

The Effects of Science, Technology, Engineering and Math Problem-Based Learning on Native Hawaiians and Other Underrepresented, Low-Income, Potential First-Generation High School Students

Authors : Nahid Nariman

Abstract : The prosperity of any nation depends on its ability to use human potential, in particular, to offer an education that builds learners' competencies to become effective workforce participants and true citizens of the world. Ever since the Second World War, the United States has been a dominant player in the world politically, economically, socially, and culturally. The rapid rise of technological advancement and consumer technologies have made it clear that science, technology, engineering, and math (STEM) play a crucial role in today's world economy. Exploring the top qualities demanded from new hires in the industry—i.e., problem-solving skills, teamwork, dependability, adaptability, technical and communication skills— sheds light on the kind of path that is needed for a successful educational system to effectively support STEM. The focus of 21st century education has been to build student competencies by preparing them to acquire and apply knowledge, to think critically and creatively, to competently use information, be able to work in teams, to demonstrate intellectual and moral values as well as cultural awareness, and to be able to communicate. Many educational reforms pinpoint various 'ideal' pathways toward STEM that educators, policy makers, and business leaders have identified for educating the workforce of tomorrow. This study will explore how problem-based learning (PBL), an instructional strategy developed in the medical field and adopted with many successful results in K-12 through higher education, is the proper approach to stimulate underrepresented high school students' interest in pursuing STEM careers. In the current study, the effect of a problem-based STEM model on students' attitudes and career interests was investigated using qualitative and quantitative methods. The participants were 71 low-income, native Hawaiian high school students who would be first-generation college students. They were attending a summer STEM camp developed as the result of a collaboration between the University of Hawaii and the Upward Bound Program. The project, funded by the National Science Foundation's Innovative Technology Experiences for Students and Teachers (ITEST) program, used PBL as an approach in challenging students to engage in solving hands-on, real-world problems in their communities. Pre-surveys were used before camp and post-surveys on the last day of the program to learn about the implementation of the PBL STEM model. A Career Interest Questionnaire provided a way to investigate students' career interests. After the summer camp, a representative selection of students participated in focus group interviews to discuss their opinions about the PBL STEM camp. The findings revealed a significantly positive increase in students' attitudes towards STEM disciplines and STEM careers. The students' interview results also revealed that students identified PBL to be an effective form of instruction in their learning and in the development of their 21st-century skills. PBL was acknowledged for making the class more enjoyable and for raising students' interest in STEM careers, while also helping them develop teamwork and communication skills in addition to scientific knowledge. As a result, the integration of PBL and a STEM learning experience was shown to positively affect students' interest in STEM careers.

Keywords : problem-based learning, science education, STEM, underrepresented students

Conference Title : ICMSE 2020 : International Conference on Mathematics and Science Education

Conference Location : Montreal, Canada

Conference Dates : June 17-18, 2020