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Margaret-Ann Armour & WISEST – An Incredible Legacy in Equity, Diversity and Inclusion in STEM and the Work Still To Do

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Margaret-Ann Armour & WISEST – An Incredible Legacy in Advancing Women in Science, Technology, Engineering, and Maths (STEM) and the Work Still To Do

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Abstract

Dr. Margaret-Ann Armour was a visionary and leader in addressing the issue of gender inclusivity and discrimination in Science, Technology, Engineering, and Maths (STEM). She was instrumental in creating WISEST – Women in Scholarship, Engineering, Science and Technology – in 1982 which was one of the first programs in Canada intentionally designed to increase the participation of women and girls in STEM career paths. Since then, this innovative organization has designed several programs featuring hands-on learning and mentoring that reduce barriers and empower people from underrepresented and marginalized groups to pursue education and careers in STEM fields. This review provides a template for WISEST programs, discusses their impact on diversity in STEM, and highlights the work still to be done.

Keywords gender; EDI; education; unconscious bias

We must do science as if people matter
- Dr. Margaret-Ann Armour, quoting Dr. Ursula Franklin

Dr. Margaret-Ann Armour often said "*We must do science as if people matter.*" This simple but powerful message was originally stated by one of Dr. Armour's role models, Canadian physicist Dr. Ursula Franklin,[1] and inspired Dr. Armour's long-standing commitment to focusing on all people mattering equally in STEM workplaces and in STEM work itself. For Dr. Armour, the statement had profound philosophical and practical implications for how she constructed her research programme, focused her administrative and outreach innovations, and challenged broader societal biases. To describe her approach towards dismantling systemic sexism, Dr. Armour talked about flowers and earthworms. If a flower fails to bloom, we intuitively recognize that the environment needs enriching: better soil, different moisture, different light. Similarly, if a person fails to flourish, it is not a problem with the person; the system needs changing. So, how do we begin to change the systemic environment? Dr. Armour described herself as an earthworm; enriching the soil so that others could flourish. In line with this metaphor, for over a quarter of a century, Dr. Armour was one of Canada's ambassadors of science, volunteering tirelessly to raise national awareness among girls, educators, parents, and employers of the importance of encouraging girls, women, and people from multiple underrepresented and marginalized groups to enter science, technology, engineering, and mathematics.

Introduction

In Canada and elsewhere in the world, science, technology, engineering, and mathematics (STEM) graduates are essential drivers of innovation. However, women have historically been—and continue to be—underrepresented in STEM disciplines and it is particularly evident in decision-making positions in academia and industry.[2-3] This underrepresentation exists at the same time as marginalization, the treatment of someone as insignificant or peripheral, and starts in childhood regardless of academic achievement in school.[4] The need to eliminate girls' and women's underrepresentation and marginalization in education—ensuring equal access to all education levels as well as women's representation in leadership roles—has been recognized by the United Nations in its Sustainable Development Goals to transform the world.[5] Furthermore, students with strong interdisciplinary, analytical, and strategic problem-solving skills—skills that are developed through STEM education—will be better prepared for a future characterized by a rapid development of technology,[6] with implications for changing women's underemployment globally. Increasing women's representation in STEM occupations can increase women's earning potential, economic security, and even their salary relative to men's.[7] It is therefore critical that we identify, understand, and remove the systemic issues that continue to affect girls' and women's attraction, retention, promotion, and long-term success.

One of the major drivers behind women's underrepresentation in STEM is the bias and discrimination that starts in childhood and persists throughout a woman's career.[8-9] The Canadian Institutes for Health Research states that, "gender refers to the socially constructed roles, behaviours, expressions and identities of girls, women, boys, men, and gender diverse people. It influences how people perceive themselves and each other, how they act and interact, and the distribution of power and resources in society."[10,a] There is considerable diversity in how individuals and groups understand, experience, and express gender beyond the binary (girl/woman and boy/man) and sex assigned at birth, including gender nonbinary and transgender persons. Gendered expectations consistent with gender stereotypes are placed on children as soon as they begin playing with toys; marketing for girls is focused on dolls, cooking, and beauty while for boys is focused on science, building, and violence (e.g. toy guns).[11] By the time girls reach high school, they are excelling in STEM subjects yet at the same time are less likely to picture themselves as scientists, mathematicians, or engineers.[12] As a result, women comprise only 38% of the students enrolling in STEM degrees at Canadian Universities, despite the fact that they represent 52% of high school graduates.[2] Gendered expectations also disenfranchise boys, who are steered away from "feminine" professions like nursing and nutrition,[13-14] and gender non-binary and transgender students, who are not valued in the traditional male/female paradigm and experience higher rates of gender-based violence.[15-16] It is also important to recognize the multiple intersecting identities that have a substantial impact on peoples lived experiences, including one's race, disability, sexual orientation, and socioeconomic background to name a few.[17] Emerging research on STEM professionals is bringing understanding to workplace experiences from an intersectional lens, including for Black

[a] There is a distinction between sex and gender. Sex refers to "a set of biological attributes in humans and animals. It is primarily associated with physical and physiological features including chromosomes, gene expression, hormone levels and function, and reproductive/sexual anatomy. Sex is usually categorized as female or male but there is variation in the biological attributes that comprise sex and how those attributes are expressed" (10). Today, many individuals gender terms in their self-descriptions (e.g., woman, man, gender non-binary, transgender), rather than sex terms (e.g., female, male, intersex) and in agreement with this preference ourselves, we use gender terms herein.

women and people in the LGBTQ2S+ communities [15-16, 18] and it is clear that there is much work to be done.

Dr. Armour's vision and mission

When Dr. Armour began as professor in the chemistry department at the University of Alberta in 1979 she was the only woman professor in her department. At that time, the prevalence of professors who were women in STEM disciplines was less than 30%, with certain disciplines, such as engineering, chemistry, and physics being well below the average.[19] Guided by the deep-rooted conviction that engaging girls directly was needed to bring about change, she was a founding member of Women in Scholarship, Engineering, Science and Technology (WISEST) in 1982. WISEST was one of the first programs in Canada intentionally designed to provide an open and supportive learning environment that embraced collaboration and valued diversity in STEM. Over the next 40 years, it grew into an innovative organization hallmarked by programming designed to break down barriers and empower marginalized and underrepresented students to pursue careers in STEM.

WISEST programming is targeted towards three main areas: teaching girls and non-binary students about STEM fields occupied primarily by men, teaching boys about STEM fields traditionally occupied by women, and teaching First Nations, Inuit, and Métis students about all STEM fields. Particular attention is paid to the career interests of students from rural communities that are shaped by greater exposure to more traditional beliefs about stereotypical gender roles, greater pressure for social conformity to adhere to these traditional beliefs,[20-22] a limited array of STEM jobs present in rural communities, lack of access to STEM mentors, and lack of access to extracurricular STEM activities. This rural disparity leads to poor employment opportunities and lower lifetime earnings of those who stayed in rural communities compared to those who relocated to urban communities.[22] Indigenous students, in addition to facing systemic racism, colonialism, and historical trauma, also frequently experience socioeconomic barriers and remain severely underrepresented in STEM fields.[23] To reduce socio-economic barriers to traveling for STEM programming, rural and Indigenous students' accommodation and travel expenses are often provided by WISEST during our programs. WISEST programming aims to reach students who are members of marginalized and underrepresented groups to increase their knowledge of and interest in STEM careers.

Dr. Armour connected science to everyday life in her chemistry demonstrations annually at WISEST's conferences from 1990-2018 by showing the amount of energy produced by the sugar in a can of pop, making nylon fabric live in front of the students' eyes, and exploring the density of river ice and its role in winter survival of marine life. For example, consistent with Dr. Armour's passion for community building and engaging children and youth through dramatic science demonstrations, WISEST programs bring together small cohorts of students to create a sense of community and engage through hands-on and team-based activities where they solve real-life problems, and both of these learning approaches better engage collaborative and community-minded students, especially girls, who tend to be more communally-oriented.[24] In addition, WISEST's programs limit activities and situations involving competition given longstanding evidence that competition tends to limit learning, undermine self-efficacy, and diminish feelings of achievement for girls.[25-26] Further, inquiry-based education focused on skill development and a growth mindset [27-29] reinforces that mathematics and science skills can be improved through concentrated effort rather than these skills being an innate ability, challenging the unfounded stereotype of girls and women having innately lower math aptitude.[30-33] Growth mindset

approaches have been shown to reduce the negative effects of these stereotypes on girls [34] and African American students.[35]

Effective mentorship is key for the development of STEM professionals and it is crucial that mentors reflect the identities of WISEST's participants.[36-37] WISEST works to show students career possibilities and further challenge stereotypes about who scientists, technologists, engineers, and mathematicians are by introducing students to role models and mentors who encourage students to develop their skills and envision their future success. Formal programs with role models and mentors from underrepresented and marginalized groups are necessary because informal mentorships (formed organically through similar backgrounds and interests by the mentor/mentee) are uncommon given underrepresentation in STEM, especially in leadership roles.[38-41] Dr. Armour was an outstanding role model and mentor, not just for the many WISEST program alumni, but also for many of the inspiring STEM professionals who volunteered their time with the program.

Programming

WISEST Summer Research Program

WISEST's flagship Summer Research Program is a paid hands-on research internship for students entering their final year of high school.[42-43] The Summer Research Program features several unique characteristics. First, students participate in real-life research before starting university, an experience that is coveted even among university students. Participants work independently and as part of a team, and through literature reviews, hands-on experimentation, and trial-and-error, contribute to leading-edge research. Second, unlike many similar STEM internship programs, participants are paid for their work and they learn the responsibilities of employment. Third, participants engage in weekly professional development sessions to learn about a range of STEM career options, tour STEM organizations, attend networking events with inspiring mentors, and attend training sessions for developing presentation, communication, and leadership skills. Fourth, at the Celebration of Research Day, students present their research projects to family, friends, teachers, university and government leaders, and program contributors. The goal of the program is to build a supportive network of family and role models, as well as confidence and professional presentation skills, all of which are associated with increased interest in STEM disciplines for students from underrepresented and marginalized groups in these fields.[44]

WISEST Science, Engineering, and Technology Conference

The SET (Science, Engineering and Technology) Conference, started in 1988, is a one-day conference welcoming over 200 Grades 10-12 students to the University campus. During the conference, students learn about career options in STEM, experience hands-on STEM activities, and talk to university students and professionals about their experiences in STEM fields. Students are encouraged to be open minded, be inquisitive, unleash their curiosity, and embrace discovery. The SET Conference reaches students across Alberta with 73% residing outside of Edmonton and at least half of those students coming from rural areas (some travelling up to five hours one way to attend). Indigenous students have made up 12% of attendees at past conferences and spend the afternoon alongside STEM professionals and mentors who are Indigenous. Indigenous students are also introduced to First Peoples' House, a place offering support for First Nations, Métis, and Inuit learners to achieve personal and academic growth at our university.

WISEST Choices Conference

The Choices Conference (established in 1990) fosters the early discovery of STEM fields to those in Grade 6. The program aims to help girls challenge stereotypes about men as scientists,[45] realize that science is something they can do, that it is interesting and fun, and that STEM fields can provide experiences filled with creativity, wonder, and teamwork. Yearly, more than 600 girls and their teachers from over 150 elementary schools spend the day at the University of Alberta, where they participate in hands-on laboratory activities (e.g., designing and building towers and bridges, making polymers in a chemistry laboratory, exploring the properties of fruits and flowers, and learning about 3D printing using TinkerCad), meeting various role models, and ending the day with a group engineering activity. This popular annual event usually has a waitlist and grade 6 teachers make it a priority to apply for their class to attend, with many teachers returning yearly because of the impact they observe this event is having on the lives of their students.

WISEST Networks

WISEST has also been instrumental in the development of two networking and mentorship programs that support the retention and advancement of university students and early-career professionals in STEM careers. These networks receive mentorship and guidance as well as funding support from WISEST and have representatives on WISEST's Board of Directors.

First, *UA-WiSE*—University of Alberta-Women in Science and Engineering—focuses on empowering all underrepresented and marginalized STEM undergraduate students. The group offers career advice, inspirational speakers, and industry-government-research mixer events. Membership is open to those who share the interest of supporting underrepresented and marginalized groups in STEM. The second is *WISER*—Women in Science, Engineering and Research—which is designed to connect graduate students and early-career women and members of underrepresented groups in STEM fields with the information, resources, support, and professional development opportunities to foster career development. WISER members are from academia, industry, and government roles at all career stages in STEM. These networks help students and professionals build community, connections, and relationships within STEM, with the larger goal of developing their career and promoting their retention in this field.

Outcomes

WISEST has directly impacted the lives of more than 50,000 students, teachers, and early career professionals and many more have been reached through the trickle effects of its initiatives in the community. In addition, up to 10,000 people are influenced yearly through outreach activities, including presentations, panels, and booths in schools, community events, clubs, social media, and online events. From elementary school through to academia and industry leadership, WISEST supports students from underrepresented and marginalized groups to explore STEM disciplines and entrench themselves in a strong and sustainable career path, all thanks to Dr. Armour's advocacy and leadership.

WISEST has closely tracked the outcomes of the flagship Summer Research Program, with more than 1600 participants since 1984. Post program surveys indicate that program experiences contributed to participants' decision to study in a STEM discipline, interest in STEM fields, level of self-confidence, awareness of mentorship and networking opportunities, and beginning their own university journeys. Of the students who participated in the Summer Research Program between 1984 and 2018, 75% (over 1200) attended the University of Alberta and 84% of these attendees majored in STEM disciplines (Figures 1 and 2). Although we do not have detailed records of the 25% who did not enrol at the University of

Alberta, through informal follow up with alumni, WISEST staff noted that many enrolled in STEM programs at other universities in Canada, the United States, and the United Kingdom.

In the mid-1990s, Dr. Armour and her collaborators studied whether participating in WISEST programs was associated with a greater likelihood of enrolling in STEM degrees among a sample of high school girls.[43] They divided 154 applicants to the WISEST programs randomly into three groups, of which one group would participate in the Summer Research Program, one in the SET conference, and one would serve as a control group. Of those participants in the Summer Research Program or SET conference, 74-87% enrolled in STEM degree programs (not limited to the University of Alberta) compared to only 66% of the control group, though this difference was not statistically significant.[43] Furthermore, in follow-up surverys participants who entered STEM fields often reported that the Summer Research Program experience was an important deciding factor for them. Many students expressed their gratitude for having the opportunity to talk with STEM professionals who are women, try hands-on lab activities, and attend workshops highlighting different STEM areas. They also stated that this experience made their transition to university easier and increased their interest in these disciplines and in continuing to advanced degrees. Many alumni have maintained ties with WISEST and their mentors. Additionally, many pursued graduate studies and are now faculty members at Canadian institutions and hold leadership roles in industry and academia. Dr. Martha White, an Assistant Professor in the Department of Computing Science at the University of Alberta and Canada CIFAR chair in Artificial Intelligence, reflected on her experience in this program on a 2017 WISEST alumni survey, "*After my Summer Research experience I realized that I wanted to pursue a career in mathematics and computing science. WISEST helped me begin this journey and, through the amazing network of mentors and role models, also provided me with invaluable support during the beginning of my career*".

Since students' experience in school influences their interest in STEM and thus their motivation to persevere,[44, 46] WISEST seeks to inspire and prepare teachers to instill equity and inclusivity in their classrooms. More than 15,000 teachers have participated in WISEST's programs, accompanying their students, acting as references for applicants, and attending professional development seminars. Following one of WISEST's 2019 conferences, a participating teacher wrote on the anonymous program evaluation, "*All four of [my students attending the conference] are from homes where the parents have never attended university. This has opened that door for them. One girl wrote in her journal that this was 'the best day of my life'*." In recognition for their valuable role, each summer WISEST organizes a Teacher Appreciation Day where teachers are invited to campus to experience innovative activities in math, science, and technology. These learning experiences have a transformative impact on the way they then teach STEM subjects in their own classrooms, breaking down the reluctance for STEM careers that is already established in many students from underrepresented and marginalized groups long before they consider pursuing post-secondary education.

Multi-generational impact is the main driver of WISEST's sustainable success. Many former participants are now 'paying it forward' for the next generation of students by volunteering in programs and mentoring students through WISEST as well as many organizations with similar missions. Through their leadership roles in industry, government, and academia, several program alumni have become role models themselves, now providing mentoring and professional development opportunities in their organizations. For many, WISEST provided a nurturing environment that sparked their curiosity and inspired them to explore and experiment, opening the path to start their career journey.

WISEST's contribution to gender equity in STEM fields has been publicly and widely recognized across Canada. WISEST was awarded a Michael Smith Award for Science Promotion in 1994 from

NSERC. In 1996, WISEST received an Excellence in Science and Technology Public Awareness award, Alberta's most prestigious science and technology honour, from the Alberta Science and Technology Leadership Foundation. For her work, Dr. Armour was selected as one of Canada's 23 outstanding women who, in Charlottetown in 2014 (on the anniversary of our 'founding fathers'), presented their Bold Vision for Canada's next 150 years. During that event, she stated, " *... the most valuable resource we have is our people. As a woman and a human being, the most important aspect of my life has been loving, respectful, and trusting relationships. Those relationships have not only been with individuals, but within many and varied supportive communities. It seems that especially women value and thrive in such communities. The community-inspired aspect of my dream is that over the next 150 years there develops in Canada a strong societal recognition of the fundamental human need to belong to supportive, interacting communities where we are nurtured and fostered.*" Dr Armour received many awards including the Order of Canada, a Governor General's Award, the Alberta Science and Technology Leadership Awards Foundation Special Award, she was inducted into the City of Edmonton Hall of Fame, and named one of the 100 Edmontonians of the Century. In 2003, Maclean's Magazine named Dr. Armour one of Ten Canadians Making a Difference and she was twice named one of the Top 100 Most Powerful Women in Canada by the Women's Executive Network. In 2016, the 600-student Dr. Margaret-Ann Armour School opened in Edmonton. Reflecting on the honour at the time, Margaret-Ann said, "*I want kids to have fun with science. That's what keeps them interested.*" Starting at the school's opening and until her passing, she was on hand for the first day of class each September, doing her best to greet every single student with hugs, handshakes, and words of encouragement.

Complementary Organizations

Outside of her work with WISEST, Dr. Armour was a community builder. She co-founded the Canadian Coalition of Women in Engineering, Science, Trades and Technology (CCWESTT) to unite over 20 professional associations, universities and colleges, and organizations in Canada with similar missions to WISEST (see http://www.ccwestt.org/partners). CCWESTT provides a support network and takes an advocacy role to increase women's representation, inclusion, and equity in STEM. Today, CCWESTT hosts a bi-annual conference and STEM professionals who are women travel from across Canada to attend. In addition, given the slow movement of women into leadership positions in STEM, CCWESTT established the Canadian Centre for Women in Science, Engineering, Trades and Technology (WinSETT Centre) with Dr. Armour as the first President of the Board. This non-profit organization aims to advance women's leadership through workshops, projects, and partnerships, and celebrating women as leaders in STEM organizations (https://www.winsett.ca/).

It was through Dr. Armour's community building and her collaborative nature that she shared her passion, lessons learned, and advised others starting similar programs. For example, the Women in Science and Engineering (WISE) Newfoundland and Labrador Summer Student Employment Program (https://wisenl.ca/ssep) was developed with Dr. Armour's guidance, experience, and lessons from founding WISEST. Complementary organizations now exist in many provinces and across the country, including Society for Canadian Women in Science & Technology (SCWIST) (started in 1981) and Let's Talk Science (started in 1993). These organizations are among many across Canada working towards the similar goal of increasing representation and inclusion of people from underrepresented and marginalized groups in STEM.

What is next for the future?

Programs like WISEST play important roles in teaching girls about career opportunities in STEM and following the inception of these programs in the 1980's there was a 20% increase in the percentage of women graduating with STEM bachelor's degrees.[19] However, the representation of women peaked in 2000 and has not substantially changed as of this writing.[2, 19] Currently, the percentage of women graduating with BSc, MSc, and PhD STEM degrees has stagnated at 39%, 36% and 31% respectively.[2]

Dr. Armour knew that the next major hurdle to increasing the percentage of women in STEM after recruitment was retention.[42, 47] Students from underrepresented and marginalized groups enter university STEM programs with the expectation that they will be treated equally. However, they encounter an overwhelming number of negative experiences during their academic journey.[8-9, 42] These negative experiences pervade every aspect of a student's environment, including discriminatory behaviour from classmates, staff, and faculty,[48-49] and serve to create a collective environment which is hostile towards marginalized and underrepresented students. Over time, the constant refrain of experiences that suggest "you're not good enough" and "you don't belong here" contributes substantially to pushing students from marginalized and underrepresented groups out of STEM careers.[50]

If we believe that a person fails to flourish because of their environment, like Dr. Armour believed, we must move towards dismantling the negative attitudes and stereotypes about people from underrepresented and marginalized groups in STEM that persist in preventing our flowers from growing. Let us not lose the human capital, innovation, talent, creativity, and industriousness found within people from diverse groups. If we are to increase representation, we need to change the system to remove the added barriers faced by people from marginalized and underrepresented groups. We must take a hard look at professional and workplace cultures and individually reflect on how each of us contributes to perpetuating systemic discrimination.[51] WISEST and programs like it created a pipeline for underrepresented and marginalized students into STEM careers but without corresponding changes to the culture, we are in danger of continuing the stagnation of the past few decades into the future.[2, 51]

In addition to addressing our individual and collective contributions to the hostile culture in STEM, we also need to continue the path that Dr. Armour started by developing scientifically-proven methods which are actually effective in changing the culture.[43] There is an enormous body of scientific literature demonstrating the manifestations and consequences of systemic discrimination,[8-9] but only a few that have researched what interventions are successful.[51-54] As scientists, we use data and facts to inform our practises and we need to employ similar methodology, including these communities in method and practice development, to increase the participation and lived experiences of people from underrepresented and marginalized groups in STEM. We need to move beyond inclusion platitudes and policies by employing methodologies to measurably take effective actions that will make STEM organizations places where everyone has opportunities to pursue long, successful careers and realize their full potential. With truly inclusive cultures, we are better equipped to *do science as if all people matter*.

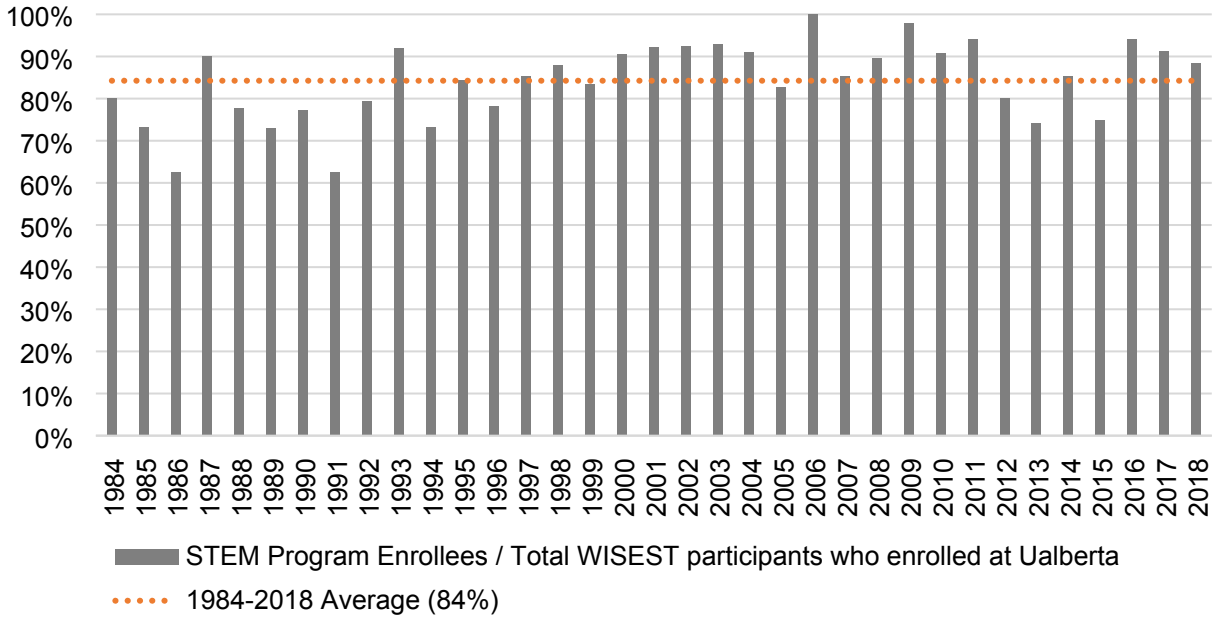

Figure 1. Proportion of WISEST alumni attended the University of Alberta and enrolled in STEM disciplines 1984-2018 (n = 1189). This research was reviewed and approved by the University of Alberta Research Ethics Board (Reference No. Pro00101675).

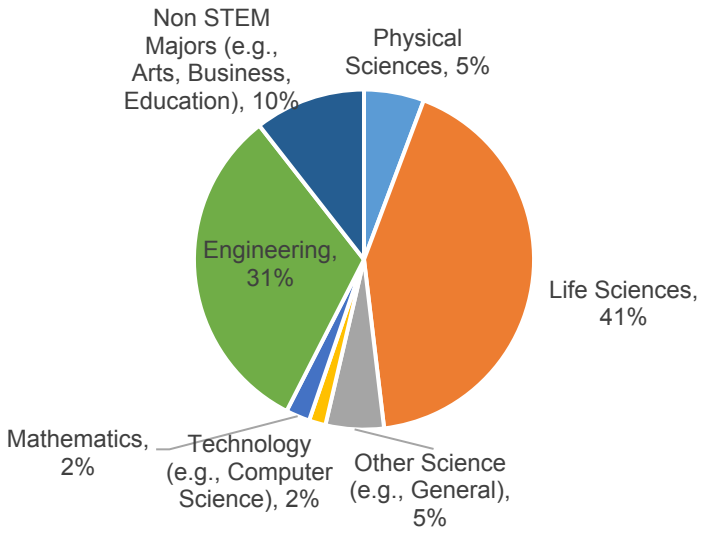

Figure 2. Disciplines of undergraduate program of WISEST Summer Research Program alumni who enrolled at the University of Alberta (n = 1189). We categorized alumni by discipline. STEM referred to the Sciences (physical, biological, and agricultural sciences), Technology (computer sciences),

Engineering, and Mathematics programs. This research was reviewed and approved by the University of Alberta Research Ethics Board (Reference No. Pro00101675).

Table 1. Data-driven approaches to addressing the challenges and barriers for people from underrepresented and marginalized groups in STEM.

Considerations	Interventions/Best Practices	References
Low visibility of people who are "like me"	• Highlight a diversity of STEM professionals in marketing materials. • Invite a diverse group of STEM professionals to share and engage with students in programming. • Select mentors to ensure their diversity reflects that of the students'.	36-37
Unconscious bias by parents, family, peers, and teachers	• Have professional development courses for teachers which highlight how to create an inclusive classroom. • Educate teachers on bias	46, 51, 55-56
Students self-selecting out of STEM	• Provide out-of-school, immersive workshop experiences that relate school learning to real world examples to motivate students to pursue STEM careers and education	57
Cultural norms for gender roles and children's learning of these norms	• Educate students, parents, and teachers about the damage done by cultural norms and conditioning with tangible alternative approaches • Educate students about self-awareness and advocacy in their own personal networks • Promote media campaigns on impact of cultural norms, highlighting resources for parents and students.	27, 58-59
Lack of specialist STEM teachers in rural and small schools	• Provide professional development and resources for teachers. • Provide virtual resources for rural students. • Provide travel and accommodation subsidies to support participation at in person events. • Travel to communities to deliver programs • Collaborate with organizations working in rural areas to provide STEM experiences.	60
Higher dropout rates for students who are racialized and Indigenous	• Develop programs targeted to the specific needs of the community with input from members of those groups • Work with established groups, such as Black student mentorship programs and First People's House, to develop content for and communicate directly with racialized students. • Build relationships with teachers and guidance counsellors who work with these populations so that they know opportunities exist and can encourage students to get involved	61

	• Develop an Indigenous Stream within programming that allows students to network with each other and Indigenous role models as well as learn about Indigenous-led research on campus.	
Access to mentors in STEM who share similar social identities	• Create programming focused on access to mentors and role models, including groups like WISER and UA-WISE.	37, 40-41
Confidence; Imposter Syndrome	• Create experiential learning experiences which build up students' confidence • Address concerns over failure, risk aversion, and the challenges imposter syndrome creates. • Avoid competitions. • Use collaborative approaches to learning.	24-26, 62
Intimidation of post-secondary studies	• Have experiential learning, hands-on experiences in a post-secondary setting to introduce students to the campus and environment as well as engage them in the subjects. • Provide access to role models who are similar to students (in terms of background, identity, values, etc) who create a safe space to learn, try and stretch a student's own perception of their abilities.	62
Access to reliable and stable internet, especially during the COVID-19 pandemic	• Offer alternatives, including pre-recorded portions of events, smaller groups. • Allow students to share access with peers on a link and/or encourage group viewing at public locations (e.g., school, healthcare facility, library). • Set up a system to loan laptops to students to participate. • Provide internet boosters for home use and offset extra internet charges.	63
Intersectional identities of the participants	• Be inclusive of many identities in the mentors, supervisors, and volunteers • Use gender based analysis (GBA+) as a foundational framework for building new programs and reviewing current ones • Have staff trained in GBA+	17, 64

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