

Developing Pre-Service Science Teachers’ Entrepreneurship Mindsets

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“Only the paranoid survive.”

—Andy Grove

Abstract: *The demand for knowledge in science, technology, engineering, and mathematics (STEM) is expanding as the twenty-first century progresses. Growing K-12 STEM education has risen to the top of the priority list in many countries’ educational reform efforts. Typical contexts for giving scientific instructions should be designed around engineering design-based thematic activities rather than the other way around. Teachers’ responsibilities as designers of design-based thematic activities would also present them with numerous chances for professional development and advancement. It is claimed that introducing entrepreneurship ideas into the engineering curriculum results in improved student satisfaction, longer professional careers, and a shift in attitudes toward engineering difficulties. It allows students to enjoy themselves more and draws their attention to the possibility of self-employment.*

Keywords: *STEM, Thematic Education, Entrepreneurial Activities, Student Improvement*

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THE 21st century is witnessing an increasing demand for expertise in science, technology, engineering, and math and improving K-12 STEM education has become a top priority in many countries' educational reform. It is essential to develop and sustain quality programs that focus on systematic and effective STEM education for educators (Guzey, 2016). Currently, the need for explicit integration of science with engineering demands teachers to express intersecting notions and core disciplines using scientific and engineering practices, which would permanently make contributions to students' prospects through guiding them to discover various connections between and among different STEM subjects and thus help them to increase the motivation to learn science, as well as reinforce conceptual comprehension of science (Marulcu & Barnett, 2016).

To promote the integration of disciplines and improve teachers' professional competence, the teaching concept of engineering design-based thematic activities has been highly recommended. It is estimated that about 90% of human being's learning process is composed of indirect experiences, which explains students' devotion to standardized assessments and examinations. To transform the conventional practice, numerous educational experts have suggested that engineering design-based activities should be adopted as a typical context for delivering scientific instructions to arouse the sense of engagement among students. Engineering design-based thematic activities both emphasizes student's perception of engineering process and supports their understanding of scientific contents (Joseph, 2004). It is firmly based on prior research carried out in educational settings, seeks to trace the evolution of learning, and examines relevant theoretical results in order to construct instructional tools that survive the challenges of everyday practice. What is more, previous literature implies that the role of teachers as the designers of such activities would also provide them with rich opportunities for professional growth, fabricating a relaxed environment for teachers and learners to dynamically interact with each other. The experience of developing design-based thematic activities offers teachers a variety of chances to analyze their teaching, reflect on their practices and reorganize their previous instructions from students' viewpoints.

In addition, some scholars argue that incorporating entrepreneurship mindsets into engineering curriculum not only associates theoretical training with practical experience, but also leads to higher student satisfaction, longer professional careers, changing attitude toward engineering challenges, teamwork skills, thus triggering their autonomous entrepreneurial interest. Andalibi (2019) discovers that students would be more interested in learning about entrepreneurship and using technical skills learned in class in solving several real-world problems with potential business opportunities. As expected, students under entrepreneurial engineering education tend to raise interesting topics that have commercial meanings and present an essential need of the campus or the society. It allows students to enjoy more and attracts students' attention to self-employment, which cultivates talents with the willingness to start their own businesses for the society.

Engineering Design-Based Thematic Activities: An Investigation of Pre-Service Science Teachers' Entrepreneurship Mindsets in this issue of the journal discusses the pre-service teachers' use of Entrepreneurship Mindsets (EM) in solving real-life problems during engineering design-based activities and collects research data via the engineering design challenge worksheet and PSA. The undergraduates' EM is evaluated in six sub-dimensions: curiosity connections, creating value, communication, character, and collaboration (Kiyici et al., 2022). While providing evidence that pre-service science teachers need more training in entrepreneurship, this paper draws our attention to the importance of science teachers' level of knowledge about entrepreneurship and their tendency to develop their students' entrepreneurship skills.

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