

Self-Efficacy, Interpersonal Skills, and Career Choice in STEM Professions

A Case Study on the FIRST Program

Y. J. Dori^{1,2} and S. Rocker Yoel¹

¹Faculty of Education in Science and Technology, Technion, Israel Institute of Technology,

Haifa 3200003, Israel

²Samuel Neaman Institute for National Policy, Haifa 3200003, Israel

Abstract

In view of the acute lack of STEM professionals, there is dire need to encourage more students to elect STEM studies. The robotics program For Inspiration and Recognition of Science and Technology (FIRST), whose participants are students 5–18 years old, employs project-based learning (PBL) principles to develop interpersonal skills. The FIRST program applies science, technology, engineering, and mathematics (STEM) principles while the students work as a team guided by mentors. About half of the program participants become mentors after they graduate or during their participation as mentees.

The goal of this research was to characterize and evaluate the effect of the FIRST program on the attitudes of mentees, graduates, and mentors regarding their self-efficacy, interpersonal skills, and STEM career choice.

A convergent mixed-methods approach was used, with data collected qualitatively via interviews and open questions and quantitatively via questionnaires. The research participants included 119 high school student mentees, 297 graduates, and 49 mentors. Partially structured interviews were conducted, in which slightly different questions were posed to each participants group. The high school student mentees, the graduates, and the mentors also responded to questionnaires designed for each of these groups. Data analysis showed that the FIRST program encouraged the participants to choose STEM careers and improved their self-efficacy and interpersonal skills. The main factor impacting the graduates' STEM career choice was their exposure to robotics and to

experts from the industry. A significant positive, strong correlation was found between all the factors, including interpersonal skills, STEM exposure, career choice, family and school support, and external motivation. The effect on participants' STEM career choice was stronger for men than for women, while external motivation affected women more than men. Mentors' and mentees' perceptions of the contribution of the FIRST program on graduates' STEM career choice and the development of their interpersonal skills were similar, but it was stronger for mentees who chose to be mentors.

The theoretical contribution of this research is to the Social Cognitive Career Theory (SCCT), as it explains high school students' career choices. The research establishes possible relations between self-efficacy, interpersonal skills, career choice aspirations, and actual career choice. The research advances our understanding of the significant contribution of the FIRST program to increasing the number of STEM professionals. The methodological contribution is the validation of the three types of questionnaires through factor analysis and the development of a rubric for analyzing interviews with the various participant groups. The study demonstrates that the FIRST program contributes to society by providing equitable opportunities for all its participants, including women, men, minorities, and those from the geographical and economic periphery.