Sustainability Infusion Project

Name and Contact Information
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Title of Module/Activity
Sustainability in Mechanical Engineering Design

Course Name and Course Number

Introduction to Mechanical Engineering Design – MECH 230

Length of Module/Activity

The "Sustainability in Mechanical Engineering Design" module will be integrated into the "Introduction to Mechanical Engineering Design" course. The module will encompass two class periods and span one week.

Primary Learning Outcomes

At the completion of this module, students will have the ability to:

1) Identify sustainable vs non-sustainable end of life options in design
2) Identify the short and long term considerations of cost/benefit impact of mechanical designs
3) Incorporate Design for Sustainability concepts to improve an existing design to realize both economic and societal benefits for the future

Resilience and/or Sustainability Connections

The "Sustainability in Mechanical Engineering Design" module addresses:

1) Systems Thinking, Futures Thinking, and Values Thinking competencies in sustainability as described in the following section.
2) Assignment of value to sustainability considerations for use during feasibility analysis.
3) Methods for considering the effects of design concepts and material selection on environmental and societal future impacts in the decision making process for final design concept selection.
4) Development of an "End of Life" plan to address sustainability considerations for the future.

Identify One or More of the Key Sustainability Competencies Addressed

1) Systems Thinking competency in sustainability is addressed through emphasizing the importance of considering the effects that decisions in design can have on society and industry. Methods for evaluating these effects and including them in a design decision matrix for design concept evaluation are taught.
2) Futures Thinking competency in sustainability is addressed through consideration of various end of life options for products and materials during the initial design concepting phase. Planning for end of life considerations teaches awareness of the impact of designs on future generations.
3) Values Thinking competency in sustainability if addressed through introduction of the students to various methods of attributing value to the impact of designs on society for consideration in overall economic feasibility evaluation of designs.

Instructional Strategies

Students will share their own ideas on sustainability and resilience as it applies to the world today and to engineering design through a group "Pair and Share" activity.

Students will explore and identify sustainable vs non-sustainable end of life options in design, as well as the short and long term considerations of cost/benefit impact of mechanical designs, through a "Gallery Walk" in class activity. The gallery walk will be performed in small groups to promote good discussions among the students. An overall discussion as a class will summarize and highlight the key learnings on the topic.

The students will also participate in a group assignment focused on analysis of an existing design for sustainability considerations and develop a redesign that addresses the topics covered in the module. This will include preparation of a value based decision matrix including sustainability and end of life considerations with the other key design parameters.

Assessment Strategy:

Formative Assessment

- Group activity on "What is sustainability and resilience as it applies to the world today and as it applies to engineering design?" in a "Pair & Share" format. Documented Discussions will capture activity results.

Summative Assessment

- Assessment of the group assignment on redesign for sustainability considerations.
- Assessment of incorporation of sustainability considerations in design and evaluation of the "End of Life" plan in the students' final Design Project Proposal mini project.