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The Impact of Integrating STEM and Arts on Student Engagement in Sustainability Education: A Multi-Phase STEAM Competition Approach

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Abstract

The pressing global sustainability challenges that we are facing today encompass complex interplay of scientific and cultural dimensions that interact in intricate ways. Currently literature related to sustainability is dominated by scientific discourse though arts, as drivers of culture, have a leverage role to play in achieving the societal transformation we envision. This study explores the effects of integrating STEM disciplines with the arts on students' engagement in sustainability education. Grounded in the STEM Education Framework (Hwang and Taylor, 2016), this qualitative study utilized a competition-based case study methodology to investigate the engagement of 46 grade nine students from 23 secondary schools in a multi-phase STEAM competition titled "Reconnecting with Nature through Flowers." Participants, invited on a voluntary basis, were engaged in three distinct activities: a quiz competition on scientific facts related to flowers, a dissection-cum-drawing competition involving the detailed study and artistic representation of flower structures, and an origami competition focused on designing and prototyping flower models. Findings revealed that the STEAM competition fostered interdisciplinary learning and developed sustainability competencies among participants, including critical thinking, design thinking, creativity, collaboration, interdisciplinary communication, mathematical reasoning, research investigation, and artistic expression. This study underscores the value of STEAM competitions in promoting engagement and interdisciplinary learning, highlighting the potential for integrating arts into STEM education to foster a holistic learning experience.

Keywords: STEAM, Competition-based learning, STEM competencies, student engagement, sustainability education