Girls Who Game at McMurrich

Kamla Rambaran and Zelia Capitao-Tavares

Middle school is a critical time for adolescent identity and STEM-interest formation [1]. The "STEM cliff" describes the steep decrease in student interest in science and engineering during middle school years, even if student grades remain high [2], and that the decrease is more pronounced for female students [3]. The strongest predictor of student STEM interest for middle-school-aged girls is their own science-related self-perception, which can be positively and negatively impacted by in-school and out-of-school science experiences [1]. Students exposed to STEM careers and provided access to explore their interests in technical and scientific skills have been shown to be more likely to pursue a STEM career [4]. Therefore, identifying and encouraging both in-school and out-of-school activities that expose students to STEM skills and careers and positively impact girls' self-perception as related to STEM could be a key to recruiting more girls into high school STEM coursework, majors, and careers.

Girls Who Game (GWG) is an international program for middle school-aged girls to collaborate in teams and co-develop virtual worlds in Minecraft Education to meet a given design challenge such as "Design and create a community of the future that prioritizes affordable and clean energy and gender equality," or "Design and create an eatery of the future that prioritizes clean water and sanitation and zero hunger." Sponsored by Microsoft and Dell, the program follows recommendations for female persistence in computer science such as learning and working in pairs, utilizing peer support, using computers for personal expression, involving female role models, and experiencing early success in some aspect of computing [5]. In Canada, the program targets International Society for Technology in Education (ISTE) standards, TDSB Global Competencies, and UN Sustainable Development Goals awareness.

At McMurrich Junior Public School, a member of CPSN (Canadian Playful School Network), GWG is taught as a class and as a club. Student experiences scaffold over time to grow student leadership–Level 2 GWG students are the peer mentors of Level 1 GWG students–and throughout the experience, the students interact with an array of adult mentors utilizing online collaboration and feedback tools such as Flip. While "fun," it's still hard work. One GWG student reflected, "The club wasn't just smooth and just like playing around with Minecraft, it was more hard-working."

The impact of GWG is reflected in ***student skills and STEM self-perception.*** McMurrich's student reflections noted "collaboration and communication" and growth in design process skills including developing empathy and cultural awareness. Sample quotes include, "[I was] researching my communities and what we had to do to provide the needs of them," "I learned to address the needs of the community through our eatery of the future," and "I got to learn about lots of new people. Something else I learned was about the indigenous community and what they like to eat and what their culture is."

Student reflections also echoed their growing STEM self-perception: "I collaborated with my team, we even went to the finals of Cybersecurity Build! It was very fun and a good educational skill that I learned." Additional reflections include: "Participating in GWG has inspired me to know that I am capable of doing anything I put my mind to," "GWG makes me more confident," and "GWG showed me that all people can be in STEM."

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Acknowledgements
McMurrich GWG teachers Kamla Rambaran and Zelia Capitao-Tavares thank the Canadian Playful School Network (CPSN), Dell, and Microsoft for their sponsorship, as well as Dr. Katey Shirey and Advanced Learning Partnerships (ALP) for their support in writing this summary.

References Cited

[1] Kang, H., Calabrese Barton, A., Tan, E., D Simpkins, S., Rhee, H. Y., & Turner, C. (2019). How do middle school girls of color develop STEM identities? Middle school girls' participation in science activities and identification with STEM careers. Science Education, 103(2), 418-439.

[2] Christidou, V. (2011). Interest, Attitudes and Images Related to Science: Combining Students' Voices with the Voices of School Science, Teachers, and Popular Science. International Journal of Environmental and Science Education, 6(2), 141-159.

[3] Barmby, P., Kind, P. M., & Jones, K. (2008). Examining changing attitudes in secondary school science. *International journal of science education*, *30*(8), 1075-1093.

[4] Blotnicky, K. A., Franz-Odendaal, T., French, F., & Joy, P. (2018). A study of the correlation between STEM career knowledge, mathematics self-efficacy, career interests, and career activities on the likelihood of pursuing a STEM career among middle school students. *International journal of STEM education*, *5*, 1-15.

[5] Denner, J., Werner, L., Bean, S., & Campe, S. (2005). The girls creating games program: Strategies for engaging middle-school girls in information technology. Frontiers: A Journal of Women Studies, 26(1), 90-98. https://muse.jhu.edu/pub/17/article/183235/pdf