

STEM CAMP: ACTIVE INVOLVEMENT IN RESEARCH AND SCIENCE ENDEAVORS

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Abstract

At almost every step of the STEM education ladder, we see girls walk away. By seventh grade, most girls have lost interest in these fields, and few high school girls plan to pursue STEM in college. Our goal for the camp is to provide encouraging STEM Education experiences to rising eighth grade girls from Wood County and Northwest Ohio by organizing a camp introducing them to emerging areas in STEM and exposing them to the environment of higher education. During this presentation, we will discuss the camp structure, curriculum design, research design and the research findings.

This presentation will present data based on pre- and post-evaluations collected and analyzed based on the learning outcomes for the 2018 Camp. Camp participants responded to daily reflective questions on each class, workshop and field trip and we used this data in planning the curriculum for the next year. Both quantitative and qualitative data were collected. Some of the data suggests that there was a 20% increase in the number of girls indicating an interest in pursuing a career in science after attending the camp. After completing the camp, 100% girls reported their goal was to attend college. Ninety-eight percent of the campers positively rated the opportunities provided by camp to learn about the real world applications of STEM. After successful completion of Tech Trek, we concluded that these girls think about themselves as future scientists, engineers, mathematicians, and computer specialists and the camp experience ignites their interest in STEM.

Keywords: *STEM education, mentorships, active learning, partnerships, STEM career ladder.*

1. Introduction

At almost every step of the STEM education ladder, we see girls walk away. By seventh grade, most girls have lost interest in these fields, and few high school girls plan to pursue STEM in college. Those who do will likely be a minority in their programs and aren't likely to find much support in their studies. Stereotypes, gender bias, and the climate of academic departments and workplaces continue to block women's participation and progress. Additional research indicates that training programs are, in fact, successful in recruiting and retaining more women and underrepresented students in STEM programs. Both mentorship and active involvement in research and science endeavors have been shown to increase motivation and interest in STEM fields among young women, and particularly young women of color. Tech Trek operates on the belief that learning and achieving come from applying oneself rather than from an inborn predisposition. The camp builds a set of values and skills that equip girls to be persistent learners in any sphere and work hard to reach their goals. For many girls, the camp experience provides the life-altering "spark" that ignites their interest and encourages them on a path toward success. The Bowling Green AAUW Branch and Bowling Green State University wanted to break this cycle and assist girls into pursuing STEM professions.

2. Goals and objectives

The goal for the camp was to provide encouraging STEM Education experience to rising 8th grade girls from Wood County and Northwest Ohio by organizing a one-week camp introducing them to emerging areas in STEM and exposing them to the environment of higher education. After successful completion of Tech Trek, the goals is for girls think about themselves as future scientists, engineers, mathematicians, and computer specialists.

The Tech Trek Learning Outcomes for participants were to:

- Know the diverse career paths within the STEM fields.
- Engage in experiential, hands-on activities that enrich learning on a daily basis.
- Experience workshops and core classes that accommodate multiple learning styles and personality types.
- Strengthen self-efficacy by providing multiple opportunities to engage in healthy competition and recognize successes.
- Experience an environment that provides them with an opportunity to meet and learn from female STEM role models of all ages.

3. Participant selection

The researchers reached out to local schools in the Wood County and Northwest Ohio area for nominations from science and math teachers. This past year there were 260 girls nominated by teachers. Once nominated, the girls are informed of the nomination and must make application to be considered for one of the fifty camp slots. Each girl is interviewed by a team of AAUW members and then 50 are selected based on their application, narrative on why they want to pursue a STEM career and their face to face interview.

4. Curriculum

Curriculum covered includes STEM careers, coding, cell research, robotics, forensics, engineering, robotics, algae bloom in the Great Lakes, chemistry, physics, microbiology, cyber security, MIT App Inventor, and biology. Participants are assigned to one of three core courses based on interest. The core courses are cyber security, microbiology and MIT App Inventor. Cyber security.

Women are in high demand in the cybersecurity profession and represent only 11% of the positions in this field. Introducing middle-school girls to this issue and the careers in cybersecurity is important so we have future professionals in this area. Middle school age girls are important to target because by age 16 they will decide not to pursue technology if they are not exposed to the curriculum or to role models (Center for Cyber Safety and Education, 2017). Cybersecurity is one of the core courses based on curriculum created by AAUW and Symantec (2108). This five-day course introduces the students to programming languages, coding, and women in the cyber security field. Students are in the computer science laboratory 3 hours per day immersed in this robust curriculum.

App Development is the second core course that is offered at the camp. We use the MIT App Inventor curriculum that introducing the girls to mobile App design, coding and creative thinking. Students are in the computer science laboratory 3 hours per day immersed in this robust curriculum using android systems and PC systems. The students begin learning how to design, build and maintain mobile applications. This course helps build the basic skills so that they can go into a career in Mobil App Development.

The third core course is microbiology. Many of the participants are interested in pursuing careers in the medical or environmental fields. The girls are in the biology laboratory with a biology professor 3 hours a day researching basic microbiology lab techniques by isolating and identifying environmental bacteria. It involves isolation of bacteria from different samples such as water, air, and milk. Then, implications of some microbiological techniques such as spreading, streaking are understood to amplify the number of bacteria. Additionally, using staining techniques will be used to distinguish between gram positive and gram negative bacteria.

During the afternoon and evening, the participants attend workshops on chemistry, physics, kinesiology, robotics, engineering, forensics and mathematics. The signature experience is the Shark Dissection workshop which provides students with a culminating experience and teambuilding.

5. Outcomes

Pre and post evaluations were completed by each camper, data is analyzed by a consultant from AAUW and the results are shared with us. Questions include items such as:

- What was your experience at Tech Trek?
- What have you learned?
- How might the Tech Trek Camp be improved?
- What are your perceptions of science, technology, engineering and mathematics?
- How would our rate the quality of the elements of the camp?

These evaluations are used to plan the camp the following year. We have found that:

- There was a 20% increase in the number of girls that indicated that they would be interested in pursuing a career in science after attending the camp.
- After completing the camp 100% girls reported that they intend to attend college.
- 98% girls positively rated the opportunities provided by Tech Trek Camp to learn about the real world applications of STEM.

Camp participants responded to daily reflective questions on each class, workshop and field trip and use this data in planning the curriculum for the next year. A Tech Trek research team designed, implemented and analyzed the evaluation process and results. Both quantitative and qualitative data were collected. Themes emerged such as confidence in pursuing a career in a male-dominated field, finding support with other like-minded girls, positive impact of team-building, understanding the gender bias that they face in STEM fields and confidence to pursue high level courses at school.

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