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PD Proposal

Title: Riding the NGSS Wave - Using Ocean Literacy to Teach Phenomenal Science

Reason for Topic Choice:

The ocean accounts for 70% of Earth's surface. Yet, the ocean's influence on us and our influence on the ocean is rarely the focus of science instruction. With the integration of the science disciplines under the Next Generation Science Standards (NGSS), ocean literacy can be brought to the forefront as students use ocean-related phenomenon to drive their understanding of Earth, life, and physical sciences as well as human impact and engineering design. The goal of my presentation is to provide my peers with ideas, resources, and time to develop lessons that will result in student understanding of the role the ocean plays in our lives and the role we play in affecting the ocean's health. Lessons will focus on student use of real time NOAA and NASA data as students derive their own conclusions about the interrelatedness of ocean health and human impact.

Integration of NASA assets and/or content from the Endeavor courses:

Content from the Endeavor course "Lessons from the Ocean" run by Dr. Marrero, will be integrated into my PD lesson. Both NASA and NOAA resources will be used and referenced for lesson plans, articles, and raw data.

Intended Audience:

My audience is middle school 6-8 grade science teachers and elementary science specialists. The NASA and NOAA data will be geared towards the middle school teachers and the elementary specialists will focus on the NASA and NOAA resources and lesson plans. I am new to my current district so I am not sure how many teachers I can entice to attend my PD. My school has four middle school science teachers serving 600 students and one elementary specialist serving 350 students. I will also invite the district science coach and ask her to invite the eight other elementary specialists and remaining middle school science teachers at the three other middle school sites. Districtwide, we are currently piloting two possible NGSS curriculum programs for the middle schools. The teachers who are not piloting materials may be more willing to attend my PD.

My school site is a Title 1 school with over 60% of the student population in the free or reduced lunch program. Our student body is also over 70% Hispanic with many English learners. Districtwide, 25% of the student population is in the free or reduced lunch program and 13% are English learners.

STEM concepts and learning goals:

The goal of this PD is to help teachers implement NGSS by using the ocean as a theme to connect phenomena for the year. There are numerous ocean-related phenomena that can drive STEM instruction and meet the NGSS and CCSS requirements while also making students more ocean literate and integrating technology, engineering design, and math. Attendees will be

introduced to science and math lessons, technology integration, and engineering design projects. Using phenomena to drive student understanding is an important concept in the NGSS. There are numerous NGSS DCIs that can be easily addressed through learning about the ocean but my focus will be on the following Earth science, life science, and engineering DCIs:

ESS2.A Earth materials and systems
ESS2.C The roles of water in Earth's surface processes
ESS2.D Weather and climate
ESS3.C Human impacts on Earth systems
ESS3.D Global climate change
LS1.C Organization for matter and energy flow in organisms
LS2.A Interdependent relationships in ecosystems
LS2.B Cycles of matter and energy transfer in ecosystems
ETS1.A Defining and Delimiting Engineering Problems
ETS1.B Developing Possible Solutions
LS2.C Ecosystem dynamics, functioning, and resilience
LS4.D Biodiversity and humans

Common Core Standards that will also be addressed include:

ELA/Literacy -

RST.6-8.1	Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS2-2), *(MS-ESS2-3)*,(MS-ESS2-5)
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-ESS2-3)
RST.6-8.9	Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. (MS-ESS2-3),(MS-ESS2-5)
WHST.6-8.2	Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content. (MS-ESS2-2)
WHST.6-8.8	Gather relevant information from multiple print and digital sources, using search terms effectively; assess the credibility and accuracy of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and following a standard format for citation. *(MS-ESS2-5)*
SL.8.5	Integrate multimedia and visual displays into presentations to clarify information, strengthen claims and evidence, and add interest. *(MS-ESS2-1),(MS-ESS2-2),(MS-ESS2-6)*

Mathematics -

MP.2	Reason abstractly and quantitatively. (MS-ESS2-2),(MS-ESS2-3),(MS-ESS2-5)
6.NS.C.5	Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. (MS-ESS2-5)
6.EE.B.6	Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. *(MS-ESS2-2),(MS-ESS2-3)*
7.EE.B.4	Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. *(MS-ESS2-2), (MS-ESS2-3)*

PD Logistics:

I intend to run the session during one of our hour-long Wednesday collaboration meetings in October or November. If needed, I will present the same PD at one or more of the other school sites. Additionally, the presentation will be posted on our district's science PD site. This

session is intended to be one hour in length with time for teachers to explore the resources and work together to begin creating a lesson. Attendees will bring either their own computers or use the class set that are on site.

Pre-survey and Post-survey Questions:

Some of my pre-survey questions will be:

- How familiar are you with using phenomena for teaching science?
- Do you use a year-long theme to teach your science content?
- Do you consider yourself ocean literate?
- How familiar are you with NASA and NOAA lesson plans and resources?
- How familiar are you with NASA and NOAA data sets?
- How often do your students engage in an engineering design activity?
- Do you integrate the science disciplines in your lessons?
- How much control do your students have in designing their own experiments?

Some of my post-survey questions will be:

- What is the value of using phenomena to teach science?
- How relevant to your students' lives are topics related to the ocean?
- Did you learn about new resources that are useful to your lesson planning?
- How likely are you to use NASA/NOAA lessons?
- How likely are you to use NASA/NOAA data?
- Describe one way that you plan to incorporate technology into your lessons.
- Describe one engineering design lesson you can use this year.
- Are you more comfortable with allowing your students to design their own experiments? Why or Why not?
- Will you use any of the sample lessons this year?
- Would you be interested in creating lesson plans using NASA/NOAA data on the next release day?

Outcomes and Expectations:

I expect my peers will be excited to discover the resources. I think they will also be overwhelmed by the amount of data that is readily available for student use. I intend to share with attendees the lesson plan I created for the Endeavor course (using MyNASA Data to map surface and ocean temperatures) so they can use it immediately with students and see the level of engagement students have using NASA data to draw their own conclusions. I hope that my peers will embrace the use of phenomena with a common theme for teaching science and recognize that there are many resources available to teach the NGSS outside of using purchased textbook curriculum.

Follow Up:

I will follow up with attendees by email and our trimester district-wide PD dates. I will offer my email address and time to meet 1:1 to help attendees as they work to develop lessons.

Hopefully, our district science coach will create a page on her district website where our lessons can be shared.

Data Collection and PD Success:

I will be using Google Forms for my pre- and post-survey collection. Google Forms provides easy analysis of responses in bar and pie charts. I also hope to get feedback from interviewing the district's science coach and my site colleagues with the goal of refining my presentation and submitting it as a workshop at the California Science Teachers Conference in 2020. After the initial pre- and post-surveys, I will evaluate the success of the PD by seeing the number of new lessons created and shared that use NASA and NOAA resources. Additionally, I hope the PD success will be demonstrated by student actions in becoming more ocean literate.