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Beyond and Within STEM: Exploring Entrepreneurial Mindsets in Engineering Education

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Abstract

Recent global pedagogical strategies highlight the growing importance of integrating STEM and entrepreneurship education. As engineers, scientists, and technologists address increasingly complex challenges in today's workforce and future economy, STEM skills alone may be insufficient; thus, entrepreneurial thinking can complement, translate and extend traditional STEM approaches. International and national policy frameworks acknowledge this need. For example, the United Nations' Sustainable Development Goals emphasize fostering entrepreneurial competencies to empower youth to innovate, create jobs, and drive sustainable development. Similarly, the European Union's Skills Agenda calls for equipping learners with entrepreneurial mindsets and ensuring practical entrepreneurial experiences during formal education, resulting in STEM education that is strengthened through entrepreneurial work-based learning. In the United States, the CHIPS and Science Act supports workforce development by investing in entrepreneurial training alongside technology and innovation programs. Some current empirical studies suggest that the engineering faculty generally recognizes the value of entrepreneurship learning for students' professional preparation and success. Therefore, understanding faculty perspectives provides key insights into how entrepreneurial competencies can be prioritized and nurtured within engineering curricula. We should also be curious about whether it is necessary for faculty to possess an entrepreneurial mindset themselves in order to effectively teach it. In line with the above, this study explored the engineering faculty's perceptions of what it means to be entrepreneurial and to identify the entrepreneurial mindsets (EM) they value most in their teaching. We utilized the EM habits of the KEEN framework through a closed- and open-ended survey and reflections from a faculty learning workshop at U.S University. Descriptive-thematic analysis revealed that faculty definition of someone being entrepreneurial was not in terms of business creation, but as an engineering mindset that placed particular emphasis on "action orientation agency", suggesting that entrepreneurial mindsets can best be nurtured through experiential and iterative learning processes. The most important EM habits for faculty were; persistence, inquisitiveness, initiative, resilience, curiosity, continuous learning, adaptability, accountability and resourcefulness. This study contributes to ongoing efforts to understand how entrepreneurial mindsets are fostered within engineering and broader STEM education.

Keywords: Entrepreneurial-Mindset, STEM, Engineering-education, Higher-education