

Melissa Roberts
STEM Leadership Seminar
Spring 2021

Leadership PD Proposal

Title: Engineering is Everywhere: Integrating Engineering in the Content area Classroom

Topic Selection:

Engineering is one of the STEM components that is often missing from the math and science curriculum. However, engineering is one of the easiest way to incorporate more STEM into the classroom because it can involve science, technology, and mathematics all at once! When students complete engineering design challenges, they learn how to collaborate with their peers and problem-solve on their own. In addition, engineering design projects give students the opportunity to learn by doing and gives them a way to express their creativity. As an eighth grade science teacher, when I challenge my middle school students with an engineering design project, they often remark that they have never done such work in their other classes. I decided to emphasize engineering for my professional development session so my colleagues learn about the ease and benefits of incorporating engineering into their classroom in hopes that more students will be exposed to the engineering design way of thinking.

NASA & Endeavor Content Integration:

The PD will incorporate NASA resources and resources I learned about from the “E” in STEM Endeavor course. Some resources include:

- [NASA BEST](#)
- [NASA & PBS Kids Design Squad](#)
- [Teach Engineering](#)
- [Engineering Everywhere](#): Boston Museum of Science

Proposed Audience:

The PD will be offered to the middle school math and science teachers since it will focus on integrating engineering in the content area classroom. There will be two 6th grade math teachers, two 6th grade science teachers, two 7th grade math teachers, two 7th grade science teachers, two 8th grade math teachers, and one other 8th grade science teacher. Each educator teaches approximately 75 students.

Learning Goals & Standards:

The PD will address the engineering integration portion of STEM education. Engineering aligns with the following standards:

NGSS Engineering Design Standards:

- **MS-ETS1-1.** Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- **MS-ETS1-2.** Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- **MS-ETS1-3.** Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- **MS-ETS1-4.** Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

PA State Standards – Science:

- **S8.A.1.1** Explain, interpret, and apply scientific, environmental, or technological knowledge presented in a variety of formats (e.g., visuals, scenarios, graphs).
- **S8.A.2.1** Apply knowledge of scientific investigation or technological design in different contexts to make inferences to solve problems.
- **S8.A.2.2** Apply appropriate instruments for a specific purpose and describe the information the instrument can provide.
- **S8.A.3.2** Apply knowledge of models to make predictions, draw inferences, or explain technological concepts.

PA State Standards – Mathematics:

- Varies by grade level but many standards state students must “model and solve real-world and mathematical problems”, which can be achieved through the engineering design process.

PD Session Information:

Pending administration approval, the PD session will take place in-person in my school’s PLC room. The session will last 1 hour and run once for each grade level. If this is not possible, the PD will occur virtually in two 30-minute sessions with all sixth, seventh, and eighth grade math and science teachers together on Microsoft Teams. For recruitment, the PD session information will be sent to all middle school math and science teachers via email. I will advertise the PD session with a flyer in each math and science teacher’s mailbox, as well.

Pre/Post-Survey:

My pre-survey will assess the PD attendees’ current knowledge of the engineering design process and the use of engineering in their classroom. My post-survey will ask the attendees their new understanding of the engineering design process and their likelihood of incorporating engineering in their classroom after being exposed to various engineering resources.

Outcomes & Expectations:

After my PD session, I hope the middle school math and science teachers have a better understanding of the engineering design process and understand the benefits of using engineering in the classroom. I hope that after I exemplify many resources, the attendees will integrate engineering into their classroom to supplement their content curriculum. I will follow up with the teachers in attendance at our monthly department meetings. I will ask them if they have incorporated any engineering design challenges yet, or if they need assistance locating engineering resources that align with an upcoming content area topic that they could do with their students.

Data Collection & Analysis:

I will use a digital survey generated from Google Forms in order to analyze the success of the professional development. My district does not use the Google suite, so with Google Forms the results of the survey will be anonymous. This will allow my colleagues to express their thoughts honestly and freely to provide genuine feedback of the professional development session.