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Transforming Integrative Maker Education for STEM Learning

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Abstract : T.I.M.E. for STEM (Transforming Integrative Maker Education for STEM learning) focuses on improving the quality and effectiveness of STEM education for pre-service teachers through a focus on the integration of maker space pedagogy. This National Science Foundation-funded project primarily focuses on undergraduate pre-service teaching students majoring in elementary education. The study contributes to the knowledge about teaching and learning by developing, implementing, and assessing faculty development, interactive instruction, and STEM lesson plan development. This project offers a valuable opportunity to improve STEM thinking skills by formally integrating STEM concepts throughout the pre-service teacher curriculum using an interdisciplinary approach. T.I.M.E. for STEM utilizes a maker space laboratory at Point Park University in Pittsburgh, PA, USA. However, the project design is such that other institutions of higher education can replicate the program with or without a physical maker space lab as the project's findings and "maker mindset" are employed. Utilizing qualitative research methodology, the project investigates the following research question: What do pre-service teachers (education students) and faculty members identify as areas of pedagogical growth in STEM learning and teaching in a makerspace environment? This research highlights the impact of makerspace pedagogy on improving STEM education learning outcomes through an interdisciplinary constructivist approach. The project is expected to have a multiplier effect as it impacts STEM disciplinary and higher education faculty, pre-service teachers, and teacher preparation programs at other universities that benefit from what is learned at Point Park University. Ultimately, the future elementary students of the well-prepared pre-service teachers steeped in maker pedagogy and STEM content will have the potential to develop higher-level thinking skills and improve their mathematics and scientific achievement, which are essential for the 21st century STEM workforce.

Keywords : maker education, STEM learning, teacher education, elementary education
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