GIRLS EXPLORING PHYSICS

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As most physicists are aware, women are under-represented at all levels of physics in North America. The situation in Canada is similar to that in the United States where data shows that the fraction of bachelor's degree recipients in physics who are women has remained relatively unchanged since the year 2000 at around 21% [1]. In 2009 a group of women faculty in the Physics Department at Simon Fraser University (SFU) decided to create an outreach program to address this issue. Various studies have shown that the largest decrease in the participation of women in physics occurs between the secondary and post-secondary levels [2] so we decided to aim our program at high school girls, specifically girls in grades 9 and 10. This is the age range when young women in BC are deciding whether to take Grade 11 and 12 physics courses. It is very unlikely that a student will choose to study physics at university if they have not taken physics in high school. Our choice to target only girls is supported by research that has shown that "explicit discussion of under-representation of women in science was positively related to physics identity for female students." [3]

Fig. 1 A participant in the Fall 2014 workshop experimenting with a Van de Graaff generator.

SUMMARY

Girls Exploring Physics is an outreach program at Simon Fraser University designed to encourage more young women to consider physics as a career path.

WORKSHOP DESIGN

Each Girls Exploring Physics (GEP) [4] workshop is comprised of two hour-long experimental physics sessions, a networking lunch with women physicists, an observatory tour and a discussion of career options in physics. Most of the experimental activities closely tie to the research fields of the women faculty in the SFU Physics Department, specifically: soft condensed matter physics, biophysics, solid-state physics, quantum technology and nuclear physics. For example, two of the activities that we have presented are "LED's: Lighting for Efficiency and Drama" where the girls learn how light emitting diodes work and create their own LED device and "Exploring Physics Through Candy" which uses candy as an introduction to soft condensed matter physics. Women faculty and students from the SFU Physics Department as well as women physicists from local industry assist during the activity sessions and attend the networking lunch. The workshops are typically held on a non-school day for the local high schools such as the BC province-wide professional development day in October or during Spring Break. This enables the girls to come to campus individually, though we have noticed that many girls come with their friends or occasionally as part of a school group with a teacher.

Fig. 2 Grade 9 and 10 girls participating in a workshop session on nuclear and particle physics.

HISTORY

The first GEP workshop was held in March 2010 with support from a Jade Bridges Programme grant awarded by the National Sciences and Engineering Research Council Women in Science and Engineering Chair for BC/Yukon. In 2011 GEP received support from WWEST Partners, an initiative of the next National Sciences and

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Engineering Research Council Women in Science and Engineering Chair for BC/Yukon who was appointed in 2010. This funding combined with on-going support from the SFU Department of Physics and Dean of Science enabled us to offer two workshops a year from 2011-2013. In 2015 we were awarded a National Sciences and Engineering Research Council PromoScience grant to improve our program, add new hands-on activities, increase our enrollment and develop a professional development workshop on women in physics for high school science teachers. We also received an additional WWEST Partners grant specifically targeted at the professional development workshop.

From March 2010-2017, GEP has presented 13 workshops, which have reached approximately 600 young women between the ages of 13 and 16. The participants primarily live in the Metro Vancouver regional district though we have had attendees from as far away as the Sunshine Coast, Vancouver Island and 100 Mile House in eastern British Columbia. In addition, our workshop participants, who represent the diversity of the local area, come from many different racial and ethnic groups. Over the last six years more than 100 SFU students, both male and female, seven female physics faculty members, four women who work in local industry and several high school students have volunteered their time to help out with various aspects of the workshops.

EVALUATION

In the past workshop participants were asked to fill out a short evaluation survey. The results of these surveys show that girls consistently find the workshops engaging and they indicate that they have learned new things. For example in the October 2013 workshop survey 40/48 girls rated the activity on LED's as good or very good and 42/48 rated the "Physics of Chocolate" activity as good or very good. In order to follow up with the young women who attended a GEP workshop, a survey of March 2010 workshop participants was conducted in the Spring of 2012. 12/15 (80%) of the survey respondents had taken or were taking Physics 11 and 8/15 (53%) had taken or were taking Physics 12.

Overall these girls show a high interest in pursuing careers in science or engineering with 13/15 (87%) stating that they plan to study STEM subjects at university. We plan to enhance our assessment of GEP in the future by having the girls complete a pre-survey about their educational plans and perceptions of physics before attending the workshop and then do a follow-up survey one or two years later to determine if their survey responses have changed.

FUTURE PLANS

Our next big step is the introduction of a professional development workshop for high school science teachers. This yearly workshop is designed to accomplish three goals: 1) introduce teachers to the issues related to the under-representation of women in physics, 2) provide strategies to address these issues, and 3) give teachers some experience with hands-on physics activities they could incorporate into their own classes. We believe that the GEP program could easily be transferred to another geographic region if the faculty at a university in that region were interested in starting their own program. We would be happy to share details about our hands-on activities and pro-d event with them.

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