Integrating “Science of Technology” into a middle school science class

Danielle Shaveet
Thomas Prince School
Princeton, MA
danielle_shaveet@wrsd.net
WPI WiFi:

Where do I teach?

What do I teach?

SCIENCE…..which I love!!

7th grade

8th grade

PLTW…..which I love!!

Design & Modeling

Automation & Robotics

Science of Technology

Why this session?

At core training I realized that many of the activities in

Science of Technology were either ones I was already

doing in my science classes….or ones that would fit nicely into

some of the science standards!

For example…..

- Roller coasters
- Pull-back toys
- Cleaning up oil spills

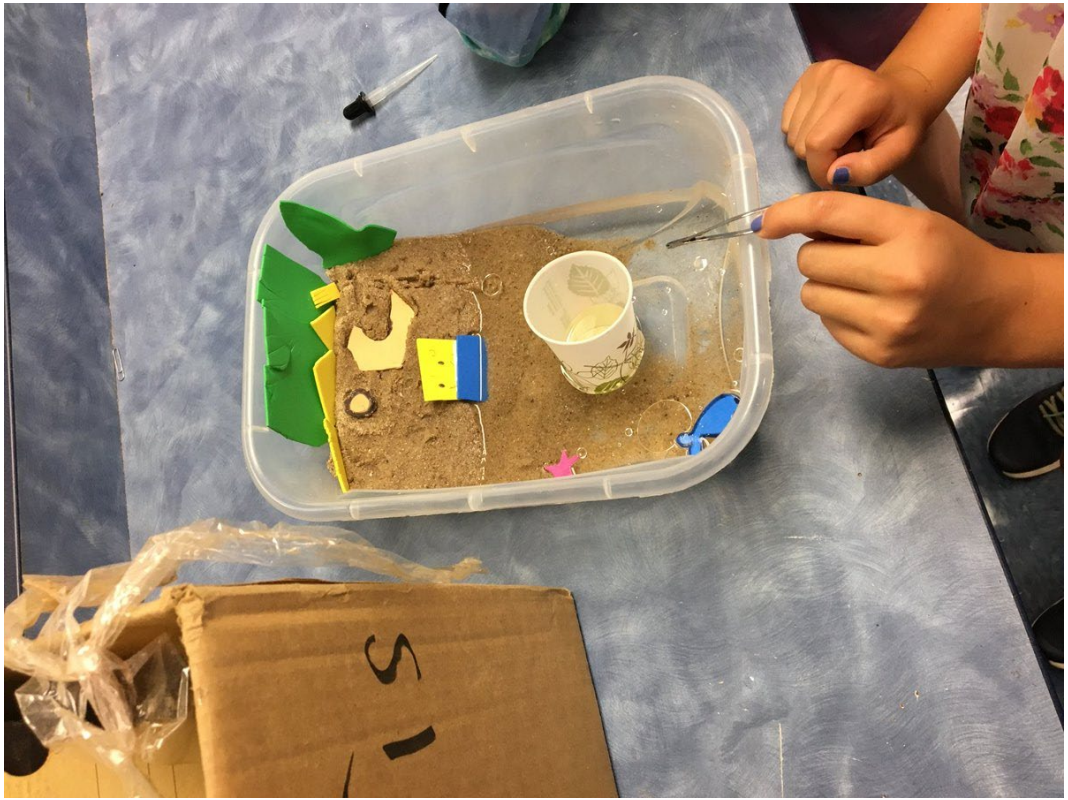
SO...WHAT TO DO???

My Ah-ha moment…..

Maybe I could still use the activities in my science classes, but revise them by looking at them as BOTH a science teacher and a PLTW teacher.

It was such a simple solution….and the results have been great! I now have activities which are much more robust than they would have been if I'd continued looking at them through only one teacher lens.

Let’s look at an example:
“Oil Spill Cleanup”



“Oil Spill Clean up” through the lens of a science teacher

Grade (MA-STE)	**subject**	**Standard (MA-STE) Note: These are just suggestions. This activity could fit under other standards as well such as 6.MS-PS1-7(MA) or 8.MS-ESS3-5**	
6	Physical science	6.MS-PS1-8(MA)	Conduct an experiment to show that many materials are mixtures of pure substances that can be separated by physical means into their component pure substances.
7	Life science	7.MS-LS2-4	Analyze data to provide evidence that disruptions (natural or human-made) to any physical or biological component of an ecosystem can lead to shifts in all its populations.
8	Earth science	8.MS-ESS3-1	Analyze and interpret data to explain that the Earth’s mineral and fossil fuel resources are unevenly distributed as a result of geologic processes.

“Oil Spill Clean up” through the lens of a PLTW teacher

Essential Questions

- What is a chemical engineer?
- What steps are required to clean up an oil spill?

Knowledge and Skills

- Utilize the steps in the design process to design a way to clean up an oil spill
- Work as part of a team to solve an oil spill engineering simulation problem
- Adhere to a budget

https://docs.google.com/document/d/1uZv1i2GLXzt9YZWSm-dVlaKB8Gt2GNdleG9QASExW_U/edit?usp=sharing

- Use a decision matrix

https://docs.google.com/document/d/1k5nxxCgHTfHQOMK_-tUBGuW9CYS74J8eTKqnj3Q-nbk/edit

- Write a Design Brief

https://docs.google.com/document/d/1nzOgU_FGmLfhsfsfEhJbVXCg9sCfvRweq8bsJ1UN594/edit?usp=sharing

Once you add the PLTW teacher lens, you also address some of Massachusetts' Tech/Engineering standards!

6.MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution.

6.MS-ETS1-6(MA). Communicate a design solution to an intended user, including design features and limitations of the solution.

6.MS-ETS2-2(MA). Given a design task, select appropriate materials based on specific properties needed in the construction of a solution.

7.MS-ETS1-2. Evaluate competing solutions to a given design problem using a decision matrix to determine how well each meets the criteria and constraints of the problem.

7.MS-ETS1-7(MA). Construct a prototype of a solution to a given design problem.

7.MS-ETS3-3(MA). Research and communicate information about how transportation systems are designed to move people and goods using a variety of vehicles and devices

Rubric through PLTW lens

I don’t usually include the decision matrix or design brief on the rubric - but they need to be submitted in order for their assignment to be graded.

If I was only looking at this project through the lens of a PLTW teacher, my focus would be the engineering component.

For example:

https://docs.google.com/document/d/1DSGAT_qx0_NM3BqWRvMqD6OJYBGrsqbHqfi3bnVuAfQ/edit?usp=sharing

Now let's look at some more examples in small groups

Around the room, you'll see stations for each activity. Each station has a large sheet of paper and some markers and sticky notes. Choose an activity. A brief description of each activity is on the next slide.

Science teacher lens: With others in the group, discuss which science standards this activity could address. (links to both MA-STE and NGSS are in the resources section of the Google Classroom)

PLTW teacher lens: With others in the group, discuss how the activity could be looked at through a tech/engineering lens. Think back to the oil spill cleanup example and look at the tech/engineering standards in MA-STE for inspiration! (FYI: PLTW provides templates for decision matrix & design brief, as well as rubrics & price lists)

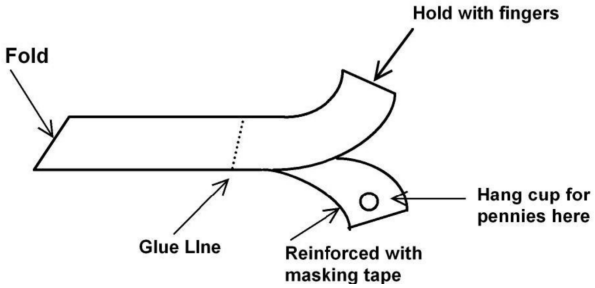
Put all your ideas on the large paper and we will have a gallery walk in about 15 minutes.

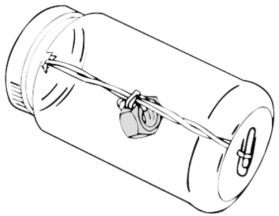
Other activities included in “Science of Technology”

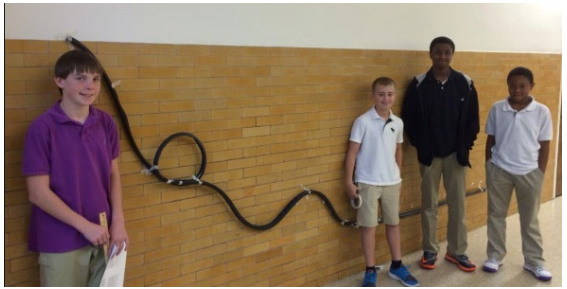
1. ***Let’s Make Ice Cream***
2. ***Let’s Make Yogurt***
3. ***Gluing it All Together*** - make different glues and test their strengths
4. ***Nanotechnology and nanoproducts*** **-** test the validity of claims made by producers of various nanoproducts (you can order a kit from PLTW containing a bunch of nanoproducts and materials needed to test them!)
5. ***Rollback toy*** - make a rollback toy and test how far it will roll with different pullbacks (the kids make the toy using a jar or bottle, a weight , a rubber band and a paperclip)
6. ***Roller coasters*** **-** made using pipe insulation & marble
7. ***Rube Goldberg Device*** (PLTW supplies a price list you could use with the kids)

There are other activities in “Science of Technology”, as well, but they don’t fit as well into a traditional middle school science curriculum

Images to help with some of the activities







Final thoughts and questions

THANK YOU FOR COMING!

Enjoy the rest of the conference!!

Please reach out to me with any questions!!

danielle_shaveet@wrsd.net