CS/IT Outreach from a Canadian Perspective

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SUMMARY

Computer Science Education Week (a.k.a. CSEdWeek) [3], officially recognized in the United States, has also helped to raise the profile of Computer Science Education in Canada and to start many conversations about computer science education that typically find receptive audiences across many sectors. Yet, the focus does not need to be computer science alone. The Association for Computing Machinery has two special interest groups explicitly dedicated to education: SIGCSE for computer science and SIGITE for information technology. Looking at the CC2005 document [5], one also finds mention of computer engineering, information systems, and software engineering. Still more areas, such as bioinformatics, may be included in future computing curricula surveys.

Programming can be identified as a common thread these areas. As educators, we do not expect that all students who take programming will pursue computer science or information technology in post-secondary education. However, we do want students to choose programming over being programmed [7]. In a 2009 Conference Board of Canada survey of young people, most could not identify an ICT (Information and Communication Technology) job. However, ICT jobs are everywhere with only about half inside the traditional information technology sector. Students, parents, teachers, guidance councilors, and school administrators need to see computing as "fun, cool, creative, and social" [8] and a great choice for a rewarding career.

Computing curriculum is not standardized across provinces, where it exists in various stages of renewal. Ideally, students will be exposed to CS/IT at an age when they are interested in exploring the possibilities that it presents. K-12 teachers, both pre-service and in-service, need support and resources to help them encourage students in computational thinking and CS/IT. Although it may be too late attract students new to CS/IT in Grade 12 as potential post-secondary majors, post-secondary education should provide pathways for these students to incorporate CS/IT into their programs of study.

The panel will give a representation of very encouraging CS/IT outreach efforts in Canada offered by various organizations working in this space. These include (in alphabetical order): the Canadian Association of Computer Science/Association d'Informatique Canadienne (CACS/AIC), comprising post-secondary institutions offering Computer Science degrees; the Canadian Information Processing Society (CIPS), known as Canada's Association of I.T. Professionals; the Canadian Coalition for Tomorrow's ICT Skills (CCICT), an industry-led coalition of employers, universities and industry organizations with the aim of ensuring availability of ICT professionals for Canadian organizations; and the Computer Science Teachers Association (CSTA - international, with chapters forming across Canada), a membership organization that supports and promotes the teaching of computer science and other computing disciplines.

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Categories and Subject Descriptors

K.3.2 [**Computers and Education**]: Computer and Information Science Education—*Accreditation, Computer science education, Curriculum, Information systems education*; K.7.1 [**The Computing Profession**]: Occupations

General Terms

Human Factors, Standardization

Keywords

Community Outreach, K-12 Education, Curriculum, Collaboration Initiatives, Industry-Education Relationships, Non-Traditional Students

1. POSITION STATEMENT: HEPTING

Events during CSEdWeek in Regina have been successful so far (in 2010 and 2011) because the dates fell during the week between the end of classes and the start of final exams. In 2012, CSEdWeek occurs later so our events must be held earlier. There is an opportunity to find a more friendly Canadian date for these activities and to honour Canadian computing pioneers in the process. It may also be that this

celebration could be scheduled differently in each province and territory.

A luncheon co-organized with CIPS has provided a great opportunity to interact with local professionals. The 2011 events included a very successful professional development day for teachers in Grades 6-12. In 2012, a follow-up is being planned for Regina and 2 other communities with help from Google's CS4HS program. For teachers who teach CS in Grades 11 and 12, we plan to use *The Beauty and Joy of Computing* [4] as a foundation. *Exploring Computer Science* [2] is a curriculum designed to address equity issues and we will work with teachers of Grades 6-10 to adapt it to our own equity concerns: increasing the participation of women and First Nations, Métis, and Inuit.

Throughout the year, we are working to increase our contact with potential future students, either on our campus or at their schools. We have found the CCICT CareerMash video and website [1] to be a great tool to get students thinking about careers in ICT. Local alumni serve as examples of achievable pathways to exciting careers.

2. POSITION STATEMENT: DONALDSON

I have always believed Computer Science to be cool and I have always encouraged my students to follow what they love and to believe that the money will follow. Money is always welcomed, but passion is a far greater motivator. For many students now, computing can be part of their passions. How do we communicate this message?

With limited resources in high schools, is it possible to offer different streams for different computing disciplines? Can schools offer CS as well as IT? Is programming the best entry point for all students interested in CS/IT?

How do we prepare teachers to teach computing and computational thinking? Computer Science is unique in its approach to teacher training. Is it time to develop instructional methods courses for Computer Science and require them in addition to academic background in the area?

Today MIT and Harvard, and many others, are delivering courses online. Most popular for K-12 topics is the freely available Khan Academy [6]. How should teachers integrate these publicly available resources into their facilitation of learning among their students?

3. POSITION STATEMENT: KING

One of the central goals of successful outreach at the K-12 level should be to attract more students into college and university programs in IT and Computer Science, and ultimately into careers in these fields. What do we tell students about the differences between the various fields comprising IT and Computing? In our outreach, do we tell students about the differences Information Technology versus Computer Science versus Software Engineering versus Business Technology Management (BTM) versus Computer Engineering versus ...? We probably do not and maybe we should not, but then how do students make the correct choice of program? The picture in Canada is complicated, due to the organizational separation of these programs. IT is usually available only as a college, 2 year diploma subject: no university programs in IT currently exist. And while a number of College-University articulation agreements do exist, they are spotty and are generally not well known or widely used. In many universities, Computer Engineering, Computer Science and BTM are in different faculties with difficult, or no, articulation between them. My own view is that the post-secondary education sector in this country should work to remove as many of these artificial barriers as possible. These areas all have considerable overlap in their curricula and we should aim to give students increased flexibility in selecting these programs so that their best interests are being served.

4. POSITION STATEMENT: SILVER

There are many barriers to entry to CS Education in the Canadian school system. Some are straightforward to identify: a focus on technical education that doesn't place CS as a science course; lack of human resources - few teachers with content and pedagogical knowledge about computing; lack of computing curriculum in most provinces; and poor math skills: students opt out of math in Grade 9 because it is not needed for other high paying professions. There are also softer, more challenging barriers that will take time to resolve:

- Misunderstanding: parents and teachers think that our children know about building digital technology because they are knowledgeable about using digital technology
- Culture: many Canadians are not predisposed to high tech jobs and many do not feel that we are able to build high tech companies
- Computing $\neq$ computer literacy: we are great in using ICT as a learning technology; fine in using ICT in application domains; terrible at building ICT
- Peer pressure: computing is not cool
- Women and IT special challenges: culture, greater peer pressure to conform

5. REFERENCES

[1] CCICT. CareerMash. http://careermash.ca/, 2011.

[2] J. Goode, G. Chapman, and J. Margolis. Exploring computer science. http://www.exploringcs.org/curriculum, 2009.

[3] S. Greengard. CSEdWeek takes hold. *Communications of the ACM*, 54(12):20, December 2011.

[4] B. Harvey, T. Barnes, and L. Segars. Ap cs principles and the 'beauty and joy of computing' curriculum. In *Proceeding SIGCSE '12: Proceedings of the 43rd ACM technical symposium on Computer Science Education*, page 677, 2012.

[5] Joint Task Force for Computing Curricula. Computing Curricula 2005. www.acm.org/education/curric_vols/CC2005-March06Final.pdf.

[6] S. Khan. KhanAcademy. http://www.khanacademy.org/, 2008.

[7] D. Rushkoff. *Program or be Programmed: Ten Commands for a Digital Age*. Soft Skull Press, 2011.

[8] D. Ticoll. Winning the jobs war. *National Post*, October 3 2011.