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STEM Leadership Seminar
Spring 2019

I. Title of Project:

Reading, Writing, Math, AND SCIENCE.....OH MY!!!

Session Description: Tips and Tricks for adding Science and Engineering thinking and language into your already constructed reading, writing, or math lessons. The focus of this PD is not on full Science units. We want to start exposing our students to the Science and Engineering skills that are involved in all content areas. This can be accomplished in one way by directly teaching our students how to be a scientist while reading, writing, or completing math.

Target Grade Level: Primary (K-3)

II. School information:

Jessamine County schools is located in south central Kentucky. It serves about 8,000 students from Pre-K to grade 12. There are 7 elementary schools, 2 middle schools, 2 high schools, a technology center and an alternative school. The mission of Jessamine County Schools is to motivate and challenge every child every day to be a caring, responsible citizen, and a high-level thinker, performer, communicator, and learner for life. Students in all grades are provided with a comprehensive curriculum in art, computer literacy, guidance and counseling, health, language arts, math, media, music, physical education, reading, science and social studies. The district strives to help students find their passion and develop that into career readiness. The district is predominately white, with 81% of students being Caucasian. It is also considered an economically disadvantaged district with 55% of students receiving free and reduced lunch.

III. Participants:

This professional development opportunity was offered to all primary(K-3) teachers in our district. There are twenty-two kindergarten teachers, twenty-one first grade teachers, twenty second grade teachers and eighteen third grade teachers across the district. Due to other professional developments, PLC meetings and report cards being due, the number of people who signed up was low. Also, at this point in the year most teachers have completed their professional development hours and are not looking for additional professional development. There were fifteen people that signed up for the professional development. On the day of the professional development, we had eight people show up. We had five kindergarten teachers, two first grade teachers and one third grade teacher. I truly believe that had we hosted this in the fall when teachers need professional development hours, our turnout would have been much higher.

IV. Summary of Project

The goal of this professional development was to help teachers find ways to incorporate the science and engineering practices into other content areas, such as math, science, reading and writing. The focus of this professional development is not on full Science units. We want to start exposing our students to the Science and Engineering skills that

are involved in all content areas. This can be accomplished in one way by directly teaching our students how to be scientists while reading, writing, or completing math.

V. Pre-questions Survey List

- 1) How familiar are you with the Science and engineering practices?
 - a. Not familiar
 - b. Somewhat familiar
 - c. Very familiar
- 2) How familiar are you with NGSS?
 - a. Not familiar
 - b. Somewhat familiar
 - c. Very familiar
- 3) How comfortable are you with integrating the science and engineering practices into literacy and math?
 - a. Not comfortable
 - b. Somewhat comfortable
 - c. Very comfortable
- 4) Are you familiar with the Picture Perfect Science and Stem book series?
 - a. Yes
 - b. No
- 5) Do you currently use picture books when teaching science lessons?
 - a. Yes
 - b. No
- 6) Do you currently incorporate science and engineering practices into your other lessons?
 - a. Yes
 - b. No

VI. Brief Description of the Actual Professional Development Training

This was an hour long training that I did with a colleague. We have been working on a district science committee together for the past year. The committee has the goal of giving teachers resources so that NGSS can be implemented in primary classrooms. Due to time constraints, our primary teachers mainly focus on reading and math with very few teachers teach science. This is a huge issue as our state testing in science has been revamped and any standard K-4 can show up on the state assessment that is given in the fourth grade.

The PD began with the pre-survey questions being filled out. We then had the participants join our Google classroom so that they would have access to the Google slideshow and any other resources. The Google classroom will also be used for follow up and collaboration after the professional development.

To start the training, we showed the participants some research as to why science is important and how it will help aid in literacy. This research is something that I pulled from my Reading and Writing in Science Endeavor class. It made an impact on me then and felt it needed to be shared. We then went through the science and engineering

practices and how they can easily be incorporated into content. We gave the teachers time to work through the Through Course Task on slide 15 and then discussed it.

I talked about the Picture Perfect STEM books and Picture Perfect Science books. These were books that I became familiar with through my work in my Reading and Writing in Science Endeavor class. I had the teachers pretend to be students while I led the lesson called “Over in the Sea”. This is where we ran out of time. I had other resources to share, but time was up.

VII. Brief Outline of the Activities

- 1) Pre-survey was filled out
- 2) Research, NGSS connections and introduction to science and engineering principles.
- 3) Science and engineering principles- quick ways to incorporate them into content.
 - a. Asking and answering questions
 - b. Models
- 4) Through Course Task- Models
 - a. Teachers given time to work through task like students.
- 5) Science and engineering principles- quick ways to incorporate them into content.
 - a. Analyzing and Interpreting Data.
 - b. Constructing Explanations and Designing Solutions
 - c. Obtaining, Evaluating, and Communicating Information**
- 6) Over in the Ocean Lesson
 - a. Teachers participated in Picture Perfect STEM lesson
- 7) STEM resources
 - a. NASA- Putting the E in STEM
 - b. Globe Storybooks
 - c. Moon Munchies

VIII. What NASA data did you include?

- NASA resource-Putting the E in STEM:
<http://www.us-satellite.net/nasa/endeavor/resources/stemresearchlinks.html>
- Globe Storybooks <https://www.globe.gov/web/elementary-globe/overview>
- Moon Munchies <https://www.nasa.gov/stem-ed-resources/moon-munchies.html>

I also included strategies that I learned from my Reading and Writing in Science Endeavor class, such as using the Picture Perfect STEM books. I will add articles from that class to the Google classroom for follow up information as well.

IX. Follow-up Activities & Post-questions Survey List

Post-questions Survey List:

- 1) How familiar are you with the Science and engineering practices?
 - a. Not familiar
 - b. Somewhat familiar
 - c. Very familiar

- 2) How comfortable are you with integrating the science and engineering practices into literacy and math now?
 - a. Not comfortable
 - b. Somewhat comfortable
 - c. Very comfortable
- 3) How likely are you to use the Picture Perfect Science and Stem book series?
 - a. Very likely
 - b. Somewhat likely
 - c. Not likely
- 4) How likely are you to incorporate the science and engineering practices into your other content areas after this training?
 - a. Very likely
 - b. Somewhat likely
 - c. Not likely
- 5) What is one thing that you learned today that you will implement in your classroom?
 - a. What else can we do to help you be successful?

A Google classroom was also created to encourage collaboration after the professional development and to provide additional resources. The PowerPoint was posted in the classroom for future reference.

X. Outcomes. Final Data Collection and Analysis

Data from Pre-survey	
How familiar are you with the Science and engineering practices?	A. 50% B. 50% C. 0%
How familiar are you with NGSS?	A. 0% B. 75% C. 25%
How comfortable are you with integrating the science and engineering practices into literacy and math?	A. 62% B. 38% C. 0%
Are you familiar with the Picture Perfect Science and Stem book series?	A. 0% B. 100%
Do you currently use picture books when teaching science lessons?	A. 100% B. 0%

Do you currently incorporate science and engineering practices into your other lessons?	A. 0% B. 100%
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Data from Post survey	
How familiar are you with the Science and engineering practices?	A. 0% B. 38% C. 62%
How comfortable are you with integrating the science and engineering practices into literacy and math now?	A. 0% B. 25% C. 75%
How likely are you to use the Picture Perfect Science and Stem book series?	A. 100% B. 0%
How likely are you to incorporate the science and engineering practices into your other content areas after this training?	A. 100% B. 0%
What is one thing that you learned today that you will implement in your classroom?	1 person- Using the question board 5 people- Picture Perfect STEM Lessons 1 person- The models and Through Course Task 1 person- no answer
What else can we do to help you be successful?	2 people- Create a list of picture books that can be used with NGSS 1 person- Create units for teaching NGSS 1 person- Create a list of where we can find the resources for Picture Perfect STEM 1 person- Model lessons/collaborate on lessons with me 1 person- help me understand NGSS better 1 person- Create a color poster of science and engineering practices that can be printed for the district. 1 person- no answer

a. Survey results/Content (how does the PD help teachers understand the content)

- 1) When I asked the question, “How familiar are you with the Science and engineering practices?” at the end of the PD, 62% responded that they were very familiar and 38% responded somewhat familiar. This shows understanding of the content by the participants. Prior to the training, 50% were not familiar and 50% were somewhat familiar.
- 2) When I asked the question, “How comfortable are you with integrating the science and engineering practices into literacy and math now?” at the end of the PD, 75% said they were very comfortable and 25% said they were somewhat comfortable. These percentages increased from the beginning of the PD when 62% responded that they were not comfortable and 38% responded that they were somewhat comfortable. This shows that the activities and information provided improved the participants’ knowledge of the science and engineering practices.
- 3) When I asked the question, “How likely are you to incorporate the science and engineering practices into your other content areas after this training?” at the end of the PD, 100% said they were very likely. This shows that they understand what was presented and feel confident using it.

survey results/Pedagogy (how are STEM activities implemented)

One hundred percent of the participants responded that they would use the Picture Perfect STEM books in their classroom. All but one participant was able to choose one thing from the professional development that they will implement in their classroom.

This shows me that the pedagogy was effective and provided the participants with experiences that will make them confident in implementing these strategies and resources in their own classrooms.

c. Was your professional development successful? Why or Why Not?

The goal of this professional development was to help teachers find ways to incorporate the science and engineering practices into other content areas, such as math, science, reading and writing. So the success of the professional development hinges on how comfortable the teachers felt at the end of the training incorporating the science and engineering practices into other content areas. According to the data, prior to the professional development 62% of the teachers were not comfortable at all incorporating the science and engineering practices into other content areas, while 38% were somewhat comfortable. After the professional development, those numbers improved to 75% feeling very comfortable and 25% being somewhat comfortable. The data improved on every question. This indicates to me that the professional development was a success for the participants. In my opinion, true success can’t really be measured until the teachers start to implement these strategies with their students. For that reason, follow up discussions will take place in the Google classroom. This will help me gauge how impactful this professional development was for the participants.

d. How did this project relate to the readings? Cite two examples.

1. Desimone, L. M. (2011). A Primer on Effective Professional Development. Phi Delta Kappan, 92(6), 68.

According to this article, quality professional development must include five core features. Those are:

Content focus- My professional development focused on content. It gave teachers strategies to incorporate the science and engineering principles into their content areas.

Active learning-The teachers were active learners during the through course task and the Over in the Ocean Lesson. This allowed teachers to look at the activities through the eyes of students.

Coherence- This professional development supports the work that is being done in our district.

Duration- The training was only one hour, but the Google classroom and follow ups will continue through the next school year.

Collective participation- Teachers from the same grade level and school should participate in professional development together.

2. Sato, M., Hyler, M. E., & Monte-Sano, C. B. (2014). Learning to Lead with Purpose: National Board Certification and Teacher Leadership Development. International Journal of Teacher Leadership, 5(1), 1-23.

This article helped me identify my priority for teacher leadership. I believe my priority is focused on student learning. I want to share my knowledge with other teachers. My students have been successful this year based on assessment data and I want other students to develop their science skills. I developed my professional development around student learning and success so that all students in our district could experience success with NGSS.

e. Will the teacher do these activities again?

The teachers seemed excited about the resources and strategies that were shared in the professional development. I would say that the teachers will use these activities again in their classroom. All but one teacher was able to list at least one thing that they were going to try and implement in their classroom. All teachers said they would use the Picture Perfect STEM resources.

f. Reflection

This journey of planning and implementing a professional development has been quite a learning process. To be completely honest, I found this task quite overwhelming in the beginning stages. But after completing the process, I have learned so much.

While I think the professional development went well, there are some things that need improvement. The first of those is time. I didn't allow enough time for all the activities and information that I wanted to share. The teachers had more discussion and questions (which is a good thing) than I anticipated. This took time away from other resources that I wanted to share. If I were to do this again, I would make it a 1.5-hour professional development.

The second thing that I would change if I were to do this professional development again is that I would make it more interactive. There was a lot of discussion and talking, which isn't the best way for teachers to learn. I would create more activities for the teachers to participate in because during the professional development this is when I saw engagement at its highest.

Even though I didn't get time to allow teachers to explore the NASA STEM resources, I have added them to the Google classroom. Teachers can explore these resources and then let me know if they have questions about implementation. I am hopeful that the participants will look at these resources and utilize them in the classroom.

The other thing that I would change is the time of year that I presented this professional development. Our teachers are required to have 24 professional development hours per year. By March, the majority of teachers have finished those requirements and are not very willing to participate in more professional development. It is also a busy time with testing quickly approaching and the pressure to get all content taught by the end of the year. Ideally this professional development would take place in August or September. I talked with my principal about presenting this again for our school at the beginning of the 2019-2020 school year and she was receptive to the idea.

While this task has been daunting, I am so glad that I have had this experience. I think it has helped me become a better leader and has also impacted teachers and students in my district in a positive way. Therefore, I consider this professional development to be a success for myself and the participants.

Appendix List

A: Standards used in the unit

B: Links to Surveys and PowerPoint used for PD workshop

C: Resource links used in the trainings

D: Teacher Contacts

Appendix A: Standards used in the unit

Standards:

K-2-ETS 1-2. 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.

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.

This professional development also focused on the eight practices of science and engineering. The NGSS Framework identifies these as essential for all students to learn and describe in detail. They are listed below:

1. Asking questions (for science) and defining problems (for engineering)
2. Developing and using models
3. Planning and carrying out investigations
4. Analyzing and interpreting data
5. Using mathematics and computational thinking
6. Constructing explanations (for science) and designing solutions (for engineering)
7. Engaging in argument from evidence
8. Obtaining, evaluating, and communicating information

Language Arts Standards:

CCSS.ELA-LITERACY.RI.K.1: With prompting and support, ask and answer questions about key details in a text

CCSS.ELA-LITERACY.RI.1.1: Ask and answer questions about key details in a text.

CCSS.ELA-LITERACY.RI.2.1: Ask and answer such questions as *who*, *what*, *where*, *when*, *why*, and *how* to demonstrate understanding of key details in a text.

CCSS.ELA-LITERACY.RI.3.1: Ask and answer questions to demonstrate understanding of a text, referring explicitly to the text as the basis for the answers

Appendix B: Links to Surveys and PowerPoint used for PD workshop

PowerPoint link:

<https://docs.google.com/presentation/d/1SOAn-wkeWAHHLDKF8lQecnH6JvQhX7wNQ8zcy9pj71s/edit?usp=sharing>

Pre-PD Survey link:

<https://docs.google.com/document/d/1h4hLNAOQ543luKhmprpGX56FDfAYppGKnIjDT8MALaY/edit?usp=sharing>

Appendix C: Resource links used in the trainings

Science and Engineering Practices Poster:

https://docs.google.com/document/d/1ELYkCwldTT_wKCCQzKSGpD5dc_6KaNUr8tOW0gvPjAg/edit?usp=sharing

Through Course Task- Which Model is Best?

https://education.ky.gov/curriculum/conpro/science/Documents/Which_Model_is_Best_TCT.pdf

Appendix D: Teacher Contacts

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Citations:

Ansberry, K. R., & Morgan, E. R. (2010). *Picture-perfect science lessons: Using childrens books to guide inquiry, 3-6*. Arlington, VA: NSTA.

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