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ED 586
Leadership PD Proposal

Title: Understanding and Using the Engineering and Design Process in Your K-5 Classroom

Rationale: After taking the E In STEM course last year I realized how much I did not know about the engineering and design process. Once I understood what the engineering and design process, I was much better equipped to backwards plan from the engineering challenge I was going to present to my students. I also began to see how the engineering and design process was embedded in the NGSS. Learning about what the engineering and design process is, where it fits within the NGSS, and how to apply it in my classroom has been invaluable. Unfortunately, this topic is not on the top of the list for most elementary schools right now. However, the engineering and design process requires a student to use lots of academic and social knowledge to complete a challenge. Teachers at every grade level can provide time for students to be innovative thinkers and collaborative teammates in authentic scenarios through this kind of work.

Assets: This PD would integrate what I have learned from the E In STEM course (i.e., the use of a design journal) as well as NASA's approach to the engineering and design process.

Audience: My proposed audience are any of the K-5 teachers in my school. There are twelve of us all together, so I am hoping for one from each grade level. Our school is a traditional K-5 elementary. Our students stay with the same teacher for all core subjects all day. It can be difficult to know all the best practices in all academic areas. The focus at K-5 is almost always literacy and sometimes math. Science has been neglected for far too long.

Learning Goal for Participants: Use the engineering and design process to enable students to demonstrate mastery of NGSS performance expectations. Using the engineering and design process is not meant to replace any teaching, but would help teachers be more effective and efficient in teaching NGSS engineering standards as well as other the other core areas (physical science, life science, earth science).

Standards specifically addressed:

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.

K-2- ETS1-2. Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

K-2- ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

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.

3-5-ETS1- 2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem
3-5-ETS1- 3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

Session Length and attendance: The initial session would be one hour. I will be recruiting other teachers at my school and advertise it via our school email list. We are a fairly small school so would quickly join grade band PLCs to pitch my presentation.

Pre-survey:
Are you familiar with what the engineering and design process is?
What is your experience with using the engineering design process in your teaching?
Tell me about science instruction in your classroom. Successes? Challenges? Limitations?
How do you assess science learning in your classroom?

Post-survey:
What is your experience with using the engineering design process in your teaching?
Tell me about science instruction in your classroom. Successes? Challenges? Limitations?
What has changed about student engagement since learning about and using the engineering and design process?
What has changed about your science instruction since learning about and using the engineering and design process?
How do you assess science learning in your classroom?
Did students meet the performance expectations?

Teacher Outcomes: Teachers will use the engineering and design process to create a unit of study around a cluster of NGSS performance expectations. The engineering and design process will be used as a teaching and learning strategy, not a set of performance expectations that need to be met individually.

Follow up: I would like to have meetings with teachers to help coach or design their units. I would also like to have a meeting/forum/focus group with all teachers who participated after the units have been taught so that they can share their experiences with each other.

Data Collection Methods:
- Surveys
- Coaching notes and/or interviews
- Record the forum of teachers after the units have been taught (to use as material to convince others to try the PD as well as to have for transcribing purposes)