

Professional Development Proposal: Enhancing Engineering in STEM Challenges

NASA Endeavor

STEM Leadership Seminar

Jenny Eades

Enhancing Engineering in STEM Challenges

Title: The title of my STEM PD will be **Enhancing Engineering in STEM Challenges**. I would love to share with the teachers in my building ways in which they can dive deeper into their STEM projects and challenges. Showing the teachers in my building ideas on ways to introduce STEM design challenges by using brain warm-ups or phenomena, how to use a design notebook throughout projects, and great resources to find engineering design challenges that are perfect for each grade level and/or class.

I selected this topic because I already work at a STEM school. All teachers in my building are already incorporating STEM into their classrooms and every classroom attends Makerspace at least once a week, if not more. We have many resources already at our fingertips. Showing teachers how to do a design challenge, the design process, or how to begin coding would be wasting their time. However, I think a lot of teachers in our school are constantly searching for new ideas and ways to deepen our student's experiences and understanding in Makerspace. These are the reasons why I thought the best topic would be to show my fellow teachers the ways in which I have learned to enrich the STEM experience and extra resources to use when deciding on and searching for new challenges.

NASA Assets and Endeavor Content:

I am going to begin my PD by reminding teachers what it means for students to be problem solvers. I will use part of the Jamie Kirkley reading from Josh Brown's class, *The E in STEM*, as an introduction. I will then compare NASA's design process to the one we use at our school using the following link: <https://www.nasa.gov/audience/foreducators/best/edp.html>

I am planning to then have teachers try a few of the online problem solving problems from *The E in STEM*. Teachers will reflect on the parts of the engineering process they had to use to complete those simple problems. We will discuss how even as adults; we unconsciously use the design process when solving problems.

I am planning to then introduce the use of design notebooks. As far as I know, teachers in my building are not using design notebooks at this time. I will show a few examples for various grade levels. This is also something that I learned while taking *The E in STEM*. Teachers will be given time to consider how they would revamp the notebook to fit their grade. I will then introduce the PBS Kids Design Squad Webpage for finding challenge ideas using the following link:

<https://pbskids.org/designsquad/parentseducators/workshop/welcome.html>

Teachers will be given planning time to browse and plan a challenge for their grade level that could include a design notebook for an upcoming standard they may have.

We will conclude this PD with a gallery walk using the post PD survey questions.

Audience: I work at a Pre-K through fifth grade elementary school. Our school has a student population of about 370. We have sixteen classroom teachers. Our classrooms have anywhere from 18 to 29 students each. All teachers in my building will be attending this PD. We have the following number of teachers in each grade level: 5th (2), 4th (2), 3rd (2), 2nd (2), 1st (3), K (3), Pre-K (2). The physical education teacher, music teacher, and art teacher will also be in attendance. Our principal and school counselor also attend all PDs. There will be a total of 21 educators if

everyone is at school on the day of my PD. All teachers in our building teach all subjects and are required to incorporate STEM into their curriculum.

STEM Concepts or Learning Goals - Any direction teachers and grade level teams take this PD, they will be hitting the NGSS engineering standard which will be a huge part of my presentation.

K-2- ETS1-1 Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

3-5- ETS1-1 Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

I also believe including the design notebook will hit a writing standard (or many) across all grade levels. This will allow teachers to spend less time on writing in isolation, since it will now be included in STEM and science activities. While our state standards may look slightly different throughout the grade levels, here is an example from first grade:

Colorado State Reading Writing, and Communicating Standard 4: Research and Reasoning:

Gather information from a variety of sources; analyze and evaluate the quality and relevance of the source; and use it to answer complex questions.

Location and Length: I intend to hold my PD in our school library. We typically have our PDs in the library where there are tables and chairs set up for our staff, a projector, and plenty of room for movement if needed. Teachers will need their computers. I will be sharing my PowerPoint with teachers 10 minutes prior to the PD session so they can follow along and click on provided links to try activities throughout. I intend to use a PowerPoint as well as have teachers interact throughout the PD. This PD is meant to be one hour in length.

Survey/Data: Some survey questions will be answered on a scale from one-four. One being never, and four being always. Other questions will be written responses.

Pre-Survey Questions:

1. Have you ever seen or used a design process outside of the one used in St. Vrain?
2. How familiar are you with design notebooks? (1-4 scale)
3. How often do you use a design notebook to enhance a STEM challenge? (1-4 scale)
4. How comfortable are you with design notebooks? (1-4 scale)
5. Do you introduce engineering design challenges using phenomena? (1-4 scale)
6. Do you ever use STEM brain warm-ups like you would during math or reading? (1-4 scale)
7. Where do you typically find your STEM challenge ideas?

Post Survey Questions:

1. Did seeing different design processes help you understand our design process? (1-4 scale)
How? (written response)
2. Can you see yourself incorporating design notebooks in the future? (1-4 scale). How do you see them progress student learning? (written response)
3. How often do you see yourself using a design notebook to enhance a STEM challenge? (1-4 scale)
4. Will you try to use phenomena as an introduction in the future? (1-4 scale)
5. Do you ever see yourself trying STEM brain warm-ups for your lessons? (1-4 scale)
6. Did you get any new challenge ideas from the PD today? Which ones? (written response)
7. Will you use any of the resources I showed you today in for future planning? (1-4 scale)
8. What would you like to see/learn from future STEM PDs? (written response)

Outcomes and Expectations: I am hoping teachers walk away from this PD feeling refreshed and like they are walking away with new ideas and helpful resources for future planning.

Follow Up: I will follow up with the teachers from this PD at our following PD. I will be creating a follow-up survey to see if teachers used any of the resources or information from my PD session.

Data Collection: The pre and post surveys will be used to collect data immediately following the PD. This will give great timely feedback. However, I would also like to create a survey that teachers take at our next PD (the following month) to see if they have used any of the ideas presented during my PD. Due to the timeline of my PD, I will have time to receive the extra survey before submitting my final paper and reflection.

References:

Colorado Department of Education (November 13, 2017). Academic Standards. Retrieved from

<http://www.cde.state.co.us>

May, Sandra. (January 30, 2018). Engineering Design Process [National Aeronautics and Space Administration]. Retrieved from

<https://www.nasa.gov/audience/foreducators/best/edp.html>

NGSS Lead States. (2013). Next Generation Science Standards: For States, By States.

Washington, DC: The National Academies Press. Retrieved from:

<https://www.nextgenscience.org/search-standards>

PBS Kids and Design Squad Global. (2018). Leading Hands-On Engineering Activities with NASA

and DESIGN SQUAD. Retrieved from

<https://pbskids.org/designsquad/parentseducators/workshop/welcome.html>