World Academy of Science, Engineering and Technology
International Journal of Chemical and Molecular Engineering
Vol:19, No:06, 2025

# Integration of Entrepreneurial Mindset Learning in Green Chemistry and Processes Course

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**Abstract :** Entrepreneurial mindset learning (EML) is the combined process of instilling curiosity and invention, developing insight and value creation while building on other active pedagogy, such as project-based learning (PBL). It is essential to introduce students to chemistry and chemical engineering entrepreneurship in a manner that gives a holistic approach by first educating students on diverse entrepreneurial skills and then providing an opportunity to build their innovation. Chemistry and chemical engineering students have an opportunity to be engaged in an entrepreneurial class project in the Green Chemistry and Processes course at South Dakota Mines. The course provides future chemists and chemical engineers with the knowledge and skills required to enable them to design materials and processes in an environmentally benign way. This paper presents findings from implementing an open-ended design project in the Green Chemistry and Processes course. The goal of this team project is to have student teams design sustainable polymer materials to fulfill a need and/or opportunity related to a fictitious aerospace company that satisfies technical, safety, environmental, regulatory, economic, and social needs. Each student team is considered a start-up company charged with the task of designing sustainable polymer materials for aerospace applications. Through their work on the project, students utilize systems and entrepreneurial thinking in selecting their design project, being aware of the existent technologies (literature and patent search) and users and clients (connections), determining the goals and motivations (creating value), and what need or problem they are trying to address (curiosity). The project draws systems boundaries by focusing on student exploration of feedstocks to end-of-life of polymeric materials and products. Additional subtopics to explore are green processes for syntheses, green engineering for process design, and the economics of sustainable polymers designed for circularity. Project deliverables are team project reports and project presentations to a panel of industry, chemistry, and engineering professionals. Project deliverables are team project reports and project presentations to a panel of industry, chemistry, and engineering professionals. The impact of the entrepreneurial mindset project is evaluated through a student survey at the end of the semester. It has been found that the Innovative Solution project was excellent in promoting student curiosity, creativity, critical and systems thinking and teamwork. The results of this study suggest that incorporating EML positively impacted students' professional skill development, their ability to understand and appreciate the socio-technical context of chemistry and engineering, and the cultivation of an entrepreneurial mindset to discover, evaluate and exploit opportunities.

**Keywords :** curriculum, entrepreneurial mindset learning, green chemistry and engineering, systems thinking
**Conference Title :** ICGC 2025 : International Conference on Green Chemistry
**Conference Location :** San Francisco, United States
**Conference Dates :** June 12-13, 2025