Engineering: Problem Solving at its Finest

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STEM Leadership Seminar

What and Why?

Engineering

Engineering is one of the STEM content areas that seems to be the hardest to incorporate into the classroom. However, it's one of the areas that teaches a very important life skill, problem solving. I chose this topic because I see a need at our school to incorporate more problem solving into our students academic lives. I also think that engineering is fun. Combining something that is fun and teaches problem solving into our academic content engages students and provides a reward with an academic focus.

How?

The engineering design process will be used in this professional development session. I also plan on introducing teachers to the Jet Propulsion Laboratory website that has many different lessons with engineering elements. The highlight of the PD will be to participate in an engineering design challenge together. I then would like teams to work together to develop a plan for using engineering in their classroom.

Who?

My school is a small charter that serves students from kindergarten up to 8th grade. My audience will include teachers who teach in multigrade classrooms. They teach all subjects to about 20 students on average.

What STEM Concepts are Covered?

STEM can encompass a wide range of subjects and material. Engineering specifically covers a lot of the Next Generation Standards for all grades. I specifically looked at middle school standards in this case, because 6th grade falls in the middle of what I teach. Problem solving is the big overarching concept that engineering can cover. Students have to be able to persevere through problems and they need to be able to come up with many solutions.

NGSS

Engineering

MS.Chemical Reactions

MS-PS1-6. Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

MS.Forces and Interactions

MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

MS.Energy

MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.

MS.Waves and Electromagnetic Radiation

MS-PS4-2. Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

CCSS

Mathematics

MP.2. Reason abstractly and quantitatively.

6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems.

ELA/Literacy

RST.6-8.3. Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks. (MS-PS1-6)

RST.6-8.7. Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). (MS-PS1-2),(MS-PS1-5)

WHST.6-8.7. Conduct short research projects to answer a question (including a self-generated question), drawing on several sources and generating additional related, focused questions that allow for multiple avenues of exploration. (MS-PS1-6)

How Long?

This PD session should be no more than 3 hours. My plan is to approach my administrator to see if I can do this professional development on a day that we have PD planned already. I don't plan on advertising my PD session.

Expectations

I hope that teachers come out of the session excited about STEAM and the possibilities it presents. I also want them to have a plan for how to incorporate engineering into their classroom in the near future. Lastly, I want them to have fun.

Data Collection

My plan to collect data is to interview teachers about their experience. I also would like to know if they used any of what they learned in their classroom. I know that this will take a large amount of time, but I want to connect with teachers on a more personal level. Surveys don'r always tell the whole story. Interviews feels more personable than a survey.

Possible Pre and Post Survey Questions

What do you know about STEAM?

Have you ever used engineering in your classroom? Has it been integrated into any other subject areas?

Engineering

Do you have an interest in learning about STEAM and how it can be integrated into your classroom? What would you like to know more about?

Would you be interested in more PD sessions on STEAM?

How will you use engineering in your classroom in the future?

Did you enjoy the session?