I. Title of Professional Development: Integrating Literacy into the Next Generation Science Standards

II. Curriculum Topic: Science is full of discovery, excitement, and mystery, making it the perfect vehicle to ignite student interest while gaining literacy skills. Using a variety of collaborative conversation and literacy strategies in a deliberate manner, students will not only understand more science, but they will also become better readers, writers, and thinkers. Through my Endeavor courses such as *Reading and Writing Across the Science Classroom* and *The Arts in STEM: Advancing Meaningful Integration,* I have learned how to incorporate literacy instruction into the science curriculum. Participants in this workshop will experience an engaging NGSS phenomenon-based lesson sequence while learning techniques for including all students in sense-making and sharing their ideas through productive dialogue, purposeful reading, and meaningful writing.

School Information: Mariposa Avenue Elementary School is a K-5 school located in Citrus Heights, California. (To be continued when I get the info from secretary)

Participants: The workshop will be offered to all the teachers at the school site. There are two kindergarten teachers, two first grade teachers, two second grade teachers, two third grade teachers, two fourth grade teachers, two fifth grade teachers, two SDC teachers, a resource teacher, Title 1 coach, and an ELD teacher.

III. Standards:

- **3-PS2-1.** Plan and conduct an investigation to provide evidence of the effects of balanced and unbalanced forces on the motion of an object.
- **3-PS2-2.** Make observations and/or measurements of an object's motion to provide evidence that a pattern can be used to predict future motion
- **3-PS2-3.** Ask questions to determine cause and effect relationships of electric or magnetic interactions between two objects not in contact with each other.
- **3-PS2-4.** Define a simple design problem that can be solved by applying scientific ideas about magnets.

IV. Summary: The purpose of this professional development opportunity is to help educators outline the process that one might take in developing curriculum that intertwines the three dimensions of the NGSS (Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts) and scientific literacy. Our school currently uses Benchmark Advance for ELA, which most teachers find challenging for our students. We also use FOSS science curriculum, with very few teachers actually teaching science. My hope is that after attending this session, teachers will try integrating literacy activities into their science classroom and understand that these strategies can play a vital role in achieving a minds-on or metacognitive approach to the learning of literacy and science. Many of the activities in the presentation I have used in my own third-grade classroom.

V. Pre-Questions Survey:

1. Have you integrated reading and writing into your science instruction?

    a. Yes
    b. No
    c. Unsure
2. If yes, do you feel you were successful?
    a. Yes
    b. No
    c. Unsure
3. Have you used a science notebook with your students?
    a. Yes
    b. No
    c. Unsure
4. If yes, how frequently do you use them?
    a. Never
    b. At least once/week
    c. At least once/month
    d. At least once/year

VI. Description of Training: The training will be in a classroom with participants seated at tables in groups of four. Using a strategy from a flipped classroom instructional model, I will send participants the powerpoint presentation and the articles for them to view before the training, in hopes they will be motivated and excited about attending. I will use the powerpoint to guide the session with each slide describing the activity or discussion. Teachers will be given time to talk with their partners and to share out when appropriate. They will be encouraged to use their science notebooks to take notes and write questions. The participants will have access to computers. The training should last 1.5 hours.

VII. Outline of the Activities in the Unit:

Introduction: The training will begin with a quick write. Each teacher will be given a science notebook in which they will the question "Why is productive talk so important for learning science?" Teachers will share their thoughts with a partner.

Building Teamwork- We will discuss the norms of engagement for our teacher session and how norms of engagement can be used for our own students when working in a group. This can be done collaboratively with a class and displayed. Examples found at https://www.exploratorium.edu/sites/default/files/pdfs/ifi/ScienceTalk.pdf (copy and paste to open, I need to fix this)

Science Interactive Notebooks- I will walk the teachers how to set up their science notebooks. Teachers will watch a video with 3rd grade students using their notebooks as they observe snails during an inquiry and investigation lesson. Ask "What aspects of literacy do you notice during this video clip?" Teachers can share out.

Science interactive notebooks fill many roles. They promote students' science learning and give students an opportunity to enhance their writing skills. They help students better appreciate the process of scientific inquiry. They help students organize their learning and, by the end of the

unit, realize how much they have learned. For teachers, the interactive notebook is a unique means of assessing student learning and organization.

According to Azimioara et al. (n.d.) "Writing is one of the ways that children learn in science…When students explain what they have seen and why they think this occurs in writing, they are forced to clarify their thoughts and organize these ideas in a way that others can understand."
An excellent website explaining how educators can have students set up their science notebooks: https://www.calacademy.org/educators/setting-up-your-science-notebooks

Formative Assessment Probe- Teachers complete "Does It Have to Touch?" formative assessment probe. Formative assessment probes and FACTs support development of communication skills in science and mathematics. Use formative assessment to provide opportunities for students to share their thinking and engage in rich discourse and argumentation using evidence-based reasoning. Teachers share their responses with a partner. Have students pair up and discuss their answers. Hand out index cards for pair share questions.

NGSS and CCSS - Common Core ELA standards are woven into the NGSS. If you think about NGSS as a tapestry, it would be made of five threads: science and engineering practices, disciplinary core ideas, crosscutting concepts, English language arts, and mathematics. The NGSS is designed to really have all of these kinds of skills, knowledge, and disciplines work together.

Show the example of the Performance Expectations from the NGSS Standards. Explain Science and Engineering Practices, Disciplinary Core Ideas and Crosscutting Concepts.
https://www.nextgenscience.org/
California NGSS Science Standards: https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp
California Science Framework: https://www.cde.ca.gov/ci/sc/cf/cascienceframework2016.asp

Phenomena Driven Instruction- Show the phenomena video two times found at https://youtu.be/nvJFFIzAwqI. Teachers draw a line on their notebook page- Notice/Wonder. Participants make note of what they noticed in the video and what they wonder about after watching.
Write noticings first, share with partner - person whose birthday is closest to today goes first.
Write wonderings next, share with partner.
Together with a partner, write one big wondering on paper with a marker and tape it to the wall to share as a group. Talk about the use of phenomena to engage students and arouse their curiosity. Some great phenomena videos can be found at
https://nasaeclips.arc.nasa.gov/video/ourworld/our-world-what-is-an-extremophile

Magnet Exploration- Pass out one doughnut magnet to each person, allow time to play and observe it. In notebooks, participants will make observations about the magnet using ideas, words or pictures and write any questions they may have.

Dialogue Dots- Sharing our findings using dialogue dots. Students are in groups of 4. Each person will take a turn sharing one observation about magnets with their group by putting their

colored card in the middle of the table. After everyone has had a chance to speak, the process is repeated.

Further Exploration- More magnet exploration as teachers investigate the following question, "What sorts of things do magnets stick to?" Make predictions and test different materials in zip-lock bag using worksheet https://docs.google.com/document/d/19ZyWjKcnEDN8dVfZHC8Qi50Oyg6dG6MVtavlYCkrVV4/edit?usp=sharing Teachers record predictions and results in their notebook.

Discovery- Chart model statements on chart paper asking "What have we discovered about magnets?" Teachers write responses in notebooks.
Examples:
1. Magnetic forces can act at a distance.
2. Magnets can push or pull each other depending on which sides are facing each other.
3. Magnetic strength depends on distance apart.

Sources of Reading in Science- Pass out samples of literary text from Benchmark and FOSS about magnets. Discuss literacy strategies that can be used with the text. Discuss with a partner other strategies that could be used. Share out to the group.

Investigation- With a partner design an investigation about magnets. Consider the following questions, "How does distance between magnets affect the strength of the force?" "How strong are different types of magnets?" "How does the number of magnets affect the strength of the force?" Record thoughts in notebooks.

Design a Better Swing Activity- Each team will design a swing that uses magnetic force to keep the swing moving after an initial push. Materials: 2 feet of yarn, 2 ring magnets, binder clip, tape
Discuss success criteria on a chart and decide as a group. Examples:

1. It must move on its own.
2. Five full swings (up and back)

Gallery Walk- Participants will walk around the room to view swings built by other groups, adding feedback using Post-Its. Teachers can return to their own designs and revise to improve the effectiveness of their swing.

Revisit the Phenomenon- Students write an explanation of how the sorter works using what they figured out about the rules of magnetic force in their science notebooks.

VIII. NASA data included: Flipped classroom instructional model, literacy strategies and readings from Endeavor courses, NASA phenomena websites, Newsela, Seeds of Science- Roots of Reading (I will be adding more here)

IX. Follow-up Activities: Our school site has been transitioning to a STEAM campus, so much of our professional development is dedicated to how to use more STEAM activities in our classrooms. After presenting my PD, during our subsequent meetings, I will take a few minutes to check in with my colleagues to if they have had success with integrating literacy into their

science instruction and encourage them to share out to the group. I will offer to help staff choose thoughtful and purposeful reading materials that complement their science instruction. I will also invite staff to come into my classroom to see me teach a lesson using literacy strategies in my science lessons.

Post-questions survey: At the end of the professional development session, I will have the teachers complete the following survey:

1. Do you better understand how to apply reading and writing strategies to enhance students' understanding of science content?
    a. Yes
    b. No
    c. Unsure
2. Will you use some of the strategies in your classroom?
    a. Yes
    b. No
    c. Unsure
3. If yes, which strategies will you try?

X. Outcomes: The result I hope to see by presenting this professional development is that teachers at my school site will recognize literacy engagement and its role in the science classroom. We have a school full of low and reluctant readers and for students to understand science content, reading engagement is key. Teachers will learn strategies to help them weave hands-on investigations of science content with purposeful literary curricula.

References

Azimioara, M., C. Bletterman, and P. Romero. n.d. *Another Approach to the Scientific Notebook. A collection of Articles and Rubric*s. Tustin School District: Tustin, Calif.

California Academy of Sciences.(2019). Retrieved from https://www.calacademy.org/educators/setting-up-your-science-notebooks

California Department of Education. (2018). *NGSS for California Public Schools, K-12.* Retrieved from https://www.cde.ca.gov/pd/ca/sc/ngssstandards.asp

Institute for Inquiry. (2015). *Exploratorium, Science talk: A tool for learning science and developing language*. Retrieved from https://www.exploratorium.edu/sites/default/files/pdfs/ifi/ScienceTalk.pdf

NASA. (2018). NASA eClips. Retrieved from https://nasaeclips.arc.nasa.gov/video/ourworld/our-world-what-is-an-extremophile

You Tube. Conveyortek. (2012). Overband Conveyor Magnet for the Recycling Industry. Retrieved from https://youtu.be/nvJFFIzAwqI.