

PICTURE THIS: USING PHOTO-RESEARCH EXHIBITS AS SCIENCE OUTREACH[†]

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INTRODUCTION

Gender imbalance in science, technology, engineering, and math (STEM) is not only a concern from a social justice perspective, but also has negative consequences for scientific innovation [1] and the economy, given that lack of workplace gender diversity is associated with lower revenue and returns [2]. It is therefore imperative for research scientists in academia and industry to identify ways to attract and retain women in STEM to ensure diversity and equity, economic viability and success in scientific endeavors. Science outreach (i.e., public outreach by scientists) could be particularly impactful in Waterloo, Ontario – a region known as ‘Canada’s Silicon Valley’ that contributes over \$30-billion annually to the global economy [3]. However, Kitchener-Cambridge-Waterloo was recently named one of Canada’s worst regions to be a woman, linking gender disparities in the technology sector to the countries’ largest gender-wage gap [4]. Thus, science outreach should be especially valuable in Waterloo, given the region’s opposing reputations as a STEM powerhouse and an unfavorable place for women.

Situated at Wilfrid Laurier University in Waterloo, Ontario, the Laurier Center for Women in Science (WinS; www.wlu.ca/wins) aims to attract women into STEM fields, celebrate women’s scientific contributions, and to address challenges faced by women in science. As a group that welcomes all genders, WinS supports the full participation of all people in science to improve gender equity, strengthening Canada’s scientific innovation, and diversifying leadership across academia, government and industry. WinS hosts various outreach initiatives; for example, a guest speaker series featuring women in STEM fields. To encourage engagement, WinS also explores new approaches to science outreach that may be more relevant to current students, many of whom are immersed in image-based social media platforms like Instagram [5]. Here, we

discuss one such innovative outreach initiative – interactive research-based photo exhibits on sexism in science.

PHOTO-RESEARCH EXHIBITS

Communicating effectively with images is challenging; for example, the complexities of the concept can be lost if the image is too simple. Alternately, the simplicity of an image can sometimes be more powerful than thousands of words. Portraying complex social issues using a visual medium has the potential to be accessible to a diverse audience. Images from two photo-research exhibits *#DistractinglySexist* (2015) and *#DistractinglyHonest* (2016) were based on social-psychological literature and findings from research by two of the authors (Hennessey and Foster) on the social costs of confronting sexism in science [6]. After initial concept development, collaboration with photographer Hilary Gauld and graphic artist Sarah Mueller allowed us to transform the concepts into reality.

#DistractinglySexist: Confronting Sexism in Canada’s Tech Triangle

The *#DistractinglySexist* exhibit consists of eight portraits of female scientists ranging from a fourth-grade aspiring neuroscientist to full professors at Wilfrid Laurier University. The title of the exhibit was chosen to be a deliberately provocative spin on a recent comment by a Nobel Prize Laureate who referred to women in the lab as ‘distractingly sexy’ (<https://goo.gl/KvNm2Q>). Through use of text, the exhibit narrative states that there is a persistent gender imbalance in science (and especially so in Physics versus other disciplines). If women choose to confront this imbalance, they may incur serious social costs (i.e., retaliation), which might discourage speaking out. If women were equipped with tools (e.g., exposure to mentors [7], a strong science identity) to buffer the costs of confronting sexism, they may be more likely to remain in science, which could reduce gender inequities and ultimately, positively impact social change. This narrative is interspersed with the exhibit

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SUMMARY

Is a picture worth a thousand words? This paper discusses a unique science outreach initiative – provocative photo-research exhibits on sexism in science.

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Fig. 1 Image features Jennifer Moss, CMO and Co-Founder of Plasticity Labs.

images to inspire thought and provide context. The exhibit drew a broad range of audiences, received national media coverage (e.g., CBC; <https://goo.gl/CGyNdE>), and toured institutions in Canada and the US, including Harvey Mudd College and the California Institute of Technology.

Each piece is paired with social-psychological literature and research findings [6]. For instance, the image in Figure 1 would be accompanied by this text:

In non-STEM contexts, women incur social costs when they confront sexism; confronters fear retaliation and are viewed negatively by others as ‘complainers’ [8], [9]. According to the Role Incongruity Model of prejudice, hostile prejudice is elicited when people enact stereotype-incongruent social roles [10]. Considering STEM careers are stereotypically masculine [11], the mere presence of women in science roles versus more feminine roles will likely elicit heightened hostility. Further, confrontation, an active versus passive behaviour, is also inconsistent with female stereotypes (i.e., submissiveness [12]). Women in stereotype-incongruent STEM roles who also confront may therefore incur a ‘double dose’ of hostility as they violate gender stereotypes in two ways.

#DistractinglyHonest: Confronting Sexism in STEM

A follow-up photo-research exhibit presents challenges faced by women in STEM from different perspectives. *#DistractinglyHonest*

consists of 13 portraits of female scientists and their allies, and one collage piece portraying a periodic table featuring women scientists. This second series addresses issues like the role of childhood socialization, work/life balance, and gender identity. Individual pieces can be displayed using chemistry stands and clamps, creating an immersive science outreach experience. The follow-up series is more extensive than its predecessor, reflecting the widespread interest garnered by the original installation. Featured scientists were from Wilfrid Laurier University, York University, Ryerson University, the Lassonde School of Engineering, and community organizations.

The *#DistractinglyHonest* narrative demonstrates the complexities around issues related to women in science; for instance, the text accompanying one piece states: “Advances in gender equity in STEM have occurred in the last few decades, leading some people to believe that men and women are *#HonestlyEqual*.” The next piece responds to this idea by stating a different perspective: “Honestly speaking, men’s and women’s experiences often differ drastically in STEM - women indicate harassment, social isolation, stereotyping, and a struggle to maintain work/life balance, which is *#HonestlyChallenging*.”

Assessing Reactions: Outreach or Outrage?

Recently we started survey research to examine the potential effects of these exhibits among participants and patrons. The exhibits utilize quick response (QR) codes linked to an online survey: (<https://goo.gl/wvUJkM>) and include questions such as, “Have you learned anything new about gender disparities in STEM since engaging with the exhibit materials?” “To what extent do you think the exhibit will impact people’s understanding of gender disparities in STEM?” and “To what extent did you enjoy engaging with the exhibit?” where scores ranged from 1 (*Not at all*) to 5 (*A Great Deal*). While data collection is ongoing, preliminary analyses show that on average, those who have engaged with the exhibits find the experience educational, impactful, and enjoyable. Specifically, descriptive statistics showed that average scores on the previously cited questions were all > 3.70, well above the scale mid-point. The survey also includes various open-ended questions (e.g., “How do you think the exhibit will impact people’s understanding of gender imbalances in STEM?”). When asked to describe the impact of the exhibit, one featured scientist said:

It was empowering to be involved with this exhibit. I tell women in STEM to build their networks - find their supportive communities - and being involved in this exhibit made me feel more connected to my network of like-minded, supportive, women (and allies) in STEM. It was also a fun and very different kind of experience for me, as a long-time scientist - who rarely gets the opportunity to be involved in different approaches to telling our stories.

Some survey respondents explicitly recognized the exhibits as a call to action. For instance, one person commented, “It’s a great visual wake-up call, done respectfully, but not quietly either.” Another way the exhibits function as outreach tools

is by facilitating group discussion. Recently a group of physics educators (OAPT) viewed #DistractinglySexist and then responded to four discussion questions (e.g., “What are the challenges female students and minorities face in a physics classroom?”). Responses indicated that educators perceived various challenges that impact underrepresented students, including stereotyping, low confidence, lack of role models, and underrepresentation in instructional materials. In this instance, the exhibits facilitated discussions on gender disparities in STEM among those teaching physics, a discipline in which women remain severely underrepresented (20% of physics graduates in Canada are female [13]).

CONCLUSION

Patrons and participants of the photo-research exhibits described in this paper report positive experiences. Feedback on the exhibits as science outreach tools indicate one notable strength of the

exhibits is that they create a space for diverse groups, including all genders, to discuss sexism in science. Moreover, the exhibits are situated within empirical research, increasing the validity of the installations. Taken together, feedback indicates that #DistractinglySexist and #DistractinglyHonest are effective outreach tools. Specifically, they appear to facilitate discussions on sexism in science, and expand the social network of women in science by connecting those in the series and people who engage with exhibit materials. To date, the exhibits have travelled both locally and internationally, reflecting their widespread positive reception among STEM and non-STEM audiences alike.

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