



Promoting Applied STEM Careers in Fashion and Entrepreneurship to High School Students

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Introduction and Purpose. While science, technology, engineering, and mathematics (STEM) are increasingly in high demand across different industries and types of jobs (P21, 2017), there is a shortage of new talent with relevant knowledge and skills. Moreover, underrepresentation of women in STEM professions has led to the development of educational programs designed to strengthen young women's interests in STEM (Brotman & Moore, 2008). Encouraging high school students to consider *applied STEM* disciplines might be a viable solution. We propose the concept and advocate for applied STEM, which we define as academic disciplines that use science, technology, engineering, and/or math within a specific professional field such as fashion, entrepreneurship, food, etc.

In this study, we developed and tested the effectiveness of experiential learning modules in an applied STEM camp to engage high school students in science-, math-, and technology-based activities. The **research objectives** were: (1) to create awareness of applied STEM careers among high school students, with a focus on fashion and entrepreneurship, and (2) to increase student interest and intention to pursue college careers in STEM. Activity theory served as a **theoretical framework** in this study. Scholars use the theory to understand how students engage with and learn STEM-related subjects (Reveles et al., 2007; Wade-Jaimes et al., 2019).

Fashion, Entrepreneurship, and STEM. Careers in fashion and entrepreneurship require the knowledge in science, technology, engineering, and/or math (Hathcock et al., 2015). Young people specifically tend to be interested in fashion and entrepreneurship (Beaudoin et al., 2006). Therefore, scholars suggest incorporating fashion and entrepreneurship to promote STEM among young people (Buchholz et al., 2014; Carter et al., 2015; Peppler, 2013; Washington et al., 2020). Previous research examined the impacts of camps on student learning, interest, and attitude toward STEM careers (e.g., Bathgate et al., 2014; Dave et al., 2010; Fields, 2009). **High school students had increased interest in STEM after participating in camps that employed fashion- and entrepreneurship-based activities (Peppler, 2013; Washington et al., 2020).** Based on activity theory and previous research, the following hypotheses were proposed:

H1: After the STEM camp, students have a higher *interest* in (a) science careers, (b) technology careers, (c) engineering careers, and (d) math careers.

H2: Students' *beliefs* that *fashion* careers involve (a) science, (b) technology, (c) engineering, and (d) math are higher after the STEM camp.

H3: Students' *beliefs* that *entrepreneurship* careers involve (a) science, (b) technology, (c) engineering, and (d) math are higher after the STEM camp.

H4: After the STEM camp, students have a greater *knowledge* about (a) fashion careers and (b) entrepreneurship careers.

H5: After the STEM camp, students report a higher *intent* to enroll in a college major that is (a) science-, (b) technology-, (c) engineering-, and (d) math-related.

Applied STEM Camp Description. We used effective STEM camps' strategies from previous research to build curriculum for the Applied STEM camp (e.g., Dunne et al., 2015; Fields, 2009.) Our camp was a fully immersive one-day experience offered on a university campus. Five hands-on experiential sessions were designed to demonstrate applications of STEM in fashion and entrepreneurship: 3D prototyping, fashion data analytics, esports, virtual retailing, and entrepreneurship. Undergraduate and graduate students were engaged as peer-mentors to lead camp participants and provide additional information throughout the day.

Method. After the study was approved by Institutional Review Boards, camp participants were recruited from nearby high schools. All camp participants (120 students) were invited to participate in the study by completing pre- and post-camp surveys. A structured questionnaire was used to measure students' perceptions of STEM, fashion, entrepreneurship, and their intentions to pursue STEM-related college majors on a six-point Likert scale (Chenoweth & Galliher, 2004; Gibbons & Borders, 2010; Kier et al., 2014; Oh et al., 2013). In addition, open-ended questions were included in the post-camp survey to collect participants' feedback about the camp, STEM, fashion, and entrepreneurship.

Research Participants. Fifty-seven camp participants completed both pre- and post-test surveys. Participants were between 14 and 17 years old, and most were female (76%). About half of students were White (47%); 26% were Black or African American; 16% were Hispanic, and 7% were Asian. About 81% took a fashion or apparel-related course at high school, and 24% took an entrepreneurship course at high school.

Results. Paired sample *t*-tests were used to test the hypotheses. After the camp, participants demonstrated:

- **(H1)** higher *interest in careers* that involve science, $t(56)=2.08, p<.05$; technology, $t(56)=2.78, p<.01$; engineering, $t(56)=2.48, p<.05$; and math, $t(56)=3.73, p<.001$;

- (H2) higher *beliefs* that *fashion* careers involve science, $t(56)=3.24, p<.01$; technology, $t(56)=3.24, p<.01$; and engineering, $t(56)=2.07, p<.05$; but not math;
- (H3) higher *beliefs* that *entrepreneurship* careers involve science, $t(56)=2.46, p<.05$, and technology ($t(56)=2.59, p < 0.05$; but not engineering and math;
- (H4) greater *knowledge* of fashion-related careers, $t(56)=4.98, p<.001$, and entrepreneurship-related careers, $t(56)=3.72, p<.001$;
- (H5) higher *intention* to enroll in college majors related to science, $t(56)=2.66, p<.05$; technology, $t(56)=5.27, p<.001$; engineering, $t(56)=4.18, p<.001$; and math, $t(56)=4.22, p<.001$

Therefore, hypotheses H1a-d, H2a-c, H3a-b, H4a,b, and H5a-d were supported. Hypotheses H2d and H3c-d were not supported.

To analyze students' responses to open-ended questions in the post-camp survey, a thematic analysis procedure was used (Braun & Clarke, 2006). Three themes were identified:

1. *New Career Ideas* explored participants' learning about different career paths and the opportunity to "try them on" during the camp. High school students were exposed to new career ideas not accessible at their high schools.
2. *College Campus Experience* examined benefits of hosting the camp on a university campus. All students enjoyed the real-life college campus experience, "I believe camps like applied STEM camp are very useful for high school students. Camps like these give experiences for students, that as a preview for what to expect in preparing for college courses and classes."
3. *STEM and Fashion*. Students were surprised to realize broad career opportunities within the fashion industry. They expressed a great satisfaction exploring the role of technology applications, "I learned that STEM and fashion are two very intertwined topics and that there are many more careers in fashion than I thought there was."

Conclusions. The results reveal the benefits of the Applied STEM camp to enhance high school students' awareness of STEM in fashion and entrepreneurship and their career-related interests, beliefs, and intentions. The Applied STEM Camp experience can be replicated at other institutions to encourage students to consider fashion and entrepreneurship careers.

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