similar time frame.[13] With 83 per cent of new workforce entrants coming from the education system, attracting more students into IT programs and making sure those programs are workplace relevant is critical.[14]

The declining enrolment in IT education is especially puzzling in light of the strong long-term employment and wage situation of IT occupations. Unemployment in IT occupations—less than 3 per cent in January 2009—is well below the national average.[15] Moreover, average ICT sector wages exceed the national wage average. In 2006, for example, ICT sector employees received average earnings of $56,465, about 45 per cent more than for all workers in Canada.[16] With low unemployment and good wages, the sector offers solid career options.
This report sheds light on two key factors for the ICT sector:

1. Why ICT occupations are not filled more easily.
2. Why many students choose not to enrol in ICT-related education

A Dialogue with Students, Parents, and Counsellors

In a report prepared for the Information and Communications Technology Council (ICTC), David Ticoll notes, "declining enrolment is a problem for many leading economies. But hardly anyone – anywhere – has systematically asked students why they choose, or don't choose, an ICT post-secondary program, or what they perceive to be the pros and cons of an ICT career."[17]

Canadian Coalition for Tomorrow's ICT Skills (CCICT)

Launched in late 2007 by Bell Canada, the CCICT is made up of 40 corporate members, 21 academic partners, and 13 subject matter experts, all of who have a deep interest in the future of the UCT sector.

The objectives of the CCICT are to:

- raise the profile of ICT and ICT career choices among young people;
- develop and sustain Canadian ICT know-how;
- raise public awareness of the importance of ICT to Canada; and
- develop immigration policies that answer companies' present and future needs.

Source: Canadian Coalition for Tomorrow's ICT Skills, 2009.

Although there are numerous hypotheses and much speculation about why students are not enrolling in ICT education, discussion to date has not been supported by a robust empirical understanding of the knowledge, views, and attitudes of Canadian students, parents/guardians, and guidance/career counsellors towards ICT education and career paths. Until now,

[11] ICTC, *Outlook for Human Resources in the Information and Communications Technology Labour Market*, p. 1.
[12] The Conference Board of Canada, *Securing Our Future*, p. 2.
[13] ICTC, *Outlook for Human Resources in the Information and Communications Technology Labour Market*, p. 11.
[14] The Conference Board of Canada, *Securing Our Future*, p. 37.
[15] ICTC, *The Canadian IT Labour Market Initiative: Labour Force Survey—January 2009* [online]. (January 2009), [cited April 9, 2009]. http://www.ictc-ctic.ca/uploadedFiles/Labour_Market_Intelligence/ICTC_Labour_Force_Surveys/LFS_January09.pdf.
[16] The Conference Board of Canada, *Securing Our Future*, p.10.
[17] David Ticoll, *IT Enrolments and Retention: Situation Report* (Ottawa: Information and Communications Technology Council, 2008), p. 10. David Ticoll is the Executive Director of the Canadian Coalition for Tomorrow's ICT Skills.

existing evidence has not answered some basic questions with much empirical confidence:

- What is it about ICT education and careers that appeals to some students, but not to others?
- Are those students who turn away from ICT paths (and the parents/guardians and guidance/career counsellors who influence them) concerned about the availability, security, or wages of ICT jobs?
- Is there something about the nature (or perceived nature) of ICT careers and students' own career values and aspirations that simply fail to align?

Research Methodology

To answer these and other questions, the Conference Board employed a multi-faceted research methodology, the core of which was a set of conversations with 1034 Grade 9 and 10 students in five cities across Canada. Students were prompted to talk about their awareness of and attitudes towards, ICT education and careers, and about their career aspirations and values more generally. Additionally, the views of parents/guardians and guidance/career counsellors about ICT education and careers were collected in order to determine what messages students might be receiving from two of their main education and career "influencers." (See Appendix A: Research Methodology for details on sample sizes, sampling methodology, issues, and implications).

The dialogues, surveys, and interviews entailed both closed- and open-ended questions, and were guided by five fundamental questions:

1. How *aware* are students of ICT education and career paths?
2. What are students' *opinions* about those education and career paths?
3. To what extent do students' general career aspirations and goals *align* with their perceptions about ICT careers in particular?
4. Who or what are the main *influencers* of students' perceptions and decisions, and what *messages* are they receiving about ICT education and career paths from the influencers?
5. What more might be done by schools, employers and others to get students more interested in ICT education and career pathways?

Researchers conducted in-class dialogues with Grade 9 and 10 students in five Canadian cities—Halifax, Montreal, Toronto, Calgary, and Vancouver—including male and female students in both public and private school systems. The dialogues engaged students during a variety of classes—including classes on arts and social sciences, career planning, law, math, science, and information technology—and occurred in schools in diverse socio-economic and ethno-cultural contexts.

CHAPTER 2

Unraveling the ICT Puzzle: Current Explanations for Declining Enrollments

At a Glance

- The ongoing debate about why students are not enrolling in ICT education in higher numbers has been shaped as much by speculation as by evidence.
- Research on students' awareness and perceptions of ICT-related education and careers generally is limited.
- Research on the specific drivers of low female participation in ICT-related programs and careers is more substantial.
- Research conducted in Australia and the United States provides some clues about why enrolment in ICT-related education is declining, but there is a pressing need for a large-scale empirical study in Canada.

There is as much speculation as evidence in the ongoing debate about why students do not enroll in ICT education in higher numbers. A handful of international studies have attempted to unravel the puzzle and some insights have emerged. But there is a pressing need for a large-scale empirical study in Canada which would provide the evidence-base for discussion and planning to proceed on a solid footing.

ICT Skills Research in Australia

The most impressive study to date of students' perceptions of ICT education and careers was completed in Australia in 2006.[18] Though the findings may not be directly applicable to the Canadian context, the research nevertheless offers some clues and insights that are useful to consider. The research focused on the attitudes of 14-19 year old students and "sought to understand what young people wanted from a career, their perceptions about a career in ICT and their perceptions about studying ICT."[19]

The study revealed that 40 per cent of the students surveyed said that they had no real understanding of ICT career opportunities in Australia and that when they did think of ICT careers, many students believed that ICT careers involve:

- "sitting in front of a computer all day" (57 per cent);
- "being indoors" (48 per cent);
- a "lack of human interaction" (46 per cent); and
- "system crashes and losing information" (40 per cent).[20]

While many students indicated that positive aspects of ICT careers include "working with the latest technology" (62 per cent), that there are "lots of job opportunities" (47 per cent), and that ICT careers are "well paid" (42 per cent), fewer indicated that ICT is a fun career option (25 per cent).[21] In general, the study found that students believe that ICT is about working with computers and that such work is "mundane, monotonous and repetitive."[22]

[18] Open Mind Research Group (OMRG), *ICT Skills Research: Attitudes to ICT Careers and Study among 14-19 year old Victorians* (Melbourne: Department of Innovation, Industry and Regional Development, 2007).
[19] OMRG, *ICT Skills Research*, p. 7.
[20] OMRG, *ICT Skills Research*, p. 8.
[21] OMRG, *ICT Skills Research*, p. 20.
[22] OMRG, *ICT Skills Research*, p. 18.

Additionally, the study found significant differences in the attitudes and intentions of male and female students. For example, more males (15 per cent) said that they intend to study ICT when they leave secondary school than females (3 per cent), and males seemed more aware of ICT generally than did females.[23]

Other ICT Studies

Research on the awareness and attitudes of students towards IT education and careers has also been conducted in the United States, but often on a smaller scale than the Australian study, with a much narrower focus, and with less direct relevance to the specific concerns of the Canadian ICT labour market. Granger offers a helpful review of much of the research and concludes that many students see ICT (or IT) careers as boring, uninteresting, too hard, and too technical, or they think that jobs are scarce and/or poorly paid.[24] A few studies are worth discussing in greater detail:

- One study focused on 836 students in high school calculus and pre-calculus classes to understand why students with an apparent aptitude for computer science do not pursue a major in Computer Science.[25] The researcher found that "the vast majority of students had no concept of what a Computer Science major entails" and that the main reasons why both male and female students did not choose CS majors had to do with "the lack of a desire to sit in front of a computer all day, and the fact that they had already chosen another major."[26] The study offers some insights that improve understanding of the enrolment puzzle but, because of its narrow focus on Computer Science and not the broader category of ICT, the findings cannot be assumed to explain the ICT enrolment phenomenon.

- Another study, which involved a paper-based survey of 1021 high school students in Nebraska, asked students about where they acquire their computer skills, their primary uses of computers, what would motivate them to seek IT careers, and the skills they believe would be necessary to succeed in IT.[27] Clues about students' level of awareness are revealed in results about students' perceptions of "skills necessary to succeed in IT careers"—keyboarding is cited most frequently (472), followed by computer skills (309), programming (181), and math (111).[28]

  But results on other questions do not provide much insight about why students do or do not pursue IT paths. For example, the study's authors report that good money/benefits was the most frequent response to a question about what would motivate students to pursue IT careers, followed by college scholarships, job availability/security, and "if it's fun."[29] However, the generality of the responses suggests that they would likely remain the same if another career option were inserted in the question, so it is hard to see what they reveal about why students do or do not actually pursue IT education and careers in particular.

- A study based on a survey of 246 university and college business students in the United States, while employing a complicated methodology, concludes that those students who chose Information Systems (IS) as a major were motivated by personal interest, aptitude, and expectations about salaries and job flexibility. Those who did not opt for IS majors cited concerns about job availability and the difficult nature of the work as reasons. Interestingly, insufficient promotion of IS as an appealing option also emerged as a factor in decision-making.[30] While the study investigates more

[23] OMRG, *ICT Skills Research*, p. 10.
[24] Mary J. Granger, et. al., "Information Systems Enrolments: Challenges and Strategies," *Journal of Information Systems Education* 18, 3 (Fall 2007).
[25] Lori Carter, "Why Students with an Apparent Aptitude for Computer Science Don't Choose to Major in Computer Science," *SIGSCE 06* [online]. (March 1-5, 2006), [cited February 24, 2009]. http://www.imageofcomputing.com/pdf/p27-carter.pdf.
[26] Ibid., p. 29.
[27] Uma G. Gupta and Lynne E. Houtz, "High School Students' Perceptions of Information Technology Skills and Careers," *Journal of Industrial Technology* 16, 4 (August-October 2000).
[28] Ibid., p. 5.
[29] Ibid., p. 5.
[30] Younghwa Lee and Sang Jun Lee, "The Competitiveness of the Information Systems Major: An Analytic Hierarchy

refined motivating factors than previous studies, the relevance of the results is diminished by a peculiar survey sample (i.e., business students, rather than all undergraduate students) and the focus on IS rather than ICT more broadly.

Gender

Women are significantly underrepresented in the IT labour force and female enrolment in IT-related programs in college and university is very low and declining. While women make up 46.7 per cent of the Canadian workforce as a whole, only 25 per cent of IT jobs are held by women.[31] At the same time, while female enrolment in post-secondary education generally is rising—women account for two thirds of the full-time enrolment growth in universities since 1971[32]—the percentage of women enrolling in IT-related programs has been falling for many years.[33] Understanding and addressing these phenomena is essential, as much of the gap between demand for and supply of ICT workers could be filled by women who, for one reason or another, are turning away from ICT paths.

While research on students' awareness and perceptions of ICT education and careers generally is emerging slowly, research which addresses gender differences in particular is more substantial. Many of the studies discussed above, along with others, often reveal significant differences between male and female students with regard to awareness of, perceptions about, intention to pursue, and confidence in one's ability to succeed in, IT education and careers.

A detailed review of literature related to gender differences is not possible here. However, a few key findings from a review produced by Wendy Cukier for ICTC are worth considering. Cukier points to five barriers to women entering IT education and careers that emerge in the literature and from her research. These include:

- *Socialization and Early Education*. From a very early age, North American girls' perceptions of and confidence in their own abilities and opportunities—especially in mathematics, technology, and science—are constrained by education and socialization.
- *Negative Perceptions of Computing and Related Work*. Popular, but negative impressions, of the IT profession—including concerns about job security and the belief that IT is "boring"—appear to affect female enrolment more than male enrolment.
- *Systematic Barriers in Post-Secondary Institutions*. Entry and retention of female students in ICT-related education is hampered by poor curriculum design, weak employment of experiential and practical learning opportunities, inflexible entry requirements, and the absence of role models.
- *Misalignment of Job Descriptions and Job Requirements*. Equating "IT professional" with "computer scientist" or "engineer" rather than focusing on the skills required to do the job often leads to the exclusion of women.
- *Lack of Workplace Support*. Workplaces that lack support for women with young families are a significant barrier. Exclusion from informal networks, the absence of role models, inadequate mentoring and career development support, also contribute to the exclusion of women.[34]

Explaining the ICT Talent Gap: Some Hypotheses

Through reviews of the literature and discussion with industry experts, educators, students, and others, the Conference Board has identified the following

Process," *Journal of Information Systems Education* 17, 2 (Summer 2006), p. 211.

[31] ICTC, *The Canadian IT Labour Market Initiative: Labour Force Survey—January 2009*, p. 3.

[32] Association of Universities and Colleges Canada, *Trends in Higher Education, Vol. 1: Enrolment* (Ottawa, 2007). p. 5.

[33] Wendy Cukier, *Diversity – The Competitive Edge: Implications for the ICT Labour Market* (Ottawa: Information and Communications Technology Council, March 2007), p. 14.

[34] Cukier, *Diversity – The Competitive Edge*, pp. 1-2.

candidate hypotheses that purport to explain why employers are having difficulty filling their ICT needs and why, in particular, enrolment in ICT education is low and declining. Though these hypotheses represent many of the most prominent explanations, the evidence for each varies. A key objective of this research project was to test some of these hypotheses in the real world and determine what is really influencing today's high school students.

- *Unavailability of jobs.* According to this hypothesis, concern about the (perceived) unavailability of jobs—due in part to outsourcing of ICT work by companies—deters potential candidates from pursuing ICT education and careers.
- *Job insecurity.* Some suggest that lingering concern about the (perceived) insecurity of jobs in the ICT sector—especially following the dot.com crash in the early part of the decade—deters potential candidates.
- *Lack of awareness*. Another theory is that students are simply unaware of ICT education and career opportunities and therefore fail to pursue them, not by choice, but by default.
- *Lack of value alignment*. Students may simply believe that "they are more likely to realize their career aspirations, whether for self-fulfillment or tangible rewards, in other fields."[35]

  In this case, the explanation may be either that *students' values and ca***r**er aspirations do not align with what ICT careers *in fact* offer or don't offer, and therefore they do not pursue ICT paths; or students' values and career aspirations do not align with what ICT careers *appear* to offer or not offer (based on misinformation), and therefore they do not pursue ICT paths (but may align if a more accurate picture of ICT careers were held by students).

  In the latter case, the problem is false or incomplete information about ICT careers whereas in the former case, the problem is a real lack of value alignment (based on a true and reasonably complete understanding about ICT careers).
- *Influences*. "Influencers – parents, teachers, guidance counsellors, friends and relatives – advise students that ICT is not for them, there is no future in it, or it's a bad career choice."[36] As with the hypotheses related to students' awareness, perceptions, and values, the messages of influencers may be motivated either by lack of awareness and misperceptions, or by a sincere belief that ICT poorly aligns with particular students' aspirations and values (based on a true and reasonably complete understanding of ICT careers).

Knowing which of these hypotheses is true, and the mechanisms by which they affect students' decisions to pursue or not to pursue ICT paths, is necessary for designing strategies to meet the ICT talent gap. But the existing evidence to test and to rank the importance of these hypotheses is inadequate.

[35] Ticoll, *IT Enrollments and Retention: Situation Report*, p. 10.

[36] Ticoll, *IT Enrollments and Retention: Situation Report*, p. 10.

CHAPTER 3

What Canadian Students Say About ICT Education and Careers

At a Glance

- More Canadian students indicate that they regard ICT as appealing (36 per cent) than *un*appealing (19 per cent).
- 41 per cent of boys, but only 32 per cent of girls, view ICT as appealing. While 16 per cent of boys find ICT unappealing, 25 per cent of girls view ICT as unappealing.
- The key factors that drive interest in ICT careers are whether students perceive them as interesting, cool, or fun and not concerns about job availability and security.
- Whether students see ICT careers as interesting, cool or fun depends a great deal on their gender and the city in which they live.

After conducting dialogues with 1034 students in cities across Canada, a clear picture emerged about students' awareness and interest in ICT education and careers.[37] Some hypotheses about gender differences and value misalignment, for example, are generally confirmed by the results. Other hypotheses, relating to job availability and job security concerns, hold little or no weight.

Overall, students would probably be more open to ICT-related careers if they knew about them.

But the real story—or stories—about what students think about ICT education and careers involves multiple plotlines and a few surprises. Overarching trends and generalizations, while important, nevertheless conceal a reality of students who are motivated by different things and perceive ICT education and careers as appealing or unappealing for very different sorts of reasons. In short, carefully listening to students reveals a diversity of voices, rather than a single voice, and thus the need for a diversity of attraction and recruitment strategies rather than a blunt instrument for all occasions.

Career Interests and Values

Before asking students about ICT careers in particular, we asked them about their career values more generally and about the various sources and people they consult for information and resources. Many of the responses were what one might expect from Grade 9 and 10 students, but there were a few surprises and some results that offer clues about declining enrolment in ICT.

Career Aspirations of Grade 9 & 10 Students

When asked what jobs or careers they are currently interested in, students offer a wide range of options. (See Text Box 1). The top choices include doctor/medicine, lawyer, engineering, business/entrepreneur, design, athlete/sports-related, architect, and teacher/educator. Recognizing that many of the students participating in the survey and dialogue had not previously been asked to think seriously about their career aspirations, the most frequent responses are likely a mix of both well-considered responses and top-of-the-head reactions.

[37] See Table 1, Appendix A, for details on city, gender and class characteristics of student respondents.

With respect to career options that might be more obviously ICT-related,[38] game designer/tester and jobs that included "computer" in the description (e.g., computer programmer, computer technician), are frequent responses. While none of these careers alone ranked among students' top 5 choices, aggregating the ICT-related career options would place the category as a whole much higher in the list.

Text Box 1

Popular Career Aspirations of Grade 9 and 10 Students

1.	Doctor/Nurse/Medicine	249
2.	Lawyer	142
3.	Engineering	137
4.	Business/entrepreneur	136
5.	Fashion/interior designer	116
6.	Athlete/sports-related	108
7.	Architect	108
8.	Teacher/educator	107
9.	Computer + X (e.g., technician, programmer)	95
10.	Psychologist/psychiatrist	94
11.	Visual arts/photography	88
12.	Accounting/finance	
13.	Game designer/tester	65
14.	Law enforcement	61
15.	Music (e.g., artist, producer)	57

Source: The Conference Board of Canada.

Nevertheless, it is difficult to draw definitive conclusions about the appeal of ICT-related careers from these results alone. ICT and ICT-related careers were frequently selected, but aside from "game designer/tester", few students listed a specific ICT career as a first choice.

Although ICT skills are critical elements of other careers, such as medicine, architecture, and accounting, the particular labour needs of the ICT sector won't be met by students who aim to be doctors, architects, and accountants.

However, ICT-related careers may have ranked higher if Grade 9 and 10 students were more aware of the full range of options available to them (e.g. bioinformatics researcher, a designer or technician of electronic medical equipment, or an industrial designer where the work combines technical aspects of computing and other fields)

Elements of an Appealing Career

We asked, "When you think about the kind of job or career that you might want, what sorts of things would make it good or appealing?"[39] Students overwhelmingly selected "pay".[40] (See Chart 1). In follow-up discussions, most students indicated that they selected pay not because they want jobs that would make them rich, but instead want enough to "live comfortably."

The next four most frequently selected factors were "interesting work,"[41] "travel opportunities,"[42] "social,"[43] and "creativity."[44] Very few regional differences emerge, and only one with statistical significance. Among students in Montreal, "interesting work" received 20 per cent of all votes whereas the average for Canada was 14 per cent. Nevertheless, the ranking of factors is consistent across all cities.[45]

[38] By "obviously ICT-related" we mean those career options that, to a layperson, could be easily associated with one or more information or communication technologies, especially computers. We recognize, however, that a broader definition of ICT-related careers can, and perhaps should, be employed, in which case "ICT-related careers" could be said to rank near or at the top of the list.

[39] Students were allowed to select up to three factors from a list of 12 prepared options using dot-stickers. Additionally, if a factor that mattered to them was not on the list, they were invited to add that factor and allocate one or more of their three dots to it.

[40] Each student received three dot-stickers with which to make their selections (An approach known as 'dot-mocracy). From the finding that 43 per cent of the dot-stickers were placed on pay one can infer that approximately 95 per cent of students placed a sticker on pay. In follow-up discussion, a show-of-hands confirmed that nearly all students voted at least once for pay.

[41] "Interesting work" received 14.2 per cent of all votes and was selected by approximately 31.2 per cent of respondents.

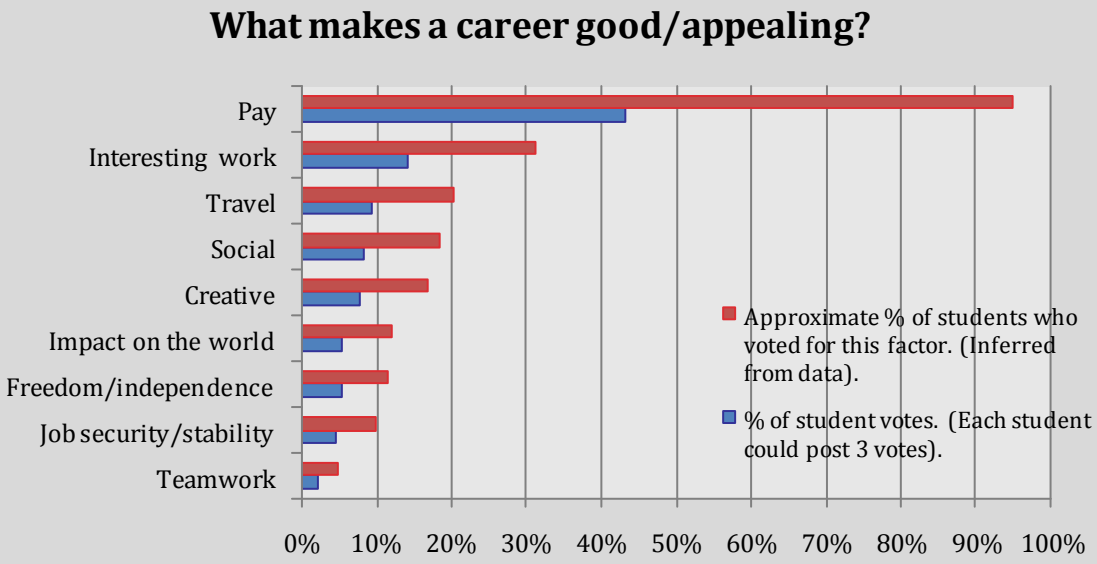
[42] 9 per cent of votes; 20 per cent of respondents.

[43] 8 per cent of votes; 18 per cent of respondents.

[44] 8 per cent of votes; 17 per cent of respondents.

[45] This question was asked using the classroom-based dot-mocracy approach. Consequently, it was not possible to collect data on gender differences on this question.

Chart 1



Source: The Conference Board of Canada, 2009.

Setting aside the prominence of "pay", this implies that today's students are motivated by post-materialist values and concerns. They want to be financially comfortable, but beyond that they are motivated to pursue careers that are interesting, provide opportunities for creative expression, and involve social interaction and occasional travel.

Students appear to be much less concerned about job security, as well as benefits and workplace safety (both of which barely register in the final tally). That less than 5 per cent of the votes went to "job security/stability" is interesting given the hypothesis that ICT enrolment difficulties are a consequence of fears about job availability and security. If concerns about job security are driving students away, then one would expect to see a more pronounced concern for job security as a general factor.

Some caution must be employed when interpreting this result. The low ranking of job security may simply be a consequence of students having only three, rather than four or more, votes. Additionally, many students at the Grade 9 and 10 levels have not yet engaged in any systematic thinking about career values and so will not have well-developed views about which factors matter most to them.

As subsequent sections of this report show, however, students' lack of concern about job security is confirmed by their responses on other questions. Consequently, communications strategies which focus on reassuring students that ICT jobs are available and secure might be unnecessary (though they may be usefully targeted at parents/guardians as we see in Chapter 4). Moreover, the prominence and influence of the post-materialist values—interesting work and creativity—carries through to student evaluations of ICT careers.

Awareness of ICT

Understanding why enrolment in ICT education is low and declining requires an investigation of numerous threads. While some students may be turning away from ICT because, on reflection, they think ICT fails to align with their career values, others may not be pursuing ICT simply because they lack

awareness of what ICT involves and what opportunities are available.

Investigation of the latter hypothesis reveals a nuanced story. Some students simply appear to lack an awareness of what ICT is and what it involves. Others appear be aware of ICT, perhaps have ICT skills, and also have an explicit understanding of what the term itself entails. A third—and perhaps most interesting group—appears to be aware of ICT careers, and may already have ICT skills, but these students simply don't use the term ICT to describe those skills and careers. They have an implicit, but not explicit, awareness of ICT.

Textbox 2
Some Words that Come to Mind When Students Think of ICT

Descriptive		Evaluative	
Computers	437	Dull/boring	55
Tech/Technology	317	Dorks/nerds/geeks	37
Internet	149	Cubicle/desk work	23
Cell/telephones	116	Smart people	22
Communications	99	Interesting	20
Information	96	Creative	14
ICT	47	Cool	5
		Fun	3

Source: The Conference Board of Canada, 2009.

What Does ICT Mean to Students?

When asked, "What words come to mind when you hear the term ICT?" students offer a wide range of responses that include both descriptive and evaluative words. (See Text Box 2). Although the question was designed as a way to assess awareness and the sophistication of students' understanding of ICT, many students took it as an opportunity to offer their opinions about the appeal of ICT.

Among the *descriptive* terms, the most frequent responses are computers, tech/technology, and internet. This implies that many students recognize that ICT and ICT careers involve computer- and communication-based technologies. But the responses may also suggest that students lack an awareness of less traditional and emerging ICT and ICT-related careers. The idea of any career has not yet taken hold in the minds of many Grade 9 and 10 students.

Additionally, the fact that many students simply wrote "ICT" or one or more of the words that make up the acronym ICT— i.e., information, communications, and technology—suggests that they know little about ICT and the ICT sector of the economy other than what they had just heard from researchers.

Textbox 3
Some Jobs that Come to Mind When Students Think of ICT

Don't know	205	Graphic design	50
Programmer	162	Media/music/film	44
Comp. Tech.	136	Educator/teacher	37
Web designer	107	Researcher	34
Telephone operator/marketer	94	Business	31
Comp. Engineer	69	Advertising	20
Game designer	68	Architect	11
IT/IT + x	59	Accountant	8
Software designer	57	Photographer	7

Source: The Conference Board of Canada, 2009.

Students who offer *evaluative* terms are more likely to offer negative words than positive words. Negative words (such as "dork" and "dull") are offered approximately twice as frequently as positive words (such as "interesting" and "cool"). At the same time, however, the results suggest that there is a sizable group of students for whom ICT is interesting, creative, and/or cool and who exhibit some enthusiasm when prompted to think about ICT.[46]

Jobs in ICT

Students were also asked to list "jobs or careers that come to mind when you hear the term ICT."[47]

[46] The most frequent responses among French students in Montreal were plays on the acronym TIC including "tic nerveux" and "maladie."
[47] Students were invited to write responses without prompting—i.e., there was no prepared list from which to

Students were previously told that ICT refers to information and communications technologies. Again, a broad range of responses was collected. (See Text Box 3). As an indication of the level of students' awareness of ICT, the responses offer a mix of good and bad news.

The most frequent response to this question is "don't know" which is particularly interesting given that students were simply presented with an empty box in which to write their ideas. Students who responded "don't know" had to make an effort to write those words while others left the box blank. If one combines the "don't know" responses with blank responses, nearly one quarter of all students could not name, or refused to guess at, a job or career in ICT.

Students were more likely than not to offer an example of an ICT occupation. The most frequently offered ideas included programmer, computer technician, and web designer/creator, followed by a long list of other prominent examples. Moreover, while further down the frequency list, students offered ICT career options that, at first glance, many would not have easily labeled ICT careers. Responses like media/music/film, educator/teacher, researcher, and business indicate that some students view ICT not simply as a set of purely technical, computer-based occupations, but more broadly to include occupations that employ ICT while involving other skills and activities as well.

There are other responses that pursue this same line of thought but push even further the boundaries of what one might conventionally classify as an ICT occupation. These sorts of responses—which include advertising, accountant, and photographer—suggest that many students in Grades 9 and 10 are thinking about ICT in ways that may be unfamiliar to parents and others of an older generation and perhaps more in line with emerging market realities.

choose options. Consequently, when compiling the results into "most frequently cited jobs," researchers had to make some judgments about how to group similar, but not identical, responses. For example, the category "web designer/creator" aggregates responses like "website developer", "web design guy", and "web making".

ICT: Distinct Job or Skill Set

The idea that students experience and perceive ICT in new, less conventional, ways was explored by asking "Do you see ICT more as a distinct job/career option or as a skill set used in other jobs/careers?"[48] The aim was to try to understand whether current Grade 9 and 10 students recognize that there are identifiable ICT occupations or whether they simply view ICT as a skill that permeates the current career landscape.

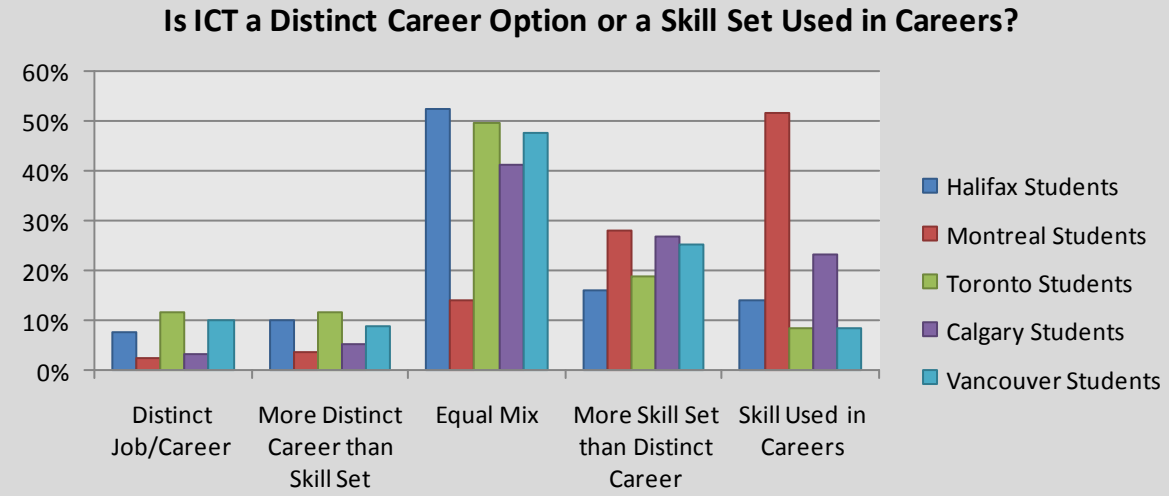
Overall, 44 per cent of students who responded say that ICT is an "equal mix" of distinct jobs and a skill set, which represents the most frequent response. However, this must be taken with a grain of salt. Students were not offered a "don't know" option on the question (except in rare cases where a few students were especially persistent in requesting one), so the "equal mix" response may have been, for many students, simply a proxy for "don't know."

Students who did not select the "equal mix" response are more likely to regard ICT as a skill set than a distinct job/career option. 24 per cent say that ICT is more a skill set than a distinct career option, while 18 per cent say that ICT is a skill set used in other jobs. By contrast, only 8 per cent view ICT as more of a distinct career option than a skill set, while 7 per cent view ICT as a distinct career option.

However, different stories emerge when one looks at the responses of students through the city-level lens of analysis. (See Chart 2).

[48] The precise wording of the question was challenging. If students acquire ICT skills and plan to use these skills in any job, but don't consciously label them "ICT skills", then the question might provoke confusion. If ICT were defined in advance in order to reduce confusion, however, that would bias the results towards the understanding of the researcher rather than capturing those of the students. The final wording errs on the side of confusion rather than that of researcher bias.

Chart 2



Source: The Conference Board of Canada, 2009.

Montreal Students

As illustrated in Chart 2, students in Montreal differ from their peers in other cities. Fewer than 6 per cent of Montreal students think that ICT is a distinct career option and only 14 per cent regard ICT as an equal mix between a distinct career and a skill set for other careers. More than 50 per cent indicate that they believe that ICT is entirely a skill set used in jobs and careers. Only students in Calgary come anywhere close to matching the views of Montreal students on this question. Even then, Montreal student are more than twice as likely as Calgary students to say ICT is a skill set used in careers.

Students in Other Cities

Nearly half of the students in cities other than Montreal who responded said that they view ICT as an "equal mix" of distinct jobs and a skill set (46 per cent). Of those students who voted on either side of the "equal mix" option, there is a clear trend towards viewing ICT as a *skill set* rather than a *distinct job/career* option. 38 per cent of students see ICT as "more" or "entirely" a *skill set* used in jobs compared to 15 per cent who view ICT as "more" or "entirely" a *distinct career* option.

As illustrated in Chart 2:

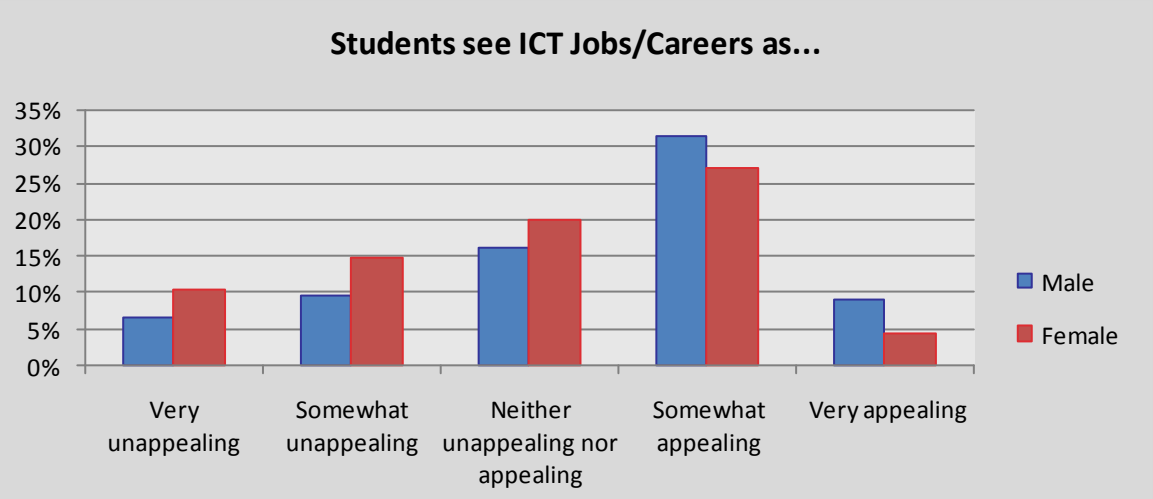
- Calgary students show the same trend as Montreal students, although somewhat muted with 23 per cent indicating that ICT is entirely a skill set used in jobs and careers.
- Toronto students are less likely than their peers in other cities to say that ICT is more or entirely a skill set used in other jobs (25 per cent) versus a national average of 38 per cent (excluding Montreal).

Implications

These findings present both a challenge and an opportunity for the ICT sector.

The *challenge* is to develop attraction and recruitment strategies that, while acknowledging the ubiquity of ICT in the world of current high school students, also show that *identifiable* ICT-oriented careers are available. The need to meet that challenge was emphasized for one researcher when, after making a point about jobs with Google, he heard one student ask, incredulously, "You can work at Google?!"

Chart 3



Source: The Conference Board of Canada, 2009.

Unless students are presented with identifiable ICT career options (rather than reminded that ICT is a pervasive feature of the economy), they may not pursue the education and career paths needed to fill the ICT sector's labour and skills demands.

The *opportunity* is that high school students appear to be receptive to the idea of careers that involve a mix of skills, including ICT skills. ICT employers, who are in need not just of IT/ICT labour, narrowly defined, but also workers who mix ICT with entrepreneurial and/or management skills, for example, may find it easier to attract and recruit future employees by emphasizing that the ICT jobs allow workers to develop and employ a variety of skills. In short, current high school students may be receptive to the idea of ICT as a dynamic, multi-disciplinary field.

In terms of overall awareness of ICT many students appear to have somewhat conventional understandings. However, there are signs that a sizable minority of students is thinking about ICT in interesting and nuanced ways.

One must remember that not all of the Grade 9 and 10 students surveyed have had formal, guided opportunities to explore career options. General awareness may improve as career exploration opportunities emerge over the rest of their high school careers.

ICT Appeal

To understand why enrolment in ICT education is low and declining, it is not enough simply to uncover students' general level of awareness. It is also necessary to understand what students think about various features of ICT careers and how well ICT aligns with their career values.

36 per cent of students indicate that they regard ICT jobs or careers as somewhat or very appealing compared to 19 per cent who see ICT jobs or careers as somewhat or very *un*appealing. (See Chart 3). But it is necessary to examine the results in a more fine-grained manner. [49]

[49] A few students regarded the questions as difficult to answer given that they had already indicated in responses to a previous question that ICT is not an identifiable career option, but instead a skill set used in other jobs. Thus, to ask about the appeal of "ICT jobs", some students suggested, is like asking about the appeal of all jobs which would be a meaningless question to ask.

In the first place, 7 per cent of students regard ICT careers as very appealing. While seemingly low—and slightly less than the percentage of students who say that ICT is very *un*appealing—if this portion of the student population were to actually pursue ICT-related education and careers, the sector's labour shortages would likely be resolved. Moreover, if some of the 29 per cent of students who say that ICT careers are somewhat appealing also pursued ICT education and careers, the sector would be in excellent shape. There is great potential to persuade many students to pursue ICT education and careers.

Secondly, however, there are reasons to be cautious. More than a quarter (27 per cent) of students respond that they "don't know" or offer no response. If we add those who offer the neutral response of "neither unappealing nor appealing", then nearly half of all students—45 per cent—might be said to be waiting for further information before making a judgment. These students may feel that they lack a clear enough understanding of ICT to shape a valid opinion about its appeal.

Presumably, the views of these students about ICT are susceptible to influence. Whether they ultimately pursue ICT will likely depend, at least in part, on the messages they receive from parents, teachers, media, and others. If the ICT sector wants to attract at least a portion of these undecided students, strategies for shaping the messages they receive will be critical.

Gender Differences

While boys are more than twice as likely to view ICT as somewhat or very appealing (41 per cent) than somewhat or very unappealing (16 per cent), girls appear to be more split on the question. 32 per cent of girls view ICT as appealing, while 25 per cent view ICT as unappealing.

Moreover, the proportion of girls who regard ICT as *very* appealing (4 per cent) is less than half of the proportion of boys who regard ICT as very appealing (9 per cent). These findings are consistent with other data about the different levels of enthusiasm and interest exhibited by girls and boys for science- and technology-based education and careers.

As well, girls are slightly more likely than boys to have clear opinions on the matter. Whereas 27.4 per cent of boys indicate that they don't know or have no response at all about the appeal of ICT, only 23.5 per cent of girls say that they don't know or give no response. While the gender difference seems rather small—3.9 per cent —given that the problem of low female participation in ICT education is already well documented, it is potentially significant.

If girls make decisions about the appeal of ICT earlier than boys, then not only are girl-centered attraction strategies important, but these strategies may need to be put in place before girls reach Grade 9 or 10.

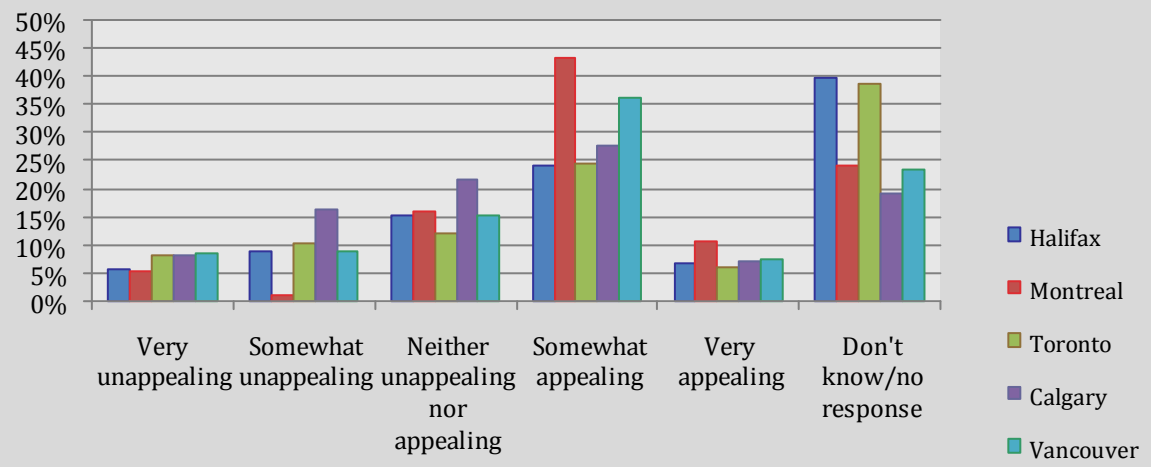
Though we sought students' views about specific features of ICT careers (next section) our results do not allow us to confirm or deny whether girls are less enthusiastic because of intrinsic (unappealing) features of ICT careers, expectations about barriers to entry into the field, a lack of self-confidence, or some other factor.

Still, a sizable minority of girls indicate that they think ICT is appealing (32 per cent) and another quarter is undecided and therefore potentially persuadable. As other results reveal, there is a small, but not insignificant, subset of girls for whom ICT appears to be an ideal career path.

Regional differences

Finally, the findings about the appeal of ICT should be examined through a regional lens of analysis. (See Chart 4 and Appendix A, Table 1). The most notable difference is that students in Montreal are much more likely than their peers in other cities to regard ICT careers as somewhat or very appealing. Nearly 54 per cent of Montreal students regard ICT careers as somewhat or very appealing versus 34 per cent of students in the rest of Canada. Students in Vancouver are not far behind students in Montreal.

Chart 4



Source: The Conference Board of Canada, 2009.

In Calgary and Vancouver, students were less likely to respond "don't know" or offer no answer than their peers in other cities. In Vancouver, this translates into a high percentage of students saying that ICT is somewhat or very appealing, whereas in Calgary, it produces a high percentage of students indicating that ICT careers are somewhat or very *un*appealing.

Whereas 41 per cent of *male* students in all cities indicate that ICT careers are somewhat or very appealing, this number reaches 44 per cent in Vancouver. While this does not compare with the proportion of males in Montreal who rate ICT careers as somewhat or very appealing—55 per cent—it does place Vancouver ahead of the other cities.

A similar trend is found among female students.

While 32 cent of female students in all cities say that ICT is somewhat or very appealing, 38 per cent of Vancouver girls offer that response which places them nearly on a par with males nationally at 41 per cent. With 52 per cent of girls in Montreal indicating that ICT is somewhat or very appealing, that city confirms itself as the home of students most enthusiastic about ICT.

In Calgary, however, we witness an increase in the number of males who think that ICT is somewhat or very *un*appealing to 22 per cent versus a national rate among males of 16 per cent. Girls in Calgary do not deviate much from the national female trends except that the lower level of don't know/no response (16 per cent) is matched by an increase in the "neither" responses (26 per cent).

While nationally don't know/no answer responses account for 27 per cent of *male* responses, the comparable Halifax don't know/no answer male response rate reaches 45 per cent. One possible explanation may be that students in Halifax have not received as much exposure to ICT as students in the rest of Canada.

Finally, in Toronto, students exhibit rather lukewarm attitudes towards the appeal of ICT compared with their peers elsewhere, if they express a view at all. 39 per cent of Toronto students offer no response or say that they have no opinion about the appeal of ICT.

Only Halifax students —at 40 per cent—are more likely than Toronto students to offer no response or have no opinion on this finding.

Toronto students are also second only to Calgary in finding ICT somewhat or very *un*appealing (18 per cent). And they tie Halifax for the lowest proportion of students (31 per cent) who view ICT as somewhat or very appealing. Given that Toronto represents the largest market for ICT workers, there is a great deal of work to be done to attract Toronto students to ICT jobs and careers.

Reasons for most regional differences are not immediately apparent. Different strategies may need to be adopted in the various regions. In Halifax and Toronto, strategies that emphasize awareness may be appropriate whereas in Calgary, strategies to improve interest and appeal are needed. Strategies for Vancouver and Montreal schools would likely best be oriented towards sustaining existing interest and appeal, as well as guiding students towards suitable programs.

Who Finds ICT Appealing and Why?

These findings about the appeal of ICT are a first step. But it is critical to understand, also, the *precise* reasons, or mix of reasons, why ICT is regarded as appealing or unappealing. Additionally, in order to develop strategic, well-targeted attraction and recruitment strategies, it is necessary to generate a finely-detailed picture of the diverse mix of motives and values that align segments of the student population with ICT pathways.[50]

Thirteen features of ICT jobs were examined (see Appendix C, Q3.4 for the complete list).The research reveals some very interesting results about who finds ICT appealing, and who doesn't, and about what appears to motivate overall perceptions and judgments. (National level results for all 13 criteria, described in detail below, can be found in Appendix B).

Availability and Stability

Grade 9 and 10 students are not turning away from ICT education and careers over concerns about job availability and security. In the first place, students overwhelmingly regard ICT jobs as easy to find and very secure/stable. Moreover, students' overall judgments about the appeal of ICT are only marginally influenced by their perceptions about ICT job availability and security.

On the **availability** of ICT jobs, students tend to think that ICT jobs are no harder and somewhat easier to find than other jobs. A mere 12 per cent indicate that they think ICT jobs are very or somewhat hard to find, while 37 per cent indicate that ICT jobs are better-than-average or easy to find. Girls are slightly less likely than boys to think that ICT jobs are easy to find, but both genders exhibit optimism in this area.

- Students in private schools are more likely than students in public schools to think that ICT jobs are easy to find. (The private school mean response is 3.76 on a five-point scale, whereas the national average is 3.40).
- Among the public schools, students in Montreal (with a mean of 3.66) and Calgary (with a mean of 3.56) are more likely than their peers in Halifax, Toronto and Vancouver to think that ICT careers are easy to find.
- Vancouver students tend to see ICT jobs as more available than not, but are less optimistic about the availability of ICT jobs than their peers in all other cities. (The Vancouver mean is 3.09 versus the national average of 3.40)

[50] We asked students to offer their opinions on 13 distinct features of ICT careers including whether ICT careers are low or high paying, interesting, and easy or complicated, among others. On each criterion, students were asked to rate ICT jobs on a 5-point scale, with 3 labeled "average." Some caution is necessary in interpreting the results given that there was no "don't know" option. The results in the "average category" may contain some implicit "don't know" responses in addition to deliberately chosen "average" judgments. However, students also had the option not to respond and between 14 per cent and 16 per cent selected that route on each question. After looking for region, gender, and other trends on each criterion, as well as the association between each criterion and students' overall judgments about the appeal of ICT, we investigated the associations between the criteria themselves to produce a better picture of who finds ICT appealing and why.

As for **job security**, a large majority of students (74 per cent) think that ICT careers offer average or better-than-average job security. 36 per cent say that ICT careers offer better-than-average security/stability. That leaves only 11 per cent of students who say that ICT offers worse-than-average job security. (15 per cent did not respond). Student responses on this question are consistently optimistic across all cities.

When we examine the possible links between students' views about ICT job availability and security, on the one hand, and their views about the overall appeal of ICT careers, on the other, we find that neither availability nor security appears to explain differences in the appeal of ICT. While this implies that the appeal of ICT is not benefitting from students' positive perceptions about availability and security, it also throws into doubt the claim that students avoid ICT because of job availability and security concerns.

The findings about ICT job availability and security are noteworthy given prominent hypotheses which hold that low enrolment in ICT education is a consequence of anxiety about these factors. While the current findings do not necessary explain why previous students did not enroll in ICT, they do offer some hope that future students will not be deterred by job availability and security concerns.

It may be that students are dissuaded at a later age and that Grade 9 and 10 students have not yet reached that age. But a strategy to sustain the current view of students may be easier to implement than one which would have to transform a negative view.

But if the most prominent explanation for low and declining ICT enrolment fails to tell the story, then what is keeping students away?

Interesting, Fun, Cool?

Whether students regard ICT-related careers as appealing or not appears to depend critically on whether they regard ICT jobs as interesting, fun, and cool. The more ICT is perceived as interesting, fun, and cool, the more appealing overall, and vice versa. Here the story is a mixed one depending on which city one is examining.

On these three factors, students in Montreal are much more likely than their peers in Halifax, Calgary, and Toronto to have a positive than a negative impression of ICT. (Specific numbers are offered below). Vancouver students are somewhat more likely than their peers in the same three cities to have positive responses on these three criteria.

For students in Halifax, Calgary, and Toronto, the appeal of ICT is somewhat deflated by negative perceptions about how interesting, cool, and fun it appears to students. Students who think ICT careers are interesting, fun, and cool, are the minority in these three cities.

While Montreal and Vancouver students are more likely to record a positive than a negative judgment on these three criteria, the correlations between these criteria and overall judgments about the appeal of ICT are roughly the same for students in all cities. Consequently, in Montreal and Vancouver, ICT's appeal is improved by perceptions about how interesting, cool, and fun it appears to students.

Interesting

Whether students regard ICT as appealing or unappealing generally is most strongly associated with how **interesting** ICT is perceived to be. Overall, students regard ICT careers as just about average in terms of how interesting they are (mean =3.03/5, where 1 is "not interesting" and 5 is "very interesting"). But there is a great deal of variation hidden in that average response.

- In Toronto and Calgary, 28 per cent view ICT as somewhat or very interesting, while 34 per cent view ICT as somewhat or very *un*interesting. 33 per cent of students in these two cities selected the "average" response.[51]

[51] Approximately 5 per cent offered no response.

- In Montreal, 50 per cent of students say they consider ICT careers somewhat or very interesting, while a mere 10 per cent consider them somewhat or very *un*interesting.
- Though not as strong as Montreal students' enthusiasm, students in Vancouver are also more interested in ICT than their peers in other cities. 41 per cent of Vancouver students regard ICT as somewhat or very interesting, while 22 per cent say ICT careers are somewhat or very *un*interesting.
- Montreal and Vancouver students' enthusiasm brings the national mean response into positive territory (3.03). Without Montreal and Vancouver, the mean is 2.97.
- Halifax students are almost three times more likely than their peers to offer no opinion on how interesting they regard ICT careers. Of those students who do offer an opinion, there is no strong trend towards viewing ICT as either interesting or uninteresting (with a mean of 3.04).

A critical issue here is the difference between male and female responses. With a mean response of 3.16, boys regard ICT as more interesting than not, but the mean response of girls at 2.75 brings the overall interest level significantly down.

Fun

Whether students regard ICT careers as **fun** is the second-most strongly associated factor with overall appeal of ICT. On this criterion, the picture is more dismal than the interest criterion. While 31 per cent of students indicate that ICT careers are not fun, only 21 per cent indicate that ICT careers are somewhat or very fun. The mean responses for both boys and girls are negative, with girls' mean significantly more negative than boys'.

Again, however, a more nuanced picture emerges when one examines city-level results.

- In Montreal, 42 per cent of students indicate that ICT careers are somewhat or very fun, while only 14 per cent say that they are not fun.
- Vancouver students are also more likely than their peers in other cities (with the exception of Montreal) to say ICT careers are fun (28 per cent in Vancouver versus 21 per cent nationally). But students in Vancouver are as likely to say that ICT careers are *not* fun (28per cent) as fun (28 per cent).
- Toronto students—both in the public and private system—are more likely than their peers in other cities to regard ICT careers as *not* fun. 45 per cent of Toronto public students and 46 per cent of Toronto private students say that ICT careers are not fun, compared with 27 per cent of students in other cities.
- At 38 per cent, students in Halifax are more than twice as likely as their peers elsewhere (14 per cent) to offer no opinion about whether they regard ICT careers as fun or not fun.

Cool

How **cool** ICT careers seem to be to students is significantly correlated with the overall perceptions of ICT. But again, students' perceptions of the coolness of ICT careers are less than ideal if we remove the enthusiastic Montreal and Vancouver students from the national aggregate results.

- In Vancouver, 30 per cent of students regard ICT careers as somewhat or very cool, while only 19 say that they are somewhat or very *un*cool.
- In Montreal, 34 per cent of students regard ICT careers as somewhat or very cool, while only 18 per cent say that they are somewhat or very *un*cool. A sizable proportion of Montreal students—43 per cent—indicates that ICT is of average coolness.
- While the mean response in all cities other than Montreal is only somewhat on the negative side of the scale at 2.91 (and slightly positive among males at 3.07), ICT careers are more likely to be seen as *un*cool than cool.
- 22 per cent of students in cities other than Montreal regard ICT as somewhat or very cool, while 25 per cent regard it as somewhat or very

*un*cool. 38 per cent of students, excluding Montreal, think that ICT is of average coolness.

- Toronto students—both in the public and private systems—are more likely than their peers in other cities to regard ICT careers as *not* cool. While the national mean response in 2.95, the mean response for Toronto public students is 2.80 and the mean for Toronto private students is 2.68.

The mean response for girls (at 2.74) is far below the mean response for boys (at 3.07). The finding here is consistent with the extensive body of research on gender differences discussed in Chapter 2.

In any case, the fact that the three factors most strongly associated with overall appeal produce average or negative responses in Halifax, Toronto, and Calgary suggests that ICT employers have work to do in improving the image of ICT careers in those cities. But it is an important step forward to know that Grade 9 and 10 students' concerns about ICT are related more to image than to anxieties about job availability and security.

Social

We found that there may be some truth to the idea that students turn away from ICT careers because they view them as anti-social. However, while it is a truth which applies to most students, it is much less the case for students in Montreal.

- In Halifax, Toronto, Calgary, and Vancouver, while 25 per cent believe that ICT careers are somewhat or very social, 33 per cent regard ICT careers as somewhat or very *un*social. And with a mean of 2.84, the overall perception is on the negative side.
- In Montreal, however, 54 per cent of students say that ICT careers are somewhat or very social, while only 10 per cent say that ICT is somewhat or very unsocial.
- While both boys and girls tend towards a negative view—with means of 2.90 and 2.73, respectively—girls tend to be less optimistic.

Given the prominent media image of ICT careers as anti-social cubicle jobs, one might have expected an even grimmer result, but the finding does not challenge the stereotype.

While students' views about the social opportunities offered by ICT careers are less strongly correlated with overall appeal than how interesting, cool, and fun ICT careers appear to students, the association between ICT's appeal and its social score are not insignificant. Consequently, the social image of ICT emerges as a junior partner in the interesting, cool, and fun nest of influence on ICT's appeal.

Creativity

A brighter point emerges from students' views about the creative opportunities permitted by ICT careers. While creativity is not as strongly correlated with overall appeal as the interesting, cool, and fun factors, there is nevertheless an association between perceptions of creativity and overall ICT appeal.

Students in public schools in all cities are more likely to regard ICT careers as creative than uncreative so the association has an overall positive effect on the appeal of ICT. Private school students are more likely to regard ICT careers as *un*creative.

- While students in Vancouver are more likely than students elsewhere to say that ICT careers are creative, overall national results are relatively uniform.
- Nearly a fifth of students regard ICT careers as *un*creative, but 37 per cent nationally (and 47 per cent in Vancouver) regard ICT careers as somewhat or very creative.
- There is a significant difference between male and female responses on this factor—boys are more enthusiastic (with a mean of 3.34) than girls (with a mean of 3.18) about the creative potential of ICT—but both genders on average regard ICT as creative. The fact that both male and female students have very positive perceptions about the creativity of ICT, and the significant association with judgments about ICT appeal, provides a

promising channel through which students can be further engaged.

Complicated and Challenging

Students in all cities generally see ICT jobs as more complicated than straightforward and more, rather than less, challenging. However, views about how complicated and/or challenging students regard ICT careers is, at best, only weakly associated with views about the overall appeal of ICT careers. This suggests that if students are interested in ICT careers, they are not deterred by the myth or reality of ICT as complicated and challenging.

- While 16 per cent of students regard ICT careers as easy/straightforward, 34 per cent indicate that ICT is somewhat or very **complicated** and 36 per cent regard ICT as of average difficulty.
- Girls are more likely than boys to regard ICT as complicated. The mean response for boys (with 1 as "very difficult/complicated" and 5 as "very easy/straightforward") is 2.76, whereas for girls it is 2.49.
- Students in Toronto (with a mean response of 2.42) and Vancouver (with a mean response of 2.43) are more likely than their peers in other cities (with a national mean of 2.67) to regard ICT careers as difficult/complicated.

Students also tend to see ICT careers as **challenging**. Only 9 per cent say that ICT careers are not challenging, whereas 46 per cent say that ICT careers are somewhat or very challenging.

- Girls are slightly more likely than boys to view ICT careers as challenging. The mean response for boys (with 1 as "not challenging" and 5 as "very challenging") is 3.55, whereas for girls it is 3.67.
- Again, students in Vancouver (with a mean of 3.80) and Toronto (with a mean of 3.78) are more likely than their peers (national mean 3.57) to say ICT careers are challenging. (In the case of Toronto, this may be explained by a sample population which included proportionally more girls than in other cities. For Vancouver, however, a gender explanation for the result is not available).

Not immediately clear is whether students view a "challenging" career as a good or bad thing. While older students and those already in the workforce tend to distinguish between complicated and challenging elements of a career, many students in Grades 9 and 10 seem to conflate these two criteria and view both as negative.

Regardless of whether or not students view ICT as complicated and challenging, there is only a very weak association between these factors and the overall appeal of ICT. It appears that some students who are interested in ICT, and view it as complicated and challenging, are willing to rise to the challenge.

Pay and Promotions

While students in all cities generally tend to think that ICT jobs pay well and offer promotion opportunities, neither factor has an especially strong influence on the overall appeal of ICT. Students who think that ICT jobs pay well are more likely to say that ICT jobs are somewhat or very appealing—but that association is only slightly more robust than factors like job security and availability, and significantly less robust than the interesting, fun, cool, and creativity factors.

Over three-quarters of students—77 per cent—think that ICT jobs offer average or better-than-average **pay**. Indeed, 44 per cent believe that ICT jobs are better-than-average or high paying. Only 9 per cent think that ICT jobs pay less than average wages. On this question, there is very little difference between male and female responses. Vancouver students exhibit a little more optimism than their peers in other cities about the pay offered by ICT jobs.

Similarly, students' views about the **promotion opportunities** afforded by ICT careers are quite positive (with a mean of 3.46), but less important than other factors in terms of explaining the overall appeal of ICT careers.

Travel and Impact

A majority of students in all cities believe that ICT careers offer few or no **travel opportunities**. Only 14 per cent would characterize ICT careers as "high-travel" options, while 44 per cent regard such careers as "low-travel" careers. The national mean response is 2.46. With the exception of private school students (with a mean of 2.28), Vancouver students are the most pessimistic (with a mean of 2.36), while Montreal students are the least pessimistic (with a mean of 2.95) about travel opportunities in ICT careers. At the same time, there is only a weak association between this factor and appeal of ICT.

By contrast, students generally think that ICT careers have an **impact** on the world. The national mean response is 3.38 (with 1 as "no impact on the world" and 5 as "big impact on the world"). There is no significant difference between male and female responses. 38.6 per cent of students think that ICT jobs have an impact, or a "big" impact, on the world, whereas only 15 per cent believe that ICT jobs have little or no impact. There is very little variation across cities.

Perceptions about impact are associated with overall appeal, but the association is not nearly as strong as the interesting, cool, and fun criteria. This is not entirely surprising given the earlier finding that having an impact on the world was selected by very few students as an aspect of any career that would make it good or appealing.

Conclusion

There is work to be done to ensure that ICT careers are seen as interesting, fun, cool, and creative, given the importance of these factors in determining the appeal of ICT among Grade 9 and 10 students. The precise strategies to be adopted, however, need to take account of gender and regional differences.

Montreal and Vancouver students are more enthusiastic about ICT than their peers in other cities. Consequently, strategies to engage Montreal and Vancouver students in ICT education and careers requires guiding those students already interested in ICT into specific jobs and careers.

Engagement strategies for girls in most cities will need to address the generally negative views that girls have of ICT. There is a minority of girls who indicate enthusiasm for ICT education and careers, but much more outreach will need to be done to engage those girls with lukewarm interest if the gender imbalance of the ICT sector is to be repaired.

Engagement strategies for Toronto students need to address the generally more negative impressions that they have of ICT compared to their peers in other cities. This strategy is especially important if ICT employers want to bring private school students—especially girls—into occupations in the sector.

Finally, in most areas—and especially in Halifax—strategies may be needed to improve general awareness of ICT education and careers. While many students have ICT skills and may be interested in ICT or ICT-related careers, many students simply have a narrow view of what ICT involves, if they have any understanding at all.

Ultimately, however, one must remember that many of these students have not yet engaged in systematic career exploration. While most have talked with parents, teachers, and others about careers generally, few seem to have had much discussion about ICT careers. What messages will these students hear when they have discussions with others?

CHAPTER 4

Channels of Influence

At a Glance

- Students are most likely to consult parents for advice about their education and/or careers (83 per cent), followed by friends (63 per cent), teachers (50 per cent), and guidance counsellors (43 per cent).
- While parents/guardians have diverse views on ICT, a perspective of *cautious optimism* appears to best characterize the parents/guardians group.
- Counsellors are much more of a similar mind than parents about the nature and appeal of ICT, and a perspective of *enthusiastic support* appears to best characterize their views.

The perceptions that students have of ICT careers are varied, but generally positive. However, Grade 9 and 10 students don't develop their perceptions in a vacuum, nor can we expect that these perceptions won't change before students make decisions about education and career paths. It is important, then, to look at the channels through which students are, or may be, influenced. Additionally, it is necessary to consider the perceptions of those people who may influence them.

Sources of Information and Advice

Students receive education and career information and advice from a variety of sources, though some sources are more prominent than others. While the weight of each source likely varies from student to student, the overall results offer a useful picture of the channels of potential influence on students' education and career choices.

Information

When asked about the sources they consult for information about education and careers, students overwhelmingly cited the internet (81 per cent). (See Text Box 4). This was followed, at some distance, by school curriculum (52 per cent) and (perhaps surprisingly for this generation) newspapers (47 per cent). However, while the frequency for these latter two sources is significantly lower than the internet, each nevertheless reaches nearly or more than half of the students who responded and therefore constitute important channels of influence.

Text Box 4

Sources of Education and Career Path Information for Grades 9 & 10 Students

1.	Internet	81%
2.	School curriculum	52%
3.	Newspapers	47%
4.	Television	42%
5.	Library	29%
6.	Magazines	27%
7.	University/College calendars	26%
8.	Government	17%
9.	Radio	15%
10.	Labour market information	9%
11.	Co-op employer information	8%
12.	Sector Councils	5%
13.	Industry Associations	3%

Source: The Conference Board of Canada, 2009.

At the same time, while the results offer a picture of some of the main channels of potential influence, the decentralized, self-selecting nature of many of the most frequently cited sources complicates the matter.

For example, while it is useful to know that students consult the internet, newspapers, and television for career advice, we do not know exactly how they use these sources. Which internet sites do students visit and how reliable are those sites? Which newspapers and which sections of those newspapers do they read? And what television channels and programs do students watch for education and career information?

While sources that are less user-directed or user-censored—such as university/college calendars and labour market information—rank lower (with the exception of school curriculum), the reach is not insignificant. That more than a quarter of Grade 9 and 10 students report that they consult university and college calendars, for example, is an important finding. As they move into Grade 11 and 12, this may become an even more prominent source of information, and thus a more useful channel through which to provide accurate and relevant information. Moreover, the extent of impact or influence of some of the sources further down the list may be deeper than those further up. For example, information acquired from discussions with co-op employers or sector councils may be regarded as more accurate and relevant by students than messages they receive from the internet or television.

Advice

Though it is important to understand where students go for information about education and careers given that these can be avenues to distribute more and better information, it is perhaps more useful to know about those people they turn to for advice about education and careers. Those who give advice to students likely have a significant influence on how students filter and assess the information that they receive. Indeed, those to whom students turn for advice may have a large impact on whether students ultimately pursue or abandon ICT education and career paths.

When asked about *who* they go to for advice about their education and/or careers students cited parents/guardians most frequently (83 per cent) followed by friends (63 per cent). (See Text Box 5). Teachers and guidance counsellors were selected by 50 per cent and 43 per cent respectively. One regional difference worth noting is that students in Montreal were less likely to consult teachers (38 per cent) than their peers in other cities (51 per cent). Yet, Montreal students were *more* likely to consult guidance/career counsellors (54 per cent) than their peers in other cities (42 per cent).

Text Box 5

Sources of Education and Career Advice for Grades 9 & 10 Students

1.	Parents/Guardians	83%
2.	Friends	63%
3.	Teachers	50%
4.	Guidance/Career Counsellors	43%
5.	Brothers/Sisters	34%
6.	Classmates	28%
7.	Businesses/Employers	25%
8.	Government	8%

Source: The Conference Board of Canada, 2009.

That students look to their parents/guardians for education and career advice is not surprising, but it is nevertheless interesting that they rank first among all sources. In follow-up discussions, researchers discovered that students turn to parents/guardians not simply because they believe that parents/guardians have the best advice, but because students feel that they have a responsibility to consult with their parents/guardians about such matters. What impact that has on the weight students give to advice from parents/guardians is not clear.

While the finding that 43 per cent of students turn to counsellors might seem low, the sample population of Grade 9 and 10 students includes many who have not yet taken a career course, nor been introduced to their guidance/career counsellor. It may be that older students consult counsellors more frequently. However, if it is true that students begin to narrow their career options as early as Grade 9, then the lower rate of consultation with counsellors may be a concern.

It is also worth noting that while family- and social-sources of advice—e.g., parents/guardians, friends, siblings—are somewhat more frequently consulted than institutional sources—e.g., teachers, counsellors, employers, government—the latter nevertheless reach a significant number of students. The influence of such sources is important given that teachers and counsellors, for example, are easier for policy-makers and employers to reach with accurate, relevant, and timely information than students' parents/guardians, siblings, and certainly more than students' friends.

However, though it may be easier to deliver such information to teachers and counsellors, and expect that they will use it, the influence of parents/guardians is much larger. In that case, ensuring that parents and guardians have accurate and relevant information about education and career options for their children is essential.

Parents/Guardians—The Cautious Optimists

Most students (83 per cent) report that they consult their parents or guardians for education and career information and advice. In that case, students' awareness and perceptions of ICT education and careers, and their decisions about school and work generally, are likely influenced by the knowledge and attitudes of their parents/guardians. But what exactly do parents/guardians think about careers in general and ICT careers in particular? What messages are students hearing from this primary source of advice?

The parents and guardians who responded have diverse perspectives on ICT, but a perspective of cautious optimism appears to best characterize the parents/guardians group as a whole. (See Appendix A: Research Methodology for details on sample sizes, sampling methodology, issues and implications.

General Career Values

In order to determine whether students and parents/guardians are on the same page about career values generally, parents/guardians were asked to indicate which factors make a job or a career good or appealing. Comparing parents'/guardians' results with those of students is revealing.[52] (See Text Box 6. For students' rankings, see Chart 1 on page 12).

Text Box 6

What Makes a Career Good or Appealing? (Parents' Ranking)

1.	Interesting work	80%
2.	Pay	60%
3.	Work-life balance	37%
4.	Secure/Stable work	30%
5.	Positive work environment	27%
6.	Impact	23%
7.	Freedom/Independence	20%
8.	Creative	10%
9.	Travel opportunities	7%
10.	Social	7%

Source: The Conference Board of Canada, 2009.

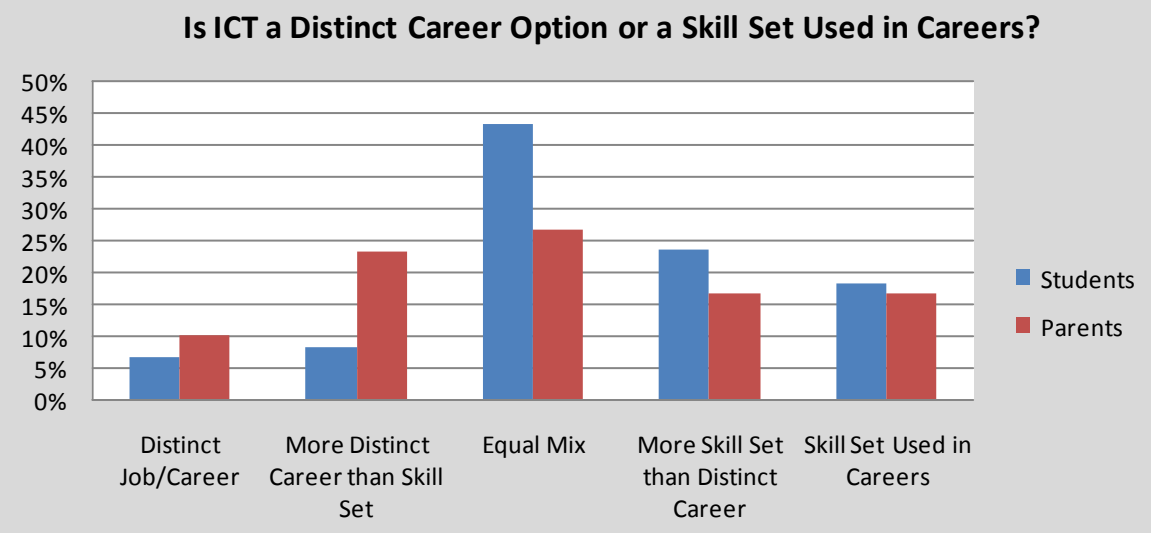
For parents/guardians, "interesting work" was the most frequently cited factor (80 per cent), followed by pay (60 per cent), work-life balance (37 per cent), and job security/stability (30 per cent). Though the top two factors—interesting work and pay—were the same for students and parents/guardians, the order of importance was reversed.

Moreover, whereas parents/guardians *overwhelmingly* indicated that "interesting work" was a factor, student enthusiasm for interesting work was somewhat more muted (80 per cent of parents versus approximately one-third of students). After pay and interesting work, the next three most frequently cited factors by *students*—travel, social, and creativity—were the least frequently cited factors by *parents/guardians*.

Setting aside pay and interesting work, which seem to be baseline factors for all groups, the results suggest

[52] For parents, percentages represent the proportion of the total parent sample that selected a given factor in the survey. For students, percentages represent the proportion of the total number of dots/votes allocated to a given factor, with each student receiving 3 dots/votes in the exercise. A result of 13 per cent for a factor selected by students, then, is equivalent to about one-third of students.

Chart 5



Source: The Conference Board of Canada, 2009.

some divergence in career values between students and parents/guardians. Whether that divergence affects the messages students receive from parents/guardians about ICT is unclear, but would depend on how ICT careers are perceived by both groups as fulfilling the various career values.

Many Grade 9 and 10 students would not yet have had systematic or rich discussions about career plans with parents/guardians. This is more likely to occur as students get closer to graduation and need to make decisions about their next steps. In that case, it is not clear how stable students' current career values and their attitudes about particular education and career paths will be once confronted more directly by the values and attitudes of their parents/guardians.

The Nature of ICT

When asked whether they see ICT as a distinct career option or as a skill set used in other careers, parents/guardians reveal attitudes that differ from those of students. (See Chart 5). Whereas students lean more in the direction of ICT as a skill set, parent/guardian responses are somewhat more polarized. A quarter of parents view ICT as an "equal mix." Other parents/guardians are evenly split between those who view ICT as entirely or mostly a distinct career option (one third) and those who view it as entirely or mostly a skill set (one third).

Significantly, students are much less likely than parents/guardians to say that ICT is entirely or mostly a distinct career option—15 per cent of students outside Quebec and 6 per cent of Montreal students, versus one third of parents. Students outside Quebec are somewhat more likely than parents/guardians to say that ICT is mostly or entirely a skill set—38 per cent and one third, respectively—while 80 per cent of students in Montreal view ICT as mostly or entirely a skill set.

These findings suggest that parents/guardians have different understandings of the nature of ICT than students. Parents/guardians appear to have a much stronger sense that ICT is a distinct job or career option while students are more likely to think that ICT is embedded in a wide range of jobs and career options. Many students, accordingly, see a need to develop ICT skills whether they intend to pursue a traditional "ICT" occupation or not.

Although Grade 9 and 10 students currently have a different picture of ICT than parents/guardians, they nevertheless seek advice from their parents/guardians when discussing education and career options. Educating parents/guardians about the new ICT reality may be an effective strategy if employers want a more accurate image of ICT to persist.

Attitudes Toward ICT Careers

Just as parents/guardians appear to differ from students in their views about the *nature* of ICT, they also differ from students on attitudes about the *appeal* of ICT careers. (See Chart 6). As a group, parents/guardians regard ICT as *less appealing* than students. While only 19 per cent of students think ICT careers are either very or somewhat unappealing, one third of parents express this view. Moreover, fewer parents/guardians (30 per cent) than students (36 per cent) said that ICT careers were somewhat appealing or very appealing.

This finding should concern those who hope to encourage more students to pursue ICT education and career paths. Knowing that almost all students consult parents/guardians for career information and advice, a significant number of students will receive an unfavourable impression of ICT from their parents/guardians. Indeed, students are more likely to receive a negative impression of ICT by speaking with their parents/guardians than they would receive simply by speaking with their peers.

Employers may regard as especially worrying the fact that the *opportunity* for parents/guardians to shape students' views about ICT is rather large given that 27 per cent of students indicated that they do not have a view on the appeal of ICT at all. If those students took on the same distribution of perceptions of ICT careers held by the parent/guardian group, rather than their peers, the result would be a significant loss of potential students and employees for ICT education and careers.

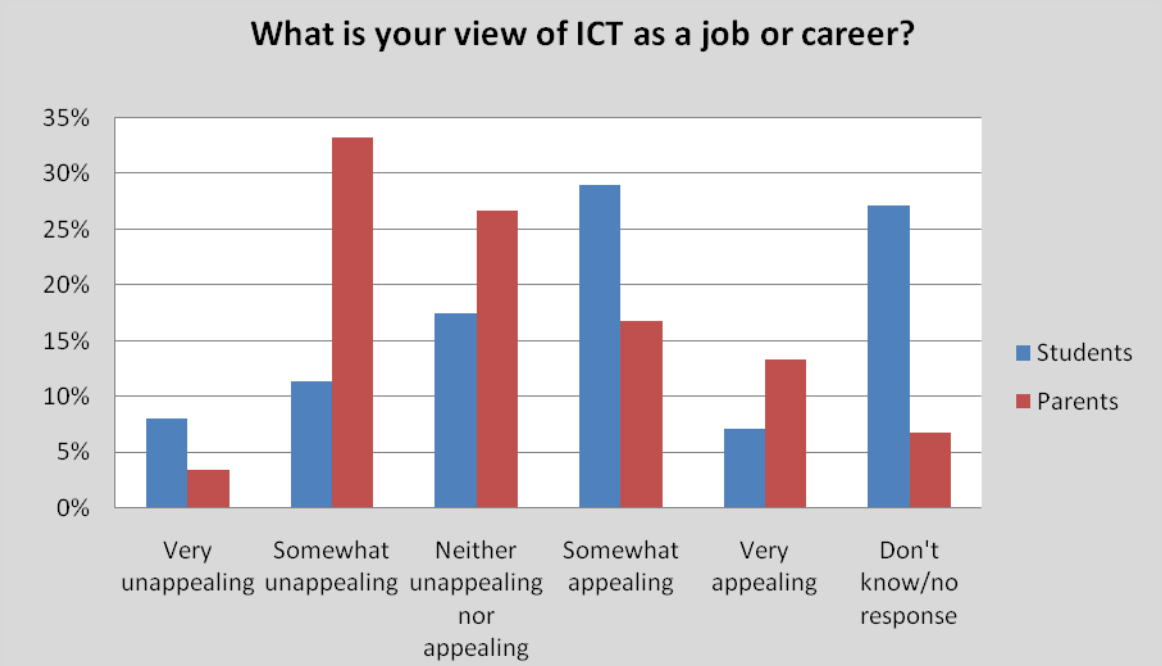
Attitudes Toward Features of ICT Careers

With respect to their views on particular features of ICT careers, parents' views differ from students' views on a few criteria. Parents are *more* likely than students to say that ICT careers are easy to find, cool, and have a big impact on the world. However,

- *Parents/guardians are less enthusiastic about ICT career security/stability than students.* Whereas 41 per cent of students who gave a response say that ICT careers offer better than average job security, only 8 of 30 parents who responded feel this way. This is a potentially significant finding given the importance of secure/stable work as a general career value for parents/guardians (30 per cent). To be fair, the mean response for both parents/guardians and students is positive on security/stability (3.20 and 3.39 respectively), but the gap may indicate that parents/guardians are still affected by the dot-com bust and fears of IT off-shoring.[53]
- *Parents/guardians are slightly less likely than students to say that ICT careers are creative.* On the creative criterion, students produced a mean result of 3.27 while parents/guardians produced a mean result of 3.17. Both results are on the positive side of the scale, but the discrepancy suggests that consultations with some parents/guardians may have a dampening effect on students' enthusiasm for the creative appeal of ICT.
- *Parents/guardians guardians are slightly less likely to regard ICT careers as interesting*. While parents/guardians regard ICT careers as only slightly less interesting than students, the difference is worth noting because of the importance that both parents/guardians and students place on "interesting work" as a career value.

[53] While a finer-grained analysis of the parent survey would be desirable, the small-n nature of the survey prevents that analysis from being pursued. When we consider only completed applications (n=30), the ability to draw valid conclusions from male (n=12) and female (n=18) responses on certain questions is severely constrained.

Chart 6



Source: The Conference Board of Canada, 2009.

Moreover, because only 30 per cent of parents/guardians said that ICT careers are somewhat or very interesting, there is little opportunity for parental influence to *increase* students' perceptions of ICT as interesting through discussions with parents. The lukewarm attitudes of both groups about how interesting ICT is, combined with the importance of "interesting work" as a career value, does not offer a very promising future for ICT recruitment under current circumstances.

Which factors affect parents'/guardians' attitudes toward the overall appeal of ICT?

When analyzing the effect that individual factors have on the parents'/guardians' overall attitudes toward the appeal of ICT careers, we found strong correlations between three factors—namely, "cool/not cool", "interesting/not interesting", and "fun/not fun"—and responses about the appeal of ICT.

The same analysis of the student data produced strong correlations between appeal and these same factors along with a fourth—creative/not creative. In short, for parents/guardians and students alike, the cooler, more interesting, and more fun ICT is perceived to be, the more likely one is to regard ICT as appealing career option overall.

What is puzzling here is that while parents/guardians are more likely than students to view ICT careers as "cool" and "fun", and only slightly less likely than students to view ICT careers as "interesting", as a group they find ICT careers generally less appealing than students. It may be that the difference between the parent/guardian and student responses on the more general question of appeal of ICT careers is explained by the different ways that parents/guardians and students interpret and/or weigh the importance of the criteria in decision-making. Or, perhaps those students who indicated no view about the appeal of ICT would, later in life or if pushed to respond, would tip the over student numbers about appeal in line with the parent/guardian numbers.

In any case, parents are more likely than students to say that ICT is unappealing (37 per cent and 19 per cent, respectively) and more than a quarter of students have yet to shape a view at all. Under these

circumstances, there are many students who may be influenced by their parents/guardians to view ICT as unappealing who may otherwise have developed a positive view of ICT if exposed only to the influence of peers.

The research project was not able to determine the precise nature and extent of parents'/guardians' influence on students' perceptions and decisions. But given that nearly all students reported that parents/guardians play a role in their decision-making, and given that so many students are undecided about the appeal of ICT careers, the opportunity for parent/guardian influence is large.

Counsellors—The Enthusiastic Supporters

43 per cent of all Grade 9 and 10 students indicate that they consult guidance/career counsellors for education and career advice. In Montreal, this figure reaches 54 per cent, and among private school students in Toronto, it reaches 80 per cent. While much lower than the number of students who turn to parents/guardians and friends, there is sizable potential for influence on students. Students' discussions about education and careers with counsellors may be more formal than those they have with family and friends, and counsellors' opinions viewed as more "expert" than the advice they receive from others.

With such great potential to shape students' views about ICT, it is important to know what counsellors think about ICT. The survey reveals a much higher degree of group consensus about the nature and appeal of ICT, and that a perspective of enthusiastic support appears to best characterize the views of the guidance/career counsellor group.

To what extent the views of the counsellors' who responded are representative of counsellors generally, however, is not entirely clear. (See Appendix A: Research Methodology for details on sample sizes, sampling methodology, issues and implications). To better understand counsellors' perceptions and the extent of their influence on students' perceptions and choices, a larger counsellor sample would be helpful, but was beyond the scope of the current research project. Nevertheless, the survey represents the first attempt to examine Canadian counsellors' thoughts about ICT and provides some signals about their views.

Text Box 7

What Makes a Career Good or Appealing? (Counsellors' Predictions of Student Responses)

1.	Pay	85%
2.	Interesting work	77%
3.	Fun/Enjoyable	58%
4.	Fulfilling/Rewarding	39%
5.	Prestige	39%
6.	Job security	31%
7.	Freedom/Independence	27%
8.	Social	23%
9.	Impact	15%
10.	Creative	8%

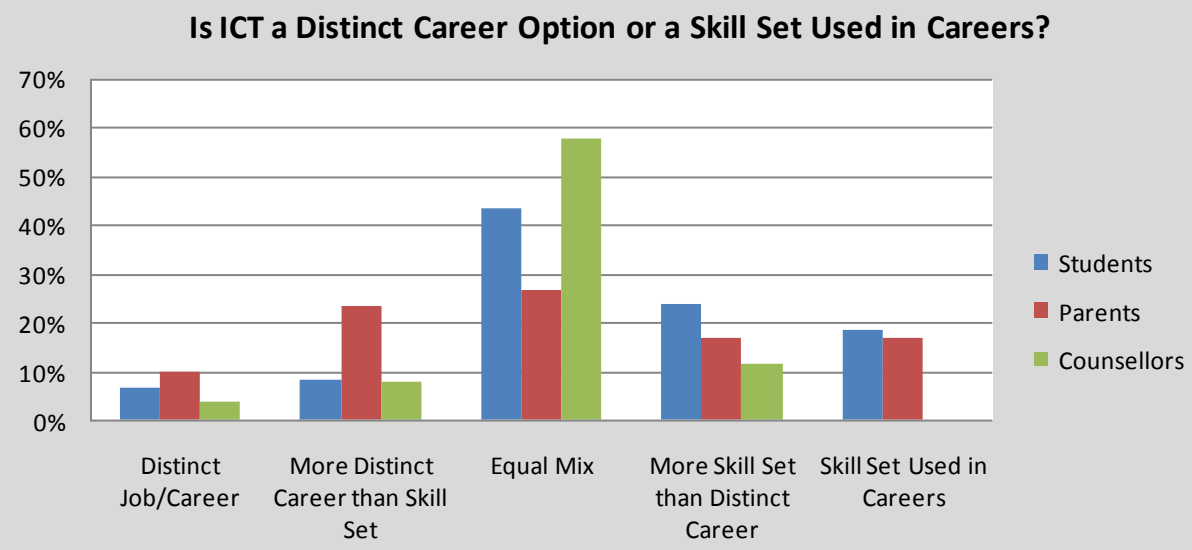
Source: The Conference Board of Canada, 2009.

Career Values and Influencers

Unlike the surveys of students and parents/guardians, the survey of guidance/career counsellors did not ask about their own career values. Instead, researchers asked counsellors to indicate what factors they believed would be important to students when thinking about jobs or careers. (See Text Box 7. For students' rankings, see Chart 1 on page 12).

While counsellors' predictions aligned with students' actual responses on the first two criteria—pay and interesting work—the ranking of the remaining factors reveal gaps between predictions and actual results. Counsellors rank work that involves social opportunities as only the 8th most important factor for students, whereas this factor ranks fourth among students' own concerns. Moreover, a mere 8 per cent of counsellors thought that creativity would be an important concern for students when, in fact, creativity turned out to be much more important to students with approximately 17 per cent selecting this as an important career value.

Chart 7



Source: The Conference Board of Canada, 2009.

These findings suggest that there is a mismatch counsellors' perceptions and Grade 9 and 10 students' actual views. Either students are not effectively communicating their values to counsellors or counsellors are not absorbing the message. In either case, counsellors may be offering education and career guidance on the basis of an inaccurate understanding of the self-reported career values of students. While the differences are not very pronounced, the overemphasis by counsellors' of job security and the under-emphasis on creativity may be something to explore in greater detail.

In terms of identifying the people who influence the education and career decisions of students, counsellors offer an account which lines up reasonably well with what students reported. Counsellors who responded to the survey correctly identify parents and friends as main sources of advice, but reverse the order of importance. Whereas students say that parents are most important (83 per cent) followed by friends (63 per cent), counsellors indicate that friends are more important (81 per cent) than parents (73 per cent).

It may be that both results contain some truth. Students were asked who they "go to for advice," while counsellors were asked "who are the biggest influencers" on students' choices. Students may *seek* the advice of their parents more frequently, but more often *take* the advice of friends.

Counsellors appear to underestimate the relevance of teachers (31 per cent) compared with students' own reports (50 per cent), but almost perfectly predict their own relevance—42 per cent in the counsellor survey and 43 per cent in the student survey indicate that counsellors are a source of advice.

The Nature of ICT

When asked whether they see ICT as a distinct job/career option or as a skill set used in other or any jobs/careers, counsellors as a group offer a less polarized response than both students and parents. (See Chart 7).

While students lean more in the direction of regarding ICT as a skill set, and parents are polarized between ICT as a distinct career and ICT as a skill set, a majority of counsellors take a more moderate view. Nearly three-fifths of counsellors indicate that ICT is an "equal mix" of distinct careers and a skill set used in other jobs. The comments of one respondent capture the flavor of most who responded this way: "I think it can be a distinct job/career option but many of the skills can be transferred to other career areas as well."

That so many counsellors say that ICT is an equal mix of distinct careers and a skill set used in other jobs may be taken as a good sign. By seeing ICT in both ways, counsellors are unlikely to discourage students from pursuing ICT careers and/or skills given the opportunities such skills would allow them.

However, when asked how they thought students would respond, counsellors' predicted that students would lean more in the direction of viewing ICT as a distinct career option than students actually did. While that might raise concerns that counsellors misunderstand students' own perceptions, the fact that the majority of counsellors regard ICT as an equal mix implies that they are likely to offer students information and advice which entails both distinct ICT career options and ICT as a skill set.

Attitudes Toward ICT Careers

Three quarters of the counsellors who responded view ICT careers as a somewhat or very positive career option. Over half indicate that ICT is a very positive career option while only one respondent indicated that ICT is somewhat negative and no counsellors who responded say that ICT is very negative.

Moreover, when asked to judge the attractiveness of ICT careers against the attractiveness of other career options, a majority of counsellors rate ICT as "equally appealing." On every candidate comparison, a majority of counsellors view ICT careers as on a par with other careers, including medicine, science, skilled trades, environmental careers, business, law, performing arts and engineering.

Some counsellors regard ICT careers as less appealing than each of the other options, but this is usually below one quarter of the total responses. The one exception is medicine where two-fifths think that ICT is less appealing and none say that ICT is more appealing; but even here, three-fifths say that ICT is equally appealing. In short, ICT does not suffer from negative bias among the majority of guidance/career counsellors who responded to the survey.

Interest

On the basis of their conversations with students, counsellors report that the level of students' interest and awareness in ICT is moderate. When asked what they perceive to be students' level of interest, three-quarters of counsellors report that there is "some interest", while a fifth report "high interest". No counsellors report that the level of interest is either very high or very low.

A sizable minority—two-fifths—however, indicate that girls respond differently than boys in terms of their level of interest. A third say that there is no difference, while a quarter say that they don't know. Aside from the thought that the general image of ICT is that the careers are "guys' jobs," counsellors offered little in the way of explanation for the difference.

Awareness

On the level of awareness that students exhibit when they speak with counsellors about ICT, three-fifths of counsellors who responded to the survey report that there is "some awareness", one quarter report that there is "low awareness" and only one counsellor reported "high awareness." No counsellors report very high or very low awareness of ICT among students. This result confirms the conclusion—derived from the student survey—that students are somewhat, but not very, aware of what ICT is and what the field has to offer.

A sizable minority—two-fifths—of counsellors report that girls respond differently than boys in terms of their level of awareness. Again, little is offered by way of explanation except to suggest that girls are less

aware of ICT because their lack of interest discourages them from further exploring the field.

Conclusion

The surveys offer a mixed story about how parents/guardians and guidance/career counsellors might influence students' awareness of and perceptions about ICT. While the counsellors who responded exhibit great enthusiasm for ICT and appear prepared to guide students towards ICT education and career paths where appropriate, the parents who responded appear to be much more cautious about ICT.

Given that students are nearly twice as likely to consult parents for advice (83 per cent) than guidance/career counsellors (43 per cent) the cautious perspective will likely reach more students than the enthusiastic perspective. More students consult counsellors in Montreal (54 per cent) than elsewhere in Canada (42 per cent), but the relative influence of parents is still much higher in Montreal as elsewhere.

If guidance/career counsellor advice is regarded by students as more "expert" than parent/guardian advice, and counsellors generally are as enthusiastic as those who responded, then perhaps they will have an influence which balances that of parents. But that is simply speculation. At present, the weight of potential influence leans much more towards the cautious optimism perspective than the enthusiastic supporter perspective. In that case, reaching out to parents with accurate information about ICT education and careers may be necessary to maintain or generate further interest among students.

CHAPTER 5

Connecting Students to ICT Careers

At a Glance

- Discussions with students, parents/guardians, and counsellors revealed a variety of suggestions about what can be done to get students more aware of and interested in ICT education and career paths.
- Participants suggested that stakeholders develop practical, well-funded, hands-on activities and opportunities to raise awareness and improve interest among students.
- Participants indicated that unique initiatives to improve girls' awareness and interest in particular are needed.

Introduction

Students, parents/guardians, counsellors, and teachers all indicate that one of the main issues that need to be addressed is the level of students' awareness in ICT education and careers. Even among those students who have a higher-than-average level of awareness, and often emerging skills and interests in ICT, there is a sense that they need to learn more about what careers are available and how to land an ICT career.

Discussions with students, parents/guardians, and counsellors reveal a variety of suggestions about what can be done to get students more aware of and interested in ICT education and career paths. The responses converge on some common themes that all three groups appear to endorse. The ideas offered occasionally move across the six themes, and there is certainly some overlap between the themes. Yet, this reflects the need for an awareness and engagement strategy that is sensitive to the fact that not one, but multiple, challenges and barriers need to be addressed in order to improve students' pursuit of ICT education and career paths.

1. Raise Awareness and "Myth-bust"

Students, parents/guardians, and counsellors all recognize that lack of awareness is a barrier to students' pursuing ICT education and careers. Many Grade 9 and 10 students lack a basic awareness of what ICT involves and what career opportunities are available. At the same time, where there is some awareness of the field, many students, as well as parents/guardians, appear to have inaccurate and sometimes negative views about ICT careers.

Participants suggest that stakeholders take action to raise awareness and correct misperceptions about ICT. Importantly, however, students say there should be "no more pamphlets!" Information delivered in the form of pamphlets, books, and other conventional media are often ignored by students. By contrast, having people in the ICT sector visit schools and explain what they do was suggested by many participants as a more effective awareness-raising strategy. Visits such as these, along with supplementary material that can be accessed online by students, were endorsed by students, parents/guardians, and counsellors.

Raising awareness needs to be achieved through dynamic, attention-grabbing ways. And "myth-busting" the stereotype of ICT workers should involve interactions between non-stereotypical individuals in the ICT field and students.

2. Offer Practical, On-Site Learning Opportunities

Consistent with the message that learning about ICT requires engaging students on a practical level, many participants suggest that improving students' interest in ICT could be achieved by arranging opportunities for students to visit and explore workplaces "where

ICT happens" as well as longer-term opportunities to deeply engage in an ICT-related field. The basic ideas was captured well by one counsellor who said that students need to be exposed to "what is out there" and given "hands on experiences" which allow them to "see it and try it."

Ideas along this theme range from less-intensive to more-intensive options, but all involve some direct on-site interaction between students and individuals working in ICT. On the less-intensive end of the scale, some suggest organizing day-long class trips to ICT workplaces. More intensive options could include job-shadowing, co-op placements, and mentorships.

3. Provide Financial Support

Participants suggest that one of the barriers to students getting more engaged in ICT is that there simply isn't an incentive structure which would draw them in. The point is not that ICT jobs need to pay better than they do—participants generally regard ICT careers as paying average or better-than-average wages. Rather, the point is that students *as students* may need some financial support or incentive to further *explore* ICT careers or support for ICT education before they are in careers and earning wages.

In this respect, participants suggest that the ICT sector and other stakeholders offer scholarships for students to study ICT-related subjects in college or university. Additionally, employers should consider offering paid apprenticeships, internships, and short-term summer jobs so that students can experience ICT without forgoing the money that they might earn elsewhere in the meantime.

4. Offer Better Courses and Hands-on Learning Opportunities

Many participants suggest that the existing school curricula simply do not support student opportunities for sustained and engaged exploration of ICT-related education and career paths. Nor do existing high school programs allow for a rich development of ICT skills, according to many participants.

While students acknowledge that most schools offer computer science and/or information technology courses, very few think that those courses offer them a realistic picture of what ICT careers and projects would be like. Consequently, students—as well as parents/guardians and counsellors—suggest that more and better ICT-related courses should be introduced into the curriculum.

Additionally, some participants think that interest may be improved if the ICT sector organized and funded hands-on ICT-related projects and multi-school competitions. This could involve teams of students working together to produce a program, game, or some other ICT-related product as part of their course requirements and subsequently enter that product in a wider competition where other projects would be showcased and judged.

5. Improve Technical and Human Resources

Finally, just as many participants indicate that curricula and learning opportunities need to be adjusted to better engage students in ICT, many also indicate that schools need better resources through which to deliver programs and engage students.

Participants frequently suggest that the ICT sector and other stakeholders provide more and better computers to schools, as well as make more "cutting-edge" software and technology available for in-class use. A few teachers and counsellors also suggest that part of the challenge that educators lack the time and resources to improve ICT-related instruction. Researchers discovered in more than one instance that computer studies teachers were self-taught and that the only opportunities they had to improve their own knowledge and skills came on their own time.

Consequently, it was not surprising to hear from one counsellor that the ICT sector and other stakeholders should "give incentives and make workshops available for educators to be more motivated to increase their knowledge and skills in this field."

6. Break the Gender Barrier

While the suggestions offered by students, parents/guardians, guidance/career counsellors, and teachers apply to both girls and boys, a number of participants also indicate the need for specific initiatives to improve girls' interest in and awareness of ICT. The suggestions are, more often than not, oriented towards improving the image of ICT to better align with what participants perceived to be girls' interests and values. In particular, some participants indicate that ICT careers would need to be seen to be more "social" than they are at present. Participants also suggest that girls be exposed to positive female role models—i.e., women already working in the field—in order to address issues of confidence. None of the participants, however, offered further details about these or other gender-related suggestions.

CHAPTER 6

Conclusion

At a Glance

- ICT labour challenges may be less a matter of absolute labour shortages, and more a matter of a skills mismatch.
- It will be essential to ensure that those students who express interest in ICT are guided towards relevant and appropriate education and career paths so that the skills mismatch challenge can be addressed.
- The ICT sector and other stakeholders should recognize the diversity of students' motivations and design ICT attraction, education, and recruitment programs that offer a corresponding diversity of opportunities and strategies.

Skills Mismatch

Discussions about ICT talent shortages in many ways have reached an impasse because stakeholders and the public generally appear to be talking about different things. On the one hand, employers repeatedly indicate that they can't find people to fill their vacant ICT positions. On the other hand, many unemployed people with ICT skills indicate that they have difficulty finding work in their field. How can both of these things be true?

In addition to people with highly specialized ICT skills and multidisciplinary skills that combine ICT with another technical field, employers are looking for a particular mix of skills among their ICT employees—such as ICT *and* business management. In many cases, unemployed people with ICT skills simply don't have the highly specialized and/or right mix of skills needed by employers.[54] A more precise way to characterize the ICT talent gap is that the ICT sector faces a skills mismatch challenge. The problem is not necessarily a lack of people but a lack of people with the *right mix* of skills for the available positions.

Seeing the talent gap in this light has implications for how ICT employers can engage better with high school students and their parents, counsellors and teachers.

While the employment prospects in ICT are above the national average, the sector is not immune to lay-offs and unemployment. Student, parent, and counsellor concerns about the ICT sector are not unfounded. Acknowledging this reality may be a way to build greater trust between the ICT sector, students, parents, and educators.

Efforts to enhance students', parents', teachers', and others' understanding of ICT employers' needs is important. This could include articulating the idea that employers need workers who are not simply technically-oriented, but who have business and management skills as well.

Additionally, if employers have ICT needs that are not being met by those graduating from ICT-related programs then university and college programs could be re-engineered to better prepare graduates for the labour market.

[54] ICTC, *Outlook for Human Resources in the Information and Communications Technology Labour Market, 2008 to 2015*. See also Aled Blake, "Skills shortages remain as unemployment reaches two million" *Wales Online* [online]. (March 18, 2009), [cited March 20, 2009]. http://www.walesonline.co.uk/business-in-wales/business-news/2009/03/19/skills-shortages-remain-as-unemployment-reaches-two-million-91466-23179365/.

Diverse Perspectives, Diverse Strategies

Whatever strategies are chosen by the ICT sector, one thing that should be kept in mind is that students' views differ. The implications of this are not always immediately apparent.

In developing strategies to attract and recruit tomorrow's ICT workers, stakeholders might consider concentrating more of their efforts on those who can be convinced rather than those who are deeply locked into stereotypes and misinformation. Spending resources on strategies that attempt to reach all students—with the assumption that all students are potential future ICT students and workers—might be an ineffective approach.

Segmented Marketing of ICT

A more strategic approach might be to customize programs to the specific needs and attitudes of diverse student groups. In some cases, resources could be spent to sustain existing enthusiasm or guide promising students towards well-designed educational programs and suitable occupations. In other cases, students with some interest might be offered improved opportunities to try ICT in practical, hands-on environments.

The research shows that students do not view ICT through a single lens, but rather through many lenses. Even students who have an interest in and aptitude for ICT may be motivated by different factors. Consequently, one-size-fits-all programs would be less effective than customized programs for improving awareness and interest in ICT. While this may require more sophisticated thinking about the market segments that can be identified, nothing less than a sophisticated, multi-faceted approach is likely to turn the tide on low and declining ICT enrolment.

A number of exemplary practices of segmented marketing and promotion of ICT are found in the next chapter of this report: *Models of Excellence*. These models are customized to the specific needs and attitudes of different groups and are having an impact by raising awareness in ICT, building confidence, and giving individuals hands-on opportunities to discover ICT and related education and career paths.

Models of Excellence

At a Glance

- A number of innovative initiatives and models already exist that that embody the suggestion that more practical, hands-on, and well-funded ICT awareness and interesting-raising opportunities should be offered for students.
- Each of the models profiled here successfully addresses one or more of the causes of low enrolment in ICT-related education or of the ICT labour gap.
- The ICT sector and other stakeholders can modify and implement similar initiatives by adopting the advice in the "Use as a Model" section in each of the profiles.

As stakeholders in the ICT sector look towards developing strategies to address the talent gap, they may find guidance in initiatives being pursued by others to improve students' awareness and interest in ICT and related sectors. The five models of excellence profiled here are not all directly related to ICT; however, they provide ideas that could easily be modified and adopted by stakeholders in the ICT sector. In all cases, the initiative profiled addresses one or more of the challenges faced by the ICT sector and offers valuable insights about how those challenges might be overcome.

In each case, we identify the features of the initiative, the demonstrated impact and benefits that it has had, and suggestions about how others might use the initiative as a model for similar initiatives in other jurisdictions or with other motivations.

Model 1—Let's Talk Science

Overview

Let's Talk Science (LTS) began in 1991 as an outreach program which paired University of Western Ontario graduate students with teachers in local schools to raise awareness of science and to improve science literacy. Over nearly two decades of work, LTS's educational programs have reached hundreds of thousands of students and thousands of educators. Additionally, its ongoing research on how people learn science and how science programs affect children and educators ensures that its programs are designed to achieve maximum impact.

Let's Talk Science

- Let's Talk Science (LTS) is a national charitable organization that strives to improve scientific literacy among students, educators, and the general community by delivering innovative educational programs, conducting research, and engaging in advocacy.
- LTS's commitment to researching exactly how people learn science and how its programs affect participants ensures that its programs are exceptionally well-designed and effective. And its engagement with children from K to 12, as well as with those who educate them, ensures that knowledge, enthusiasm, and confidence can be sustained over time.
- http://www.letstalkscience.ca/main/

Recognized as a leader in science learning, LTS has won the Michael Smith Award for Science Promotion (1995 and 2000) as well as the Canadian Award in Aviation (1997), and was an honourable mention for the Drucker Award for Canadian Nonprofit

Innovation (1995). With staff that includes scientists, early childhood educators, and teachers, LTS is well-positioned to build and sustain bridges between the science and education communities with positive consequences for students and the general community.[55]

Objectives

LTS strives to make science "exciting, interesting and relevant for youth and educators through a range of age-appropriate, hands-on learning programs."[56] It recognizes the importance of exposure to science at a young age and to science literacy throughout life—both for those who will become scientists and for the general community. In order to overcome the "negative stereotypes, image problems and the 'fear of [science] being too difficult'" that constitute barriers to greater student participation in the sciences, LTS develops and delivers programs to students and educators that are both informative and empowering.[57] LTS hopes not only to "build the 'talent pipeline' and fuel innovation" in science, but also to ensure that science is understood and enjoyed by people in the general community.[58]

Activities

LTS offers a range of hands-on, inquiry-based programs that are targeted to young and older children, educators, and scientists. Its programs and services include:

- *The Partnership Program.* This program recruits science students to volunteer in their communities to "ignite science excitement" by facilitating hands-on activities with students, guiding field trips and laboratory tours, providing science fair mentoring, and making presentations in a variety of settings.[59]
- *Wings of Discovery*. Designed as an early learning program for use by educators in preschool and kindergarten settings, *Wings of Discovery* "enables educators to engage young children's natural curiosity about the world" and to develop their "skills, knowledge and positive attitudes…by using science as a context to integrate language, mathematics, art and music."[60]
- *Professional Learning and Training*. LTS delivers a range of workshops and learning opportunities that aim to build teachers' confidence in teaching science concepts and skills to students from kindergarten to high school.[61]

Through these and many other programs, LTS builds confidence among both students and educators, improves attitudes towards science, and contributes to the development of the conceptual and functional skills necessary for science education. Additionally, LTS devotes considerable attention and resources to research with the conviction that successful educational programs must be built on a sound understanding of how people actually learn science and on results about program performance. LTS's commitment to understanding how people learn and to understanding the impact of its programs on participants sets it apart from other science promotion organizations.

Impact and Benefits

LTS has reached an extraordinary number of students and educators during its nearly twenty years of existence. In 2005, for example, LTS set a goal for itself of increasing its overall reach by 15 per cent. By

[55] LTS, "What We Do" [online]. (2006), [cited March 12, 2009]. http://www.letstalkscience.ca/main/what_we_do/.
[56] Douglas Watt, *Let's Talk Science: Making Science Education Exciting, Relevant and Rewarding,* (Ottawa: The Conference Board of Canada, 2001), p. 1.
[57] LTS, *2006/2007 Annual Report*, [online]. (2007), [cited March 12, 2009]. http://www.letstalkscience.ca/main/images/stories/aboutus/LTSnewsroom/06_07_Annual_Report.pdf.
[58] LTS, *2006/2007 Annual Report.*
[59] LTS, "The Partnership Program" [online]. (2006), [cited March 12, 2009]. www.letstalkscience.ca/main/the_partnership_program.
[60] LTS, "Wings of Discovery" [online]. (2006), [cited March 12, 2009]. www.letstalkscience.ca/main/wings_of_discovery%AE/.
[61] LTS, "Professional Learning and Training" [online]. (2006), [cited March 13, 2009]. www.letstalkscience.ca/main/professional_learning_%26_training/.

2006, LTS reported that it had exceeded those targets. By expanding its pool of volunteers to 1,258, LTS experienced a 32 per cent increase over the previous year. Moreover, it delivered its various programs to over 93,000 individuals that year—a 22 per cent increase over the previous year.[62] In general, LTS reaches approximately 100,000 students and educators through one or more of its many high-quality programs each year.

While the extent of its reach alone is worth acknowledging, what is especially notable about LTS is the high quality and significant impact of its programs for participants. For example, LTS's *Wings of Discovery Kindergarten Resource* underwent a rigorous national review by educators and was found to be a very well-designed and useful program. A teacher with the Toronto District School Board observed that the program is "an inspiring resource overall…a wonderful way for all students to have the opportunity for success in learning science and technology."[63] LTS routinely reviews its programs and adjusts them in order to ensure that they are as effective and engaging as possible.

Use as a Model

While LTS is focused on science more broadly, and not ICT specifically, it nevertheless offers a stellar model that stakeholders in the ICT sector may wish to emulate. Certain key features of the model are worth special attention:

- *Evidence-based program design.* LTS is committed to testing the impact and appropriateness of its programs for students and educators. A research agenda which explores how learning occurs, how attitudes are formed, and which links program design to measured impacts and outcomes, helps to ensure that money spent on awareness-raising and education activities will have an excellent return on investment.
- *Early-age engagement.* LTS is a national organization that reaches students of all ages. In this respect, LTS reaches into education pathways early enough to challenge stereotypes and other barriers before they take firm hold among students.
- *Teaching the teachers.* By offering programs that help teachers develop the skills and confidence to teach science, LTS increases the chances that its efforts will extend beyond the immediate life of any given program. And it ensures that efforts to challenge barriers among students are matched by changes among educators level. In short, it helps to develop the infrastructure necessary to improve science literacy and enthusiasm.

There are many other features of the LTS model worth exploring, and stakeholders in the ICT sector interested in developing a similar model should examine those other features carefully.

[62] LTS, *2005/2006 Annual Report*, [online]. (2006), [cited March 13, 2009]. http://www.letstalkscience.ca/main/images/stories/aboutus/LTSnewsroom/LTS_Annual_Report_05-06.pdf.
[63] LTS, *2005/2006 Annual Report*.

Model 2—CEMC Seminar in Computer Science for Young Women

Overview

In 2009, the Centre for Education in Mathematics and Computing (CEMC) at the University of Waterloo will host 48 grade 9 and 10 girls from across Canada as they participate in week-long seminars "focus[ed] on learning about computer science in a cooperative and supportive atmosphere."[64] The aim is "to spark interest in computer science among young high school girls, so that they might consider taking computer science courses at the high school level." Indications are that the seminar is achieving that aim.[65]

Objectives

The seminar was originally launched in 2002 as the J.W. Graham Seminar and was later known as the Imperial Oil Seminar in Computer Science for Young Women in recognition of funding provided by Imperial Oil to run the seminar from 2003 to 2007. In its first year, the seminar attracted over 800 applications for 40 positions, and has received between 300 and 900 applications per year since then.[66] A portion of a recent $12.5 million grant from the Bill and Melinda Gates Foundation to CEMC will be used to run the seminar for the foreseeable future.

In addition to offering some initial exposure to and training in computer science, the program attempts to change the misperception that women are unsuitable for computer science and engineering careers. Sandy Graham, the coordinator of the seminar, emphasizes that the program is "about changing the image that computer science has among girls at the grassroots. If these girls get the word out around their schools that computer science is a viable career option for women, then we have accomplished our goal."[67]

CEMC Seminar in Computer Science for Young Women

- Summer camp hosted by the University of Waterloo for girls in grades 9 and 10 that aims to spark interest in computer science and challenge stereotypes and barriers to women's participation in computer science.
- Participants learn that computer science is about more than just programming and using computers; they are mentored by female faculty and graduate students; and they build confidence in their capacity to pursue science.
- http://cemc.uwaterloo.ca/events/csgirls.html

Activities

The core elements of the seminar are to introduce girls to programming and digital hardware concepts through lectures, practical activities, and labs. Participants gain familiarity with basic programming concepts and produce programs "with real functionality."[68] Additionally, in the digital hardware sessions, participants learn about and create simple and complex circuits. Organizers of the seminar believe that the curriculum offers a window into the sorts of things that students would do in high school computer science courses and thus gives participants an opportunity to decide whether such courses would suit them.

The organizers also plan a range of activities that serve to create a more appealing image of technology careers for young women, including empowerment

[64] Catherine Teasdale, "Booting Up Girls' Interest in Computer Science," *Imperial Oil Review* 2 [online]. (2004), [cited March 16, 2009]. www.imperialoil.ca/Canada-English/thisis/publications/2004Q2/pdf/Eng-science.pdf.
[65] CEMC, "Imperial Oil Seminar in Computer Science for Young Women" [online] (November 13, 2006), [cited March 16, 2009]. http://www.cs.uwaterloo.ca/prospect/liaison/imperialOil/.
[66] Sandy Graham, "CS Girls Rock". Presentation at the Computer Science & Information Technology Symposium—Norfolk, Virginia [online]. (March 4, 2004), [cited March 16, 2009]. csta.acm.org/csits/presentations/graham.ppt.
[67] Graham quoted in Teasdale, "Booting Up Girls' Interest in Computer Science".
[68] Sandy Graham, "Expanding the Pipeline: Waterloo Offers CS Seminar for High School Girls". *Computing Research News* 16 (1). [online]. (January 2004), [cited March 16, 2009]. www.cra.org/CRN/articles/jan04/graham.html.

and team-building activities, and activities designed to dispel myths about technology-related education and career paths held by girls, their parents, and others. These include:

- off-campus outings including plays at the Stratford Festival and rock climbing which helps to build camaraderie and positive attitudes among the young women;[69]
- the delivery of lectures and courses, where possible, by female faculty and graduate students at the university, thereby presenting participants with positive female role models in computer science.
- a family and faculty banquet which allows parents to see their daughters in a computer science milieu and to interact with successful women who have established exciting careers in computer science.[70]

Impact and Benefits

The young women who attend the summer seminar report that they are very pleased with the experience. One participant from Saskatchewan typifies the response of many girls. Before attending the seminar she thought that computer science was "a boring, antisocial and pretty limited field" and that "computer scientists were people who fixed computers". After the seminar, however, she noted that "I know now that isn't the case. You can work in just about any area with computer science."[71]

Survey results which track the impact of the program have been collected since 2002. Surveyed prior to the 2007 seminar, only 35.4 per cent of participants said that they expected to take a computer science course in their high school. At the end of the seminar, 61.5 per cent said that they would. Consistently impressive results have been achieved in each of the other six summers during which the seminar was held.[72] By creating a positive environment for young women to experiment with computer science, the summer seminar helps to counteract the negative stereotypes and barriers experienced by women in the computer science world.

Use as a Model

Stakeholders in the ICT sector may want to replicate the program with a focus on ICT. To do so, a number of factors should be considered:

- The seminar costs approximately $80,000 to run each year, with travel costs for attendees as the largest expense.[73] In order to keep costs to participants at a minimum (currently $150 per participant plus personal expenses), funding from external sources is critical. The University of Waterloo has managed to secure funding for its program in all years from a variety of sources. The $12.5 million grant to CEMC by the Gates Foundation ensures that the CS Seminar and other programs can be sustained.
- A successful program of this kind also requires the identification of instructors, especially women, who have the necessary expertise and who can act as role models. The University of Waterloo has both; other institutions can meet this need also.
- Finally, the assistance and support provided to applicants and participants by their high school teachers and counsellors, as well by their parents, is important. In some cases, potential participants had no plans to apply until their own teachers encouraged them to do so.

With so many applications received each year from across the country for this impressive but small program, there is obviously room for other corporate sponsors and universities to partner in creating programs with similar objectives and activities.

[69] Teasdale, "Booting Up Girls' Interest in Computer Science."
[70] Graham, "CS Girls Rock."
[71] Quoted in Teasdale, "Booting Up Girls' Interest in Computer Science."
[72] Sandy Graham. Email communication with Daniel Munro. March 9, 2009.
[73] Sandy Graham. Email communication with Daniel Munro. March 9, 2009.

Model 3—CEMC Summer Institute for Teachers of Computer Science

Overview

Throughout the research project, one concern that was raised by many students, counsellors, parents, and teachers is that educators often lack the resources needed to successfully raise awareness of and improve students' interest in ICT. In some cases, this is attributed to a lack of access to physical resources, such as computers, while in other cases it is a lack of skills and pedagogical resources to teach ICT-related subjects properly.

The Summer Institute for Teachers of Computer Science hosted by Centre for Education in Mathematics and Computing (CEMC) at the University of Waterloo offers a solution to part of the problem. Now in its tenth year, the CEMC Summer Institute gathers up to sixty computer studies educators for four days of intensive seminars, collaboration, and informal networking, to develop and share innovative ways to teach high school computer science and engineering.

Objectives

The Summer Institute was launched in 2000 at the University of Waterloo by the CEMC and the Association of Computer Studies Educators (ACSE). From 2003 to 2007, the program was known as the Imperial Oil Summer Institute for Computer Studies Teachers, in recognition of funding provided by Imperial Oil during those five years. The Summer Institute is now supported by a portion of the same $12.5 million grant from the Bill and Melinda Gates Foundation to CEMC that is also used to support the Seminar in Computer Science for Young Women.

The CEMC Summer Institute "is intended to provide educators with activities useful in the computer science and computer engineering classrooms." It aims to provide attendees with a forum to discuss curriculum issues and opportunities for educators to share teaching and learning strategies.[74]

CEMC Summer Institute for Teachers of Computer Science

- The Centre for Education in Mathematics and Computing at the University of Waterloo hosts an annual Summer Institute for Teachers of Computer Science which offers teachers a chance to learn about new technologies, teaching techniques, and to share challenges and solutions for teaching computer science in high school.
- The strength of the program is that it offers teachers—one of the major groups of influencers of students' education and career paths—a way to maintain their awareness of and expertise in computer science so that they can more effectively communicate the importance and excitement of the field to students.
- http://cemc.uwaterloo.ca/events/csteachers.html

Activities

Computer science educators gather each August at the University of Waterloo and spend four days "living on campus, networking with other teachers, learning new skills and brainstorming classroom activity ideas."[75] In addition to participating in learning sessions on technical and programming issues—such as sessions on Java and Turing programming, setting up networks, and interfacing—teachers also participate in roundtable discussions about the challenges of teaching computer science in high school.

Presenters are recruited from among retired high school teachers, current high school teachers, faculty members and graduate students from the University of Waterloo, and graduate students from the University

[74] Sandy Graham, "Strategies for Implementing the Curriculum for Computer Science and Computer Engineering" [online]. (2008) [cited March 17, 2009]. http://cemc.uwaterloo.ca/events/CSteachers_program_2008.pdf.

[75] CEMC, "Summer Institute for Computer Studies Educators," [online]. (2009), [cited March 17, 2009]. http://cemc.uwaterloo.ca/events/csteachers.html.

of Toronto and Ryerson University.[76] The coordinator of the Institute, Sandy Graham, notes that "since the focus is implementing the curriculum in the classroom, high school teachers are most likely to have the tools and strategies to share with other high school teachers. However, we do invite university…and college faculty members to present sessions." Consequently, the Institute offers an excellent opportunity for teachers to learn not only from other teachers who "are most likely to have the tools and strategies to share with other high school teachers," but also from those who are conducting innovative research in academia.[77]

Additionally, participants are asked to share with other participants at the Institute a resource they have developed and/or use as part of the classroom implementation of the computer studies curriculum. This could include a lesson plan for a unit, a program, a website, or some other tool used in the classroom. The resources are shared and discussed during the Institute and, afterwards, are compiled on a CD and uploaded on a website which allows all other teachers across the province to access the materials.[78] Along with post-Institute Facebook groups for each year, the shared resource website offers attendees and others a way to continue to share their challenges and solutions to teaching computer science in high school.

Impact and Benefits

According to Graham, the Summer Institute is viewed by many as "the only chance the participants have to network with teachers in their own subject areas, because they are often isolated in their schools."[79] One participant indicated that "this is essential [professional development] for computer studies teachers who often work in isolation."[80] By bringing together teachers who face the same issues and who need to develop strategies to deliver computer science curriculum in the high school, the Summer Institute offers a valuable way for teachers to develop new skills and confidence for the classroom.

The compilation of resources developed and shared by participants is another key benefit of the program. Websites for each of the previous nine iterations of the Summer Institute are maintained allowing participants and others access to the presentations and resources that have been shared over the years.[81] Moreover, the CEMC is planning to compile all of the resources that have been collected over the years into a more user-friendly and searchable format.[82]

Surveys of participants following the four-day events reveal that over 90 per cent feel that the Summer Institute is very to extremely useful, would recommend it to their colleagues, and plan to share resources and what they've learned with their colleagues.[83] In general, the Institute offers a way to engage with and educate the educators who play a significant role in the extent and quality of exposure to computer science students receives and, consequently, a significant role in the level of interest and enthusiasm students have for education and careers in the field.

Use as a Model

Stakeholders in the ICT sector may want to replicate the program with a focus on ICT. To do so, a number of factors should be considered:

- While travel and registration costs are paid by participants, other costs associated with organizing and running the Institute amount to between $30,000 and $40,000 each year.[84] The

[76] Sandy Graham, "CEMC Summer Institute 2008," [online]. (2008), [cited March 17, 2009]. http://cemc2.math.uwaterloo.ca/csteachers/Institute2008/index.html.
[77] Sandy Graham. Email communication with Daniel Munro. March 17, 2009.
[78] For examples of shared resources, see http://cemc2.math.uwaterloo.ca/csteachers/Institute2008/index.html.
[79] Sandy Graham, "Imperial Oil Summer Institute for Computer Studies Educators" (August 2007). On file with author.
[80] Quoted in Graham, "Imperial Oil Summer Institute for Computer Studies Educators."
[81] Available at http://cemc.uwaterloo.ca/events/csteachers.html.
[82] Sandy Graham. Email communication with Daniel Munro. March 17, 2009.
[83] Sandy Graham. Email communication with Daniel Munro. March 17, 2009.
[84] Sandy Graham. Email communication with Daniel Munro. March 17, 2009.

CEMC at the University of Waterloo uses a portion of a $12.5 million grant from the Bill and Melinda Gates Foundation to support the Institute.

- Organizers of the institute note that collaboration is an essential element of success. Members of the ACSE, faculty and graduate students from the University of Waterloo and other schools, and teacher-participants themselves contribute to the expertise and resources available to attendees.
- Finally, because curricula differ across provinces, a program oriented around a specific curriculum would need to limit participation to teachers in a single province. In considering possible replication, then, stakeholders in the ICT sector might consider creating an institute for each province, thereby ensuring relevance to specific curricula; or orienting an institute towards a more general focus on technology and pedagogical resources with applicability across provinces.

In any case, a program which reaches out to teachers to provide them with knowledge, skills, and practical resources that they can use in the classroom would certainly improve their enthusiasm about and ability to teach computer science or other ICT-related subjects. In turn, well-prepared and enthusiastic teachers are likely to generate a similar enthusiasm among students in computer science or other ICT-related education and career paths.

Model 4—Techsploration

Overview

Techsploration offers girls in high school (primarily Grade 9) opportunities to explore careers in trades and technology through research, interaction with female mentors in the field, worksite visits, and a two-day conference. Having successfully completed ten years of activities, *Techsploration* continues to offer an inspiring model of a hands-on, mentorship-based, approach to improving girls' interest in trades and technology careers.

The program is administered by the Women in Resource Development Committee (WRDC) which was established to "foster an environment that will increase the participation of women in the trades and technology sectors in Newfoundland and Labrador."[85] The WRDC provides training opportunities for women, educates the public, and advocates for policies that would promote women's participation in the trades and technology sectors.

Objectives

Recognizing that women's participation in the trades and technology sectors is low and that women face considerable barriers to participation, the WRDC creates and supports programs that address those barriers and improve participation. Special emphasis is placed on improving opportunities for women and girls in low-income situations, rural communities, and women and girls from the Aboriginal and Francophone communities of Newfoundland and Labrador.

Techsploration aligns with those aims by providing young women in high school (especially Grade 9) with opportunities to explore science, trades, and technology occupations, while generating awareness about the critical role of work in their lives.[86] In particular, *Techsploration* aims to:

Techsploration

- Techsploration was launched in 1998 to allow Grade 9 girls in Newfoundland and Labrador opportunities to explore careers in the trades and technology sectors and to challenge stereotypes and barriers that undermine women's participation in these sectors.
- Through research, mentoring, and worksite visits, participants become "experts" on a particular career and present their findings to their peers. As a result, Techsploration improves girls' knowledge and confidence, thereby increasing their likelihood of enrolling in math and science courses in high school and pursuing trades and technology careers.
- http://www.techsploration.ca/

- introduce girls to in-demand trades and technologies careers;
- increase girls' knowledge of how to research a technology or trades career;
- demonstrate to girls the value of taking science, math, technology and trades courses to keep all their career options open; and
- provide positive interactions with female role models working or training in trades and technology careers.[87]

Activities

Techsploration's 6-month program brings together teams of six girls with a teacher and female role models already working in one of the relevant fields. Each student in the team researches a trades or technology occupation which includes an interview with a female role model and a worksite tour. Additionally, participants are introduced to and

[85] Women in Resource Development Committee, "About Us" [online]. (Undated), [cited March 13, 2009]. http://www.wrdc.nf.ca/aboutus.htm.

[86] Techsploration, "Overview" [online]. (Undated), [cited March 13, 2009]. http://www.techsploration.ca/Program%20Overview.htm.

[87] Techsploration, "Program Goals and Objectives" [online]. (Undated), [cited March16, 2009]. http://www.techsploration.ca/Program%20Overview.htm.

trained in the use of a career planning tool that they can use to make education and career decisions.

After four months of research, the teams come together in St. John's for a "Techsplorer' Event" where, over a day and a half, they share their findings through multi-media presentations, learn from each other, and interact with the role models. Additionally, the event "expands on and reinforces the information provided in the student presentations by providing an opportunity for each girl to attend a one-hour workshop with their mentor, followed by activities designed to introduce the girls to all the team role models."[88]

After the "Techsplorer's Event", participants return to their schools to share their findings and experiences with their other schoolmates during the "Techsploration Goes to School" stage of the program.[89] By the time the girls make their presentations, they have acquired an "expert" knowledge and self-assurance that allows them to make those presentations to their peers with great confidence. That experience is expected to further reinforce knowledge gained and to help dispel myths and stereotypes about women's capacity to understand and pursue trades and technology careers.

Impact and Benefits

Over the past ten years, *Techsploration* has been offered to girls in over two dozen schools across the province, including many schools in rural communities, three First Nations schools, and an Acadian school.[90] Over 500 girls have participated on *Techsploration* teams and "it is estimated that 10,000 students in Grades 7-12 have attended the annual 'Techsploration Goes to School presentations', which include[s] access to female role models and guests who [field] questions about their respective occupations."[91]

A study of the impact of *Techsploration* conducted in 2005 revealed that the program is achieving its objectives. In particular, for girls who had participated, the program:

- increased their level of interest in trades, technical, technology, and science-related occupations;
- increased knowledge about specific careers in these fields;
- fostered a positive attitude towards pursuing math and science courses in high school;
- led them to question stereotypes around gender roles in employment; and
- improved confidence in their aptitudes and abilities.[92]

Additionally, parents and teachers indicated that the program is valuable not only for students, but for them as well. Some parents reported that "they got to know their daughters better and became aware of talents that surprised them." And many teachers said that the program "enhanced their ability to inform students about a wider range of career opportunities."[93] Participating employers also benefit by making contributions to the development of the labour force generally, and also have opportunities to build relationships with specific individuals who may be recruited in the future.

Use as a Model

The *Techsploration* experience reveals the importance of having a dedicated administrative staff and resources to carry out critical functions. Additionally, the model reveals the importance of the following

[88] WRDC, "Techsploration" [online]. (Undated), [cited March 13, 2009]. http://www.wrdc.nf.ca/tech/info.html.
[89] WRDC, "Programs: Techsploration" [online]. (Undated), [cited March 13, 2009]. http://www.girlsintrades.com.
[90] Government of Nova Scotia, "Province Helping Young Women Explore Career Opportunities" [online]. (April 4, 2006), [cited March 13, 2009]. http://www.gov.ns.ca/news/details.asp?id=20060404002.
[91] Madeline Comeau, *Benefits of the Techsploration Program: A Study of Two Rural Schools in Nova Scotia*, [online]. (September 2005), [cited March 13, 2009]. http://www.techsploration.ca/Program%20Overview%20Assets/Benefits%20of%20Techsploration.pdf, p.1.
[92] Comeau, *Benefits of the Techsploration Program*, p. ii.
[93] Ibid.

considerations for anyone wishing to emulate the program:

- *Stable funding.* Identifying and securing funding will be an ongoing challenge in replicating the *Techsploration* model. *Techsploration* itself is supported by provincial funding and has developed a stable base of corporate sponsors which has grown as its own success and reach has improved.

Finding role models/mentors. The success of *Techsploration* depends to a great extent on its ability to identify and recruit engaging female role models. A network of corporate sponsors and supporters has been developed that is often called upon by *Techsploration* staff to suggest names of potential role models in trades or technology occupations. Programs modeled on *Techsploration* would need to develop and draw on its own networks to find and recruit role models.

Model 5—Innovative Technology Experience for Students and Teachers (ITEST)

Overview

The Innovative Technology Experiences for Students and Teachers (ITEST) program was established in 2003 by the U.S. National Science Foundation to fund, support, and study initiatives that engage school-age children and teachers in science, technology, engineering, and mathematics (STEM), and information and communication technology (ICT) activities. ITEST does not constitute a single initiative. Rather, it acts as an overarching mechanism through which promising initiatives can be found and supported, and through which effective practices can be identified and disseminated.

Objectives

ITEST—formerly the Information Technology Experiences for Students and Teachers—is part of a national strategy to enhance participation in STEM and ICT sectors. It aims to "examine the most current practices in STEM education and workforce development" with a view towards identifying effective practices and encouraging their adoption more broadly.[94]

In particular, the goals of the ITEST program include:

- developing, implementing, studying and evaluating strategies that encourage K-12 students to be intellectually prepared for careers in information technology and STEM fields and considering careers in those fields;
- developing strategies that equip teachers with the resources to ensure that their students consider and are prepared for choosing to enter the STEM workforce; and
- producing research tools and research findings that build the knowledge base about approaches, models and interventions with K-12 aged children and teachers that are most likely to increase U.S. capacity in the STEM workforce, including ICT fields.[95]

Innovative Technology Experiences for Students and Teachers (ITEST)

- Established and funded by the U.S. National Science Foundation, ITEST aims to support and study educational initiatives that improve students' and teachers' awareness, expertise, and interest in science, technology, engineering and math (STEM) and information and communications technology (ICT) careers.
- ITEST is unique in that it provides a supporting architecture for grassroots initiatives, but does not run the initiatives itself. Instead, its role is focused on finding, supporting, and evaluating initiatives in order to identify effective practices and to encourage wider dissemination and adoption of those practices.
- http://www2.edc.org/ITESTLRC/default.asp

Activities

ITEST activities fall into two broad, but related, categories—namely, program-funding and program-assessment.

1. Program-Funding

ITEST "funds projects that provide opportunities for both school-age children and teachers to build the skills and knowledge needed to advance their study and to function and contribute in a technologically rich society."[96] Programs are identified through a regular "program solicitation" process, supported by the NSF, which offers individuals and groups a chance to apply for funds to pursue initiatives that align with ITEST's objectives. The most recent call

[94] Education Development Centre, *Preparing Tomorrow's STEM Workforce Through Exploration, Equity & Engagement: Five Years of Innovative Technology Experiences for Students and Teachers* [online]. (2009), [cited March 16, 2009]. http://www2.edc.org/ITESTLRC/Materials/Preparing_Tomorrow's_STEM_Workforce_v1.pdf.

[95] National Science Foundation, "Innovative Technology Experiences for Students and Teachers (ITEST): Program Solicitation NSF 09-506" [online]. (2008), [cited March 16, 2009]. http://www.nsf.gov/pubs/2009/nsf09506/nsf09506.pdf.

[96] ITEST, "What is the NSF ITEST Program?" [online]. (2009), [cited March 16, 2009]. http://www2.edc.org/ITESTLRC/about/default.asp.

for applications indicates that between 25 and 40 initiatives will be awarded funds and that over $35 million is available to those initiatives over a two-year cycle.[97] Recent initiatives include:

- an Austin, TX program in which 100 middle and high school girls use computer visualizations and game development tools to create solutions to global warming and other real-world problems while learning science, math and engineering;
- a program in eastern Washington state which supports 180 middle school students from rural schools to participate in community-focused projects using GPS, programming, robotics, and 3-D modeling; they receive mentoring and college preparatory support to increase interest and achievement in STEM education and careers; and
- a Hartford, CT program in which 300 high school students gain IT skills by producing a DVD on IT careers and by refurbishing computers for donation.[98]

2. Researching and Sharing Effective Practices

ITEST also follows and analyzes the performance and outcomes of the various initiatives with a view towards identifying general principles of successful program design and effective practices that should be emulated by others. A National Learning Resource Center was established to evaluate ITEST-sponsored programs, to build a "community of practice" that allows for collaboration and cross-project sharing of effective practices, and to disseminate knowledge.[99] ITEST produces publications, hosts online dialogues and listservs, and organizes numerous conferences and webinars each year that bring together ITEST staff, initiative creators and managers, and others to discuss projects and lessons learned.

The simultaneous focus on both program support and program evaluation ensures that resources are used in effective ways and that future programs addressing STEM and ICT labour shortages are designed for maximum effectiveness.

Impact and Benefits

As a national program with significant federal funding, ITEST's activities reach a sizable and broad demographic. During its first six years of operation, ITEST-sponsored programs have reached:

- 158,200 students, Grades 6-12;
- 4,700 teachers; and
- 1770 parents and caregivers.[100]

Each sponsored program is evaluated by ITEST and the results vary. ITEST has created an "Online Evaluation Database" that not only houses results of program evaluations, but also tools that can be used to improve existing, and to design new, programs. The Database is not accessible to the general public, but evaluations of a few programs can be obtained.[101]

Use as a Model

The model highlighted here is ambitious and expensive. Unlike the other models profiled in the report, ITEST represents an extremely well-funded national-level approach to addressing labour shortages in STEM and ICT. Recognizing the significant challenges that one would face in developing a comparable model in Canada, ITEST nevertheless offers an example of a strategy that may be required in the Canadian context if significant, long-term improvements are to be made to the ICT talent gap.

[97] National Science Foundation, "Innovative Technology Experiences for Students and Teachers (ITEST): Program Solicitation NSF 09-506."
[98] ITEST, "ITEST Snapshot" [online]. (2009), [cited March 16, 2009]. http://www2.edc.org/ITESTLRC/Materials/ITESTSnapshot_2009.pdf. Abstracts for all programs funded by ITEST since 2003 can be found at: http://www2.edc.org/ITESTLRC/Materials/Project_Abstracts_for_C1_2_3_4_5_6.pdf.
[99] ITEST, "What is the NSF ITEST Program?"
[100] Education Development Centre, *Preparing Tomorrow's STEM Workforce*, p. 6.
[101] Leslie Goodyear and Bethany Carlson, "The ITEST Learning Resource Center's Evaluation Database: Examples from the Collection," *International Journal of Technology in Teaching and Learning* 3 (1) [online]. (2007) [cited March 16, 2009]. http://www2.edc.org/ITESTLRC/events/goodyear_carlson_evaldb.pdf.

To replicate the model, a number of elements would need to be put in place, including:

- *Government support.* ITEST has significant support from the U.S. Government. In addition to the funding offered by the NSF (approximately $120 million over 5 years), having the support of a national government agency allows for easier interaction with the schools where programs are conducted and evaluated.
- *Program Evaluation.* An approach that ties evaluation and iterative learning to initiative design and delivery will achieve better results than approaches that simply offer money with no follow-up. ITEST has an expert staff that collects, synthesizes and analyzes results from the various initiatives that it sponsors. In the absence of such a research capacity, the rigorous identification of effective practices and general principles of program design would be difficult, if not impossible to achieve.
- *Availability of initiatives to support and study*. The success of ITEST's activities ultimately depends on an ability to locate candidate initiatives to support and study. If no such initiatives are available or can be found, then ITEST and programs modeled on it would be at risk of failure. Fortunately, the funding that ITEST can offer to candidate initiatives, combined with the reach afforded it by a national organization like the NSF, creates an incentive and opportunity structure for creators and managers of candidate initiatives to find ITEST rather than vice versa.

APPENDIX A:

Research Methodology

The Conference Board employed a multi-faceted research methodology, the core of which was a set of conversations with 1034 Grade 9 and 10 students in five cities across Canada about their awareness of, and attitudes towards, ICT education and careers, and about their career aspirations and values more generally.

Additionally, the views of parents/guardians and guidance/career counsellors about ICT education and careers were collected in order to determine what messages students might be receiving from two of their main education and career "influencers."

Students

The dialogues, surveys, and interviews entailed both closed- and open-ended questions, and were guided by five fundamental questions:

- How *aware* are students of ICT education and career paths?
- What are students' *opinions* about those education and career paths?
- To what extent do students' general career aspirations and goals *align* with their perceptions about ICT careers in particular?
- Who or what are the main *influencers* of students' perceptions and decisions, and what *messages* are they receiving about ICT education and career paths from the influencers?
- What more might be done by schools, employers and others to get students more interested in ICT education and career pathways?

Participating Schools

Halifax
- West Halifax
- Prince Andrew
- Citadel High
- Sir John A MacDonald
- J.L. Isley

Montreal
- Collège Français

Toronto
- Bloor Collegiate Institute
- Jarvis Collegiate Institute
- Georges Vanier
- Bishop's Strachan School
- Toronto French School

Calgary
- Bowness
- Woodman
- E.P. Scarlett
- Simon Fraser
- Ernest Manning
- Western

Vancouver
- Templeton
- Gladstone
- Point Grey
- Prince of Wales

The participating classes were drawn from schools in Halifax, Montreal, Toronto, Calgary, and Vancouver and included students in both public and private school systems, and classes in both English and French. The dialogues engaged both male and female students in a variety of class subjects—including arts and social sciences, math, science, and information technology—and occurred in schools in diverse socio-economic and ethno-cultural contexts.

City, Gender and Class Characteristics of Respondents

	Total Students	Gender			# Classes	# Students by Type of Class		
		Male	Female	N/A		Career Classes	IT Classes	Other Classes
Halifax	**243**	141	85	17	**11**	0	200	43
Montreal	**95**	47	48	0	**3**	65	0	30
Toronto	**99**	31	41	27	**6**	29	0	70
Calgary	**286**	168	96	22	**12**	90	124	72
Vancouver	**209**	132	67	10	**8**	124	85	0
Private Schools*	**102**	29	72	1	**6**	53	0	49
Total	**1034**	**548**	**409**	**77**	**46**	**209**	**561**	**264**

* Private school students were all located in Toronto.

Source: The Conference Board of Canada, 2009.

An examination of the characteristics of respondents reveals that the sample population is diverse, with a good distribution of students in career, IT, and other classes. (See Table, "City, Gender, and Class Characteristics of Respondents").

While there are more male respondents than female respondents, there is a reasonable proportion of each. Moreover, the analysis in the report frequently distinguishes male and female responses, and unpacks any potential skewing of the results as a consequence of gender imbalance.

In all cities, researchers visited numerous schools and classes. In Montreal, however, researchers visited a single school and three classes due to onerous procedures for research approval. Recognizing the potential for biased results, we systematically controlled for as many variables as possible to ensure that the Montreal results were reliable.

With Montreal students exhibiting greater enthusiasm for ICT than their peers elsewhere, the concern was a pressing one. Note, however, that of all the cities visited, Montreal had the most even gender balance—which suggests that the enthusiasm was not simply a function of a high proportion of male respondents in the sample. Similarly, none of the classes surveyed in Montreal were IT classes, so the enthusiasm was not a function of class subject. Nonetheless, because the students surveyed in Montreal had views which differed from their peers in most cities, a follow-up study might be helpful.

The private schools we visited were in Toronto, but they are *not* included in the Toronto results. Results from the private schools should be taken with caution given the high proportion of girls in the sample. And the generally negative view that these students offer of ICT is likely more a consequence of gender than it is of the nature of private schools themselves.

Parents

The perspectives of parents were gathered through an online survey and some open-ended interviews. 60 parents responded to the survey. 30 surveys were completed while partial results were obtained from the remaining 30 responses. Parents were recruited for the survey through invitations delivered by students.

Of the 30 completed surveys completed, 12 were submitted by male parents and 18 were submitted by female parents. The respondents held a broad range of occupations; however, no information about age, region, educational attainment, or socio-economic status was collected.

The results of the parents' survey may be influenced to some extent by a response bias— those parents who responded were *self*-selected. However, the results themselves reveal a wide distribution of perceptions and attitudes towards ICT which suggests that the self-selection of parents may not have resulted in any significant skewing of results.

To better understand parents' perceptions and the extent of their influence on students' perceptions and choices, an additional study with a larger sample of parents is advisable.

Counsellors

The perspectives of counsellors were gathered through an online survey. 54 counsellors responded to the survey. 26 surveys were completed while partial results were obtained from the remaining 28 responses. Counsellors were recruited from the schools that researchers visited, as well as through an invitation sent by the Canadian Counselling Association to its members.

The 26 respondents who completed the survey were from urban (54 per cent), suburban (15 per cent) and rural schools (27 per cent). 35 per cent indicated that the school at which they work offers IT/ICT courses while 27 per cent indicated that their school does not offer such classes. 38 per cent were unsure.

No information about counsellors' age, gender, region, socio-economic status was collected.

Again, because the respondents were self-selected, there is a response bias risk. With the respondents displaying great enthusiasm for ICT generally (i.e., 58 per cent indicated that ICT is very appealing), researchers wondered whether only those counsellors who already have an interest in ICT responded thereby skewing the results.

However, when asked to compare ICT with other career options, counsellors overwhelmingly indicated that ICT was equally or less appealing than other career options (such as engineering, arts, law, environment, skilled trades, science, and medicine). This suggests that the counsellors who responded, while generally enthusiastic about ICT, are not simply ICT cheerleaders. If anything, the general enthusiasm for ICT is a signal about counsellors' enthusiasm for *all* career options rather than a bias towards ICT in particular.

To better understand counsellors' perceptions and the extent of their influence on students' perceptions and choices, an additional study with a larger sample of counsellors is advisable

APPENDIX B:

Selected Data

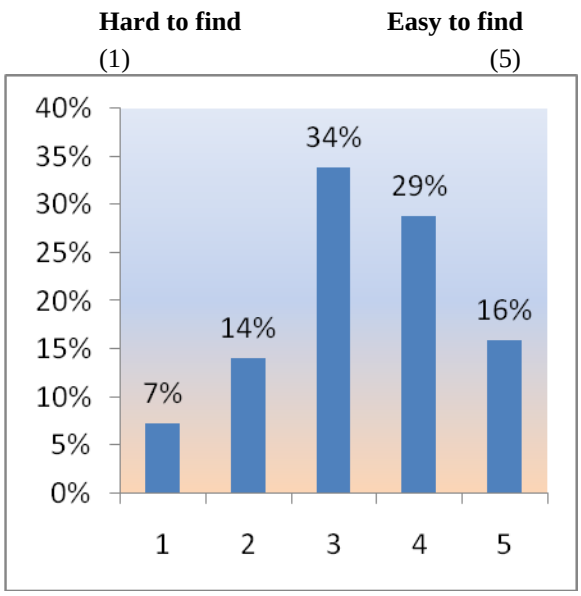
One of the most important questions for determining why students are or not attracted to ICT jobs and careers involved asking them to offer their evaluations of 13 distinct characteristics of ICT careers. (See Question 3.4 in the Student Exercise Book reproduced in Appendix C).

While there were many regional and gender differences in the results, it is helpful to have readily accessible national results. The percentages in the graphs below will not add to 100 per cent because They do not include the percentage of 'no responses' which were consistently between 14 per cent and 16 percent on each question.

Analysis of the results reproduced in the graphs can be found in Chapter 3—What Canadian Students Say About ICT Education and Careers (especially pages 20-24).

B1—Job Availability

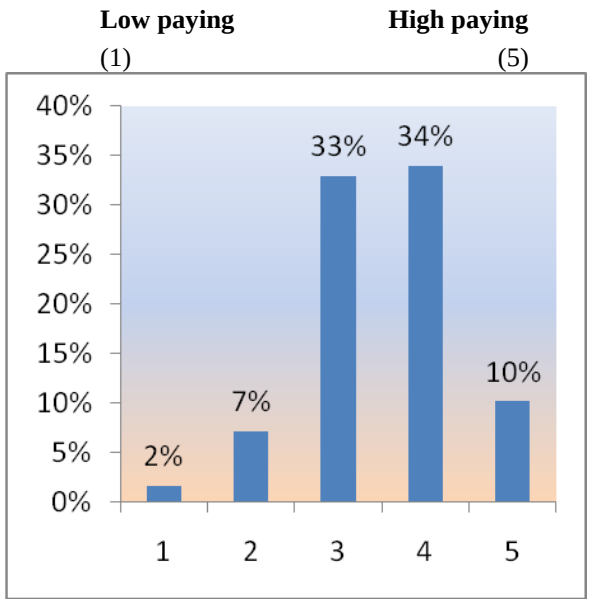
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B2—Pay

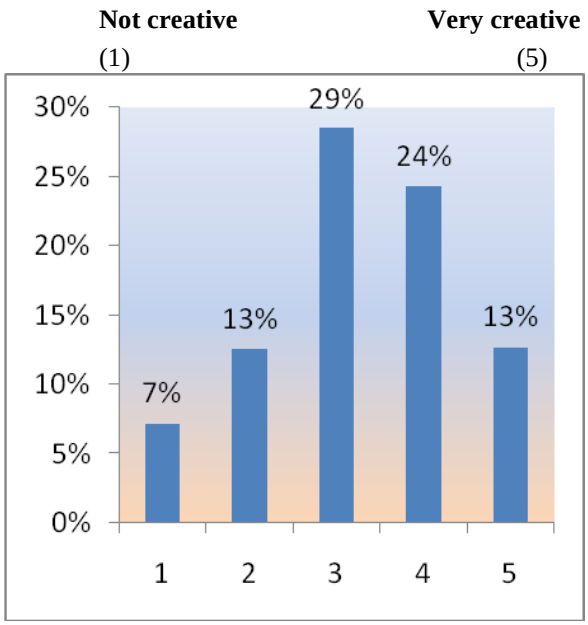
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B3—Creativity

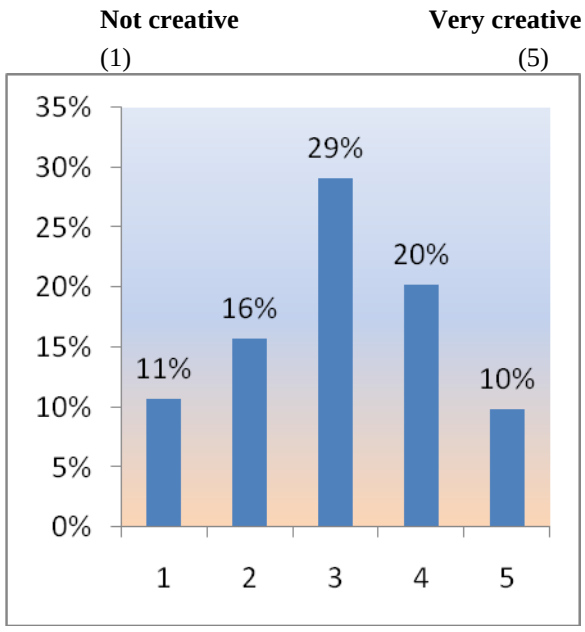
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B5—Interesting

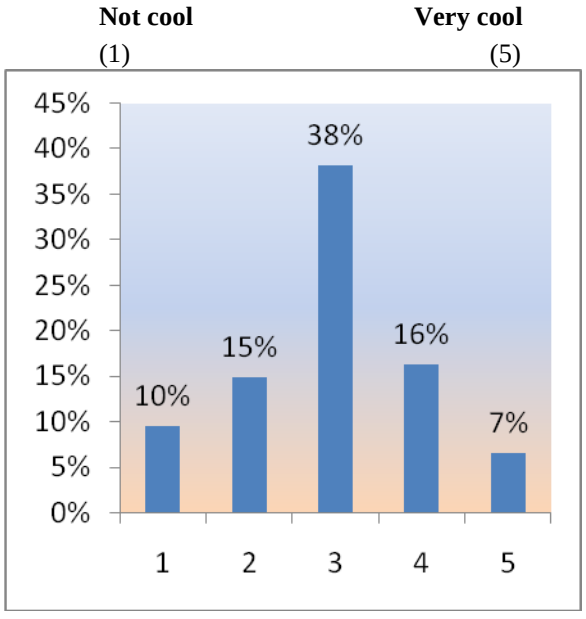
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B4—Coolness

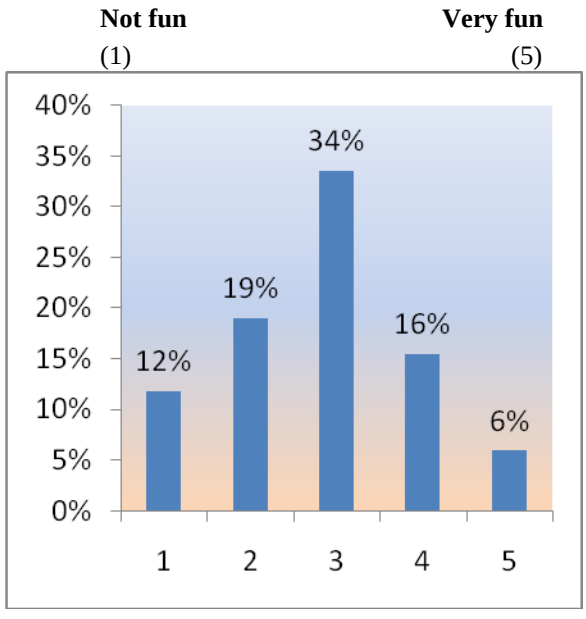
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B6—Fun

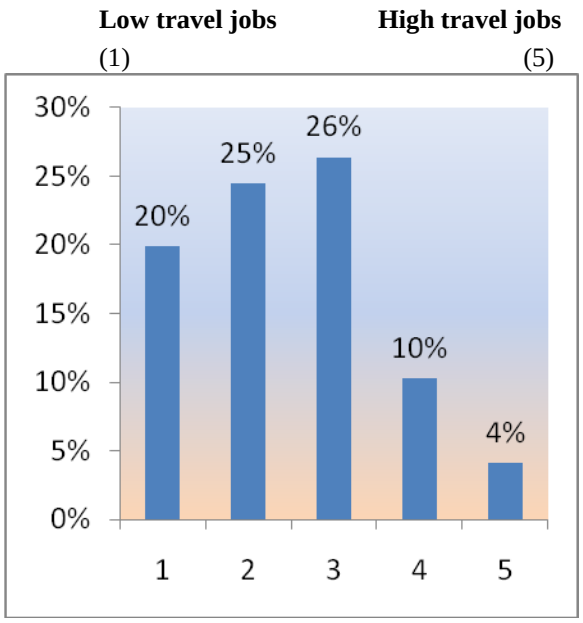
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B7—Travel

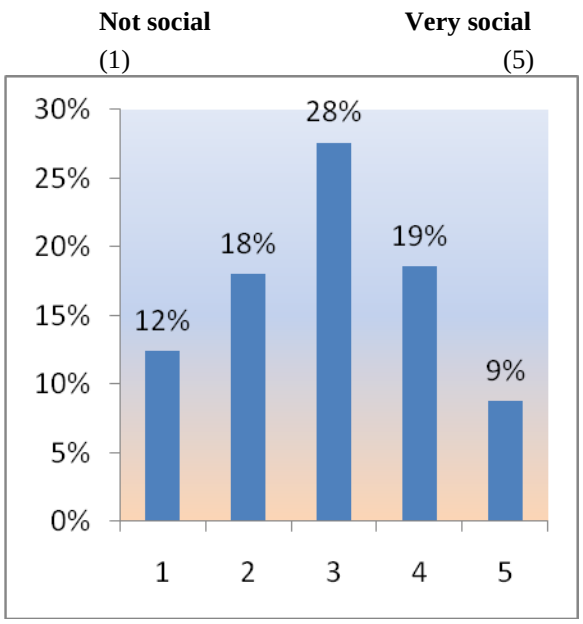
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B8—Social

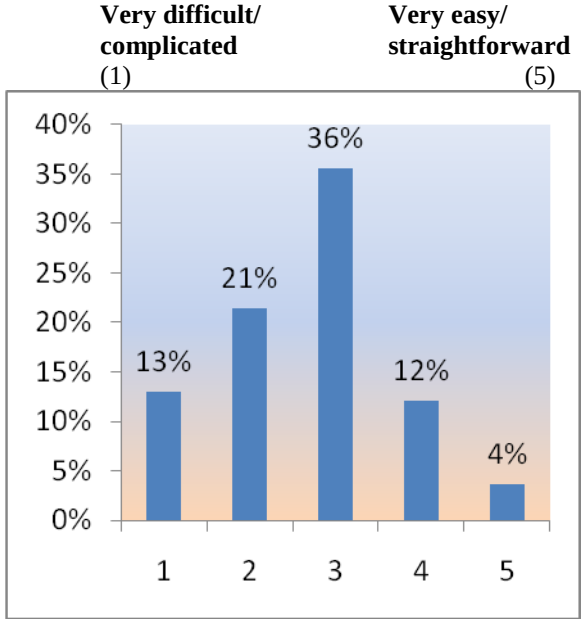
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B9—Complicated vs. Straightforward

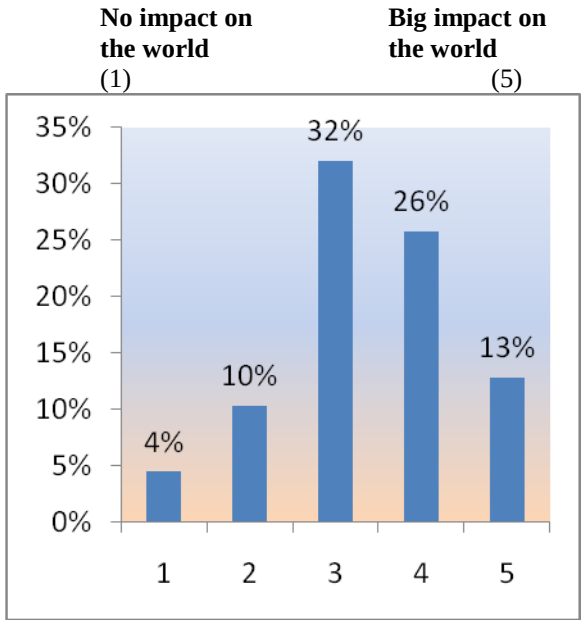
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B10—Impact

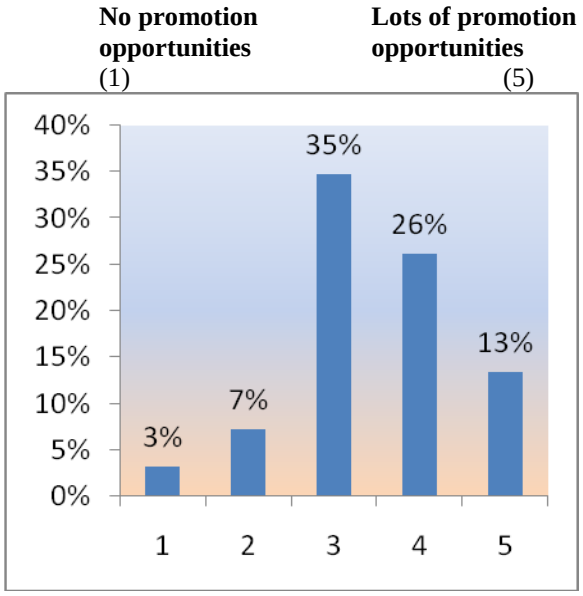
Students think ICT Jobs/Careers have…



Source: The Conference Board of Canada, 2009.

B11—Promotion Opportunities

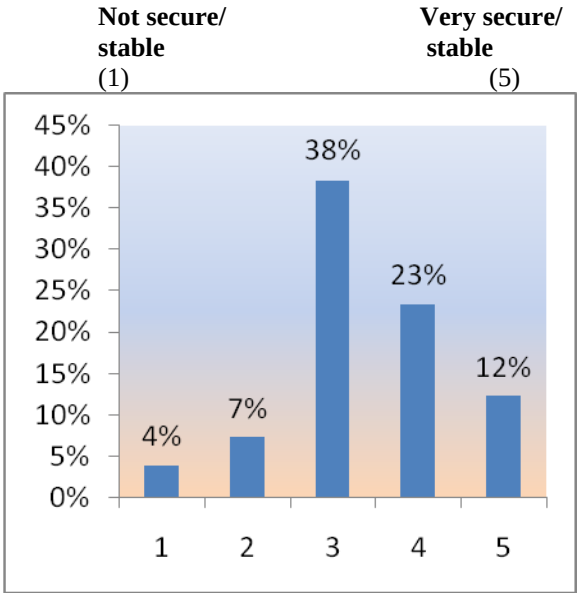
Students think ICT Jobs/Careers have…



Source: The Conference Board of Canada, 2009.

B13—Job Security/Stability

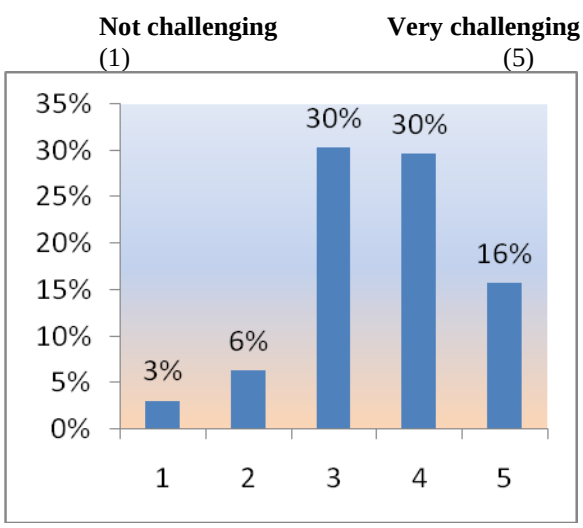
Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

B12—Challenging

Students think ICT Jobs/Careers are…



Source: The Conference Board of Canada, 2009.

APPENDIX C:

Tools—Student Exercise Book

As part of the in-class dialogues conducted with students, a Student Exercise Book was distributed to and completed by students. The exercise book ensured that the qualitative discussions would be supplemented by quantitative survey results thereby allowing for a two-track analysis of the dialogues. The student exercise book is appended here.

The Conference Board of Canada
Insights You Can Count On

STUDENT SURVEY–BOOK

What *YOU* Think about ICT Jobs and Careers

Conversations with Grade 9 and 10 High School Students across Canada

Prepared by:

The Conference Board of Canada

January / February 2009

F | M

Introduction:

Who We Are

- The Conference Board of Canada, located in Ottawa, Ontario, is an independent, not-for-profit applied research organization.
- We create and share insights on economic trends, public policy and organizational performance. We do work on social, economic, and environmental issues.

What This Project is About

- We want to understand what you are looking for in a job or a career.
- We want to know what your views are on ICT as a job or a career.
- We want to know what your thoughts are on studying ICT in school.

There's lots of research out there on these topics…but no one has bothered to ask you directly. We're changing this. Between December 2008 and February 2009 we are:

- Visiting over 40 schools across Canada (in Halifax, Montreal, Toronto, Winnipeg, Saskatoon, Calgary, and Vancouver).
- Talking with over 1,200 Grade 9 and 10 students.
- Talking with guidance and career counsellors.
- Talking with parents/guardians.

What We Are Doing Today

- Answer some questions and get some responses (workbook exercises).
- Talk as a group about some ideas (classroom discussion).
- Participate in a couple of 'dotmocracy' activities (classroom voting).

Stage 1

What do *you* think makes for a good job or career?

►Workbook Exercises ◄

1.1

What jobs or careers are you interested in?

At the moment, the jobs or careers that I am interested in include:

-
-
-
-

►Flipchart and Discussion Exercises ◄

1.2

Flipchart, Discussion

DISCUSS: What jobs or careers students are interested in, and why.

►Workbook Exercises ◄

1.3

Where do *you* go for information or resources when thinking about a job/career?

[Please check (☑) all that apply]

- ❑ Library
- ❑ School/course curriculum
- ❑ University/college calendars
- ❑ Internet (e.g., Monster.com)
- ❑ Labour market information
- ❑ Magazines
- ❑ Co-op employer requirements
- ❑ Newspapers
- ❑ Television
- ❑ Radio
- ❑ Sector Councils (e.g., ICTC)
- ❑ Industry Association materials
- ❑ Government sources
- ❑ Other (please describe):

_____

1.4

Who do *you* go to for advice when thinking about *your* education or a job/career?

[Please check (☑) all that apply]

- ❑ Friends
- ❑ Brothers/Sisters
- ❑ Parents/Guardians
- ❑ Classmates
- ❑ Teachers
- ❑ Guidance/Career Counsellors
- ❑ Businesses/Employers
- ❑ Government
- ❑ Other (please describe):

_____

►Flipchart and Discussion Exercises ◄

1.5

Flipchart/Discussion

REVIEW: Look at the list of 'Who You Go To' for advice on jobs and careers (1.4).

Add any missing factors to the list.

Poll students to see who they go to for information / advice (show of hands).

►Workbook Exercises ◄

1.6

When *you* think about the kind of job or career that *you* might want, what sorts of things would make it good or appealing?

I think that the sorts of things that would make a job or career good or appealing include:

-
-
-
-

►Flipchart, Voting and Discussion Exercises ◄

1.7

Flipchart and Dotmocracy

DISCUSS: What sorts of things make a job or a career good or appealing.

Add anything that is missing from the list.

VOTE: Using 3 stickers (dots) vote for what you think are the most important factors.

1.8

Discussion

DISCUSS: Is anyone surprised by the dotmocracy results?

Have any important factors been missed or left off of the list?

Stage 2

How aware are *you* of ICT jobs and careers?

►►Workbook Exercises ◄◄

2.1

When *you* hear the term 'ICT' what words come to mind?

Words that come to mind when I hear the term 'ICT' include:

-
-
-
-

2.2

What are some of the jobs or careers that come to mind when *you* think of ICT?

Some of the jobs or careers that come to mind when I think about ICT include:

-
-
-
-

►►Flipchart and Discussion Exercises ◄◄

2.3

Flipchart and Discussion

REVIEW: What sorts of words came to mind.

DISCUSS: What sorts of ICT jobs/careers did students come up with.

Can you name a job/career that doesn't involve ICT?

►►Workbook Exercises ◄◄

2.4

What are some of the sectors or industries in Canada that have ICT jobs?

Some of the sectors or industries in Canada that have ICT jobs include:

-
-
-
-

2.5

Do *you* know of any jobs in Canada that *don't* involve ICT?

Some jobs in Canada that don't involve ICT include:

-
-
-
-

►►Flipchart, Voting and Discussion Exercises ◄◄

2.6

Flipchart and Dotmocracy

INTRODUCE: ICT as a distinct career option/skill set used in other jobs (1-5 scale).

VOTE: Using 1 sticker (dot) vote for what you see as the most appropriate response.

2.7

Discussion

DISCUSS: Is anyone surprised by the dotmocracy results?

Stage 3

What's *your* perception of ICT jobs and careers?

►►►Workbook Exercises ◄◄◄

3.1

What is *your* view of ICT as a job or a career?

Using the 1 to 5 scale, below, please check (✓) the description that *you* think is most correct.

ICT as a job or a career is:

1	2	3	4	5	6
Very Unappealing	**Somewhat Unappealing**	**Neither Unappealing nor Appealing**	**Somewhat Appealing**	**Very Appealing**	**Don't Know**

►►►Flipchart and Discussion Exercises ◄◄◄

3.2

Flipchart and Discussion

DISCUSS: What might be some 'positive' things about working in an ICT job or career.

3.3

Flipchart and Discussion

DISCUSS: What might be some 'negative' things about working in an ICT job or career.

►►►Workbook Exercises ◄◄◄

3.4

How would *you* best describe ICT jobs or careers?

For each of the 'pairs of descriptions' listed below (e.g., low paying…high paying), please check (✓) the most appropriate point along the 1 to 5 scale (e.g., 1=low paying, 3=average paying, 5=high paying).

◄◄◄ I think ICT jobs/careers are… ►►►						
	1	2	3 (avg.)	4	5	
hard to find						easy to find
low paying						high paying
not creative						very creative
not cool						very cool
not interesting						very interesting
not fun						very fun
low–travel						high–travel
not social						very social
very difficult/ complicated						very easy/ straightforward
jobs with *no* impact on the world						jobs with a *big* impact on the world
jobs with *no* promotion opportunities						jobs with *lots* of promotion opportunities
not challenging						very challenging
not secure/not stable						secure/stable
_____						_____

Stage 4

What more needs to be done to get *you* interested in ICT?

►►►►Flipchart and Discussion Exercises ◄◄◄◄

4.1

Flipchart and Discussion

DISCUSS: What more could be done to get students interested in ICT education or an ICT job/career.

4.2

Flipchart and Discussion

DISCUSS: How an ICT job/career would have to change in order to get the attention or interest of students.

About The Conference Board of Canada

We are:

• A not-for-profit Canadian organization that takes a business-like approach to its operations. • Objective and non-partisan. We do not lobby for specific interests. • Funded exclusively through the fees we charge for services to the private and public sectors.	• Experts in running conferences but also at conducting, publishing and disseminating research, helping people network, developing individual leadership skills and building organizational capacity. • Specialists in economic trends, as well as organizational performance and public policy issues.	• Not a government department or agency, although we are often hired to provide services for all levels of government. • Independent from, but affiliated with, The Conference Board, Inc. of New York, which serves nearly 2,000 companies in 60 nations and has offices in Brussels and Hong Kong.

Our Mission

To build leadership capacity for a better Canada by creating and sharing insights on economic trends, public policy and organizational performance.

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