Enhancing Science and Mathematics Understanding Through Fishing Camps

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EXECUTIVE SUMMARY

In this chapter, the authors explored the experiences of students and preservice teachers (PSTs) participating in a fishing camp designed to integrate STEM education with outdoor experiential learning. They examined the impact of this informal learning experience on students' attitudes towards science and mathematics, their engagement and understanding of STEM concepts, and the development of PSTs' pedagogical knowledge. All participants reported viewing science and mathematics as more accessible and interesting and feeling more confident in their abilities. This chapter included eight hands-on activities implemented in the fishing camp that significantly enhanced participants' understanding of science and mathematics. Some challenges associated with organizing a fishing camp were also identified.

INTRODUCTION

STEM education, encompassing the fields of science, technology, engineering and mathematics, is of great importance for preparing students to thrive in an increasing complex and technologically advanced world (National Research Council, 2015; Skayia et al., 2019; Whitesell, 2016). Proficiency in these subjects not only opens doors to a wide range of career opportunities but also fosters essential skills such as critical thinking, problem-solving, and innovation (Attard et al., 2020; National Science Board, 2016; Sahin et al., 2014). Despite the recognized importance of STEM education, many students exhibit reluctance and disengagement when it comes to learning these subjects. This reluctance can stem from a variety of factors, including abstract concepts, lack of relevance of everyday life, and a traditional classroom approach that may not adequately cater to diverse learning styles (Li et al., 2020; Nugent et al., 2015; Potvin & Hasni, 2014).

Research indicates that informal learning experiences, which take place outside the conventional classroom setting, hold significant promise for addressing student reluctance and enhancing STEM education (Datta, 2016; NRC, 2009; Polinsky et al., 2019; Walan & Gericke, 2021). Informal learning environments provide students with hands-on, real-world experiences that make abstract concepts more concrete and relatable. These settings encourage active participation, curiosity, and a sense of discovery, which can transform students' attitudes towards STEM subjects and increase their engagement and motivation (Barksdale et al., 2022; Datta, 2016). Mohr-Schroeder et al. (2014) found that if students were exposed to STEM education earlier in their schooling years, they would have a better chance to pursue STEM as a potential career choice in the future. However, many elementary and middle school students have limited exposure to rigorous STEM curriculum due to the lack of teacher training, available resources or structured class schedule (Binns et al., 2016; Civil, 2002; Roberts et al., 2018).

Pre-service teachers (PSTs), especially PSTs seeking K-8 teaching certificates are often reluctant to engage with science and mathematics and reported a lack of confidence in personally doing science and mathematics (Adams & Gupta, 2017; Evans et al., 2021). Their attitudes towards STEM subjects can affect their attitude towards teaching those subjects and how they will teach in the future (Amato, 2004; Gullberg et al., 2017; Sun, 2023). Negative attitudes often led to less time spent teaching science and mathematics, more dependence on textbooks, and less emphasis on teaching methods that engage students in genuine inquiry-based activities (Appleton & Kindt, 2002; Campbell et al., 2022). There is a need to provide additional opportunities for these PSTs to develop conceptual understanding, positive dispositions, increased confidence and self-efficacy in teaching STEM subjects (Adams et al., 2014; Bursal & Paznokas, 2006, Sun, 2023).