

The Economic Security of Women in Canada:

A focus on STEM (Science, Technology, Engineering, and Mathematics)

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Equity, diversity, and inclusion (EDI) are critical to the economic security of women in Canada. Women have been making a case for equity for generations; until society is aware, appreciates the benefits, and is prepared to act, the most articulate and well founded arguments for equity will not be heard or acted upon whether they be as basic as equal pay for equal work, or as lofty as representation on boards. The focus of this brief is the critical need for attraction and retention of girls and women in STEM (Science, Technology, Engineering, and Mathematics) fields that must occur if Canada is to be an international leader in supporting the economic stability of women.

The attrition of women in STEM, often called “the leaky pipeline”, begins when they are young. Statistics indicate that girls begin to retreat from these areas of study as they progress through academic programs. To build equity girls must be encouraged by teachers and parents to continue pursuit of STEM programs; winning them back is significantly more difficult. Opportunities to participate in co-curricular programs with a STEM focus play key roles in this engagement. FIRST Robotics Canada is a prime example.

FIRST, a not-for profit international organization founded in 1989 by Dean Kamen, an inventor, entrepreneur, and passionate advocate for science and technology, promotes STEM learning from kindergarten to graduation. Kamen's vision was fuelled by a desire to inspire students to pursue STEM; the result is the acronym FIRST: “for inspiration and recognition of science and technology”. Initially, the program focused on high school based FIRST Robotics Competition (FRC). It grew to engage all other grades with an agreement between FIRST and the LEGO Group to create FIRST LEGO League (FLL). The complexity of each program builds on age and stage appropriate learning. FIRST was established in Canada in 2001; it has grown to 226 FRC teams, 822 FLL teams (grades 4-8), and 349 FLL Jr. (grades 1-3) teams nationally. Girls and boys are equally involved in FLL; girls represent 37% participation at the high school level. (FIRST Robotics Canada, 2016).

The impact of participation in FIRST on girls' pursuit of STEM fields is well documented through a longitudinal study of participants executed by Brandeis University in Massachusetts. The study, which began in 2012, continues to track 1,000 participants. The most recent release (April 2017) stated the following: “FIRST continues to show significantly greater impacts on girls than their male counterparts on all of the STEM-related measures. ... While all of the differences between FIRST participants and comparison students are significant, the impacts for girls in FIRST on each measure are also significantly larger than those for boys.” (Brandeis University, p. 5) Although the study is based in the U.S., the same holds true in Canada. Interestingly, 85% of girls on all-girl teams pursue STEM fields. (Byers, 2015)

If the impact of engagement in STEM experiences is so profound for girls, and they pursue STEM post secondary programs, why is there attrition in the work

force? This question has become a focus for FIRST Canada. Based on data driven evidence, the recent strategic plan placed a laser focus on the engagement of girls and other underserved youth. The inception of the Girls in STEM Executive Advisory Council (GISEAC) is a result driven strategy. The Council, whose membership demonstrates EDI, is addressing engagement and retention. Workshops for industries where women retreat provide strategies to engage, support, and encourage women to be confident and resilient, especially when they meet adversity in the workplace. FIRST Canada's inaugural Girls in STEM weekend (May 27- 28, 2017) is designed to empower the 100 participants to be resilient, develop strong networks, seek a mentor, recognize supportive leaders, and understand that as women in STEM fields they must recognize the "glass obstacle course" that they will encounter. Encouraging girls to engage in STEM is for naught if women do not possess critical skills to withstand what are recognized as difficult, unsupportive work environments that will continue to exist until critical social biases are challenged and culture changes. However, girls and women don't need to be "fixed"; they need male advocates who will treat them as equals. (NCWIT, 2017). It is the goal of FIRST Robotics Canada to move the needle for the current generation of young women. However, this work will not have an impact unless policy supports the critical need for women in STEM fields.

Women have a profound impact on the workforce. In 2015, *The Economist* stated that the increase in female employment in the advanced world "has been the main driving force of growth in the last couple of decades." (Reynolds, 2015). Universities are encouraging women to pursue STEM fields; the University of Toronto claimed proudly in 2015 that 30% of first year engineering classes were female. With many female graduates, we must examine what occurs in the workplace that results in only 22% remaining in STEM fields (Critical Math, 2016). Research consistently demonstrates that women face gender bias, are overlooked for promotion, do not have visible role models or champions, and often feel like impostors (Perimeter Institute, 2016). A woman from a visible minority feels these biases more strongly (Duodu, 2017) and is significantly less likely to be promoted. (Schwartz, 2015). In addition, "challenges in funding make it harder for all scientists but create the risk that we will lose promising early career scientists, especially women", who are taking time to have families (Hanigsberg, 2017).

So where are we headed? Clearly there is a need for women in STEM fields. "Closing the gender wage gap represents further growth for the developed world, in Canada an estimated increase in GDP of close to 10 per cent" (Reynolds). Clearly, as Weigl states, "closing the gender gap isn't just the right thing to do. It's the smart thing to do." Canada must develop solutions. Achieving systemic support for solutions that will demand change will be challenging. As Coe states: "real change only comes about when people are uncomfortable and the status quo is challenged. More science camps for girls do not challenge the status quo..." To affect true change we must remove the glass obstacle course that

discourages women from pursuing STEM careers. Coe continues: “championing girls into pathways which are full of potholes - when we are not addressing the potholes, is not acceptable...only by fixing them will we see more women pursue those pathways.” Tough work, but to make Canada’s economy strong and Canada’s women economically secure, it must be done.

Recommendations to support the economic security of women in STEM related fields:

1. Challenge the status quo by holding CEOs and boards accountable for their demographics and hold organizations accountable for system and structural change.
2. Withhold funding or other resources to enforce change as in Science Minister Duncan’s proposal for university funding.
3. Bring together organizations that support women in STEM.
4. Impose quotas to achieve balance; as shown in Sweden’s quota project, they can be to be very effective at boosting diversity and improving systemic change.
5. Engage men in the conversation so that they can become advocates.
6. Support from the Federal Government to encourage the development of organizations such as Australia’s SWAN, the UK’s Athena SWAN, the U.S. based NCWIT all of which support women in STEM fields. At present Canada lags behind in this work.

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