Professional Development: Final Report

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STEM Leadership
SCED 545

Curriculum Topic:

The Professional Development I delivered was titled “STEMifying the Science Classroom”. It was an introductory presentation to expose the participants to what STEM involves and where resources can be found. The area is developing and STEM is not fully implemented throughout all of the districts in the area. I presented sample lessons that could be used in the science classroom aligned to the current curriculum. Lesson resource sites were shared with the participants.

School Information:

Audie Murphy Middle School is located in Alamo,Tx. It is 15 minutes away from the border to Mexico. The area is developing at a steady rate and STEM is a new area of interest in the local school districts. The school serves a student population of 890 students. The student population fluctuates throughout the year. Many of our students are economically disadvantaged. For the previous reason, many students will transfer to other schools as their home life situations change. The school demographic is 99% Hispanic.

Participants:

The Professional Development session was offered to the Science Department and Administration. They were all able to attend the session from beginning to end. There were 4 8th grade Science teachers which included a Science Enrichment teacher. There were 2 7th grade teachers and 3 6th grade teachers. The CLF (Collaborative Learning Facilitator), Dean of the Science Department Assistant Principal, and the Principal were also present in the session. Total number of participants was 12. All of the teacher participants have either earned a Master’s degree or are working on it. It is a group composed of lifelong learners eager to impart knowledge.

Standards:

6th grade

6.8(A)* compare and contrast potential and kinetic energy 6.8(C)* calculate average speed using distance and time measurements 6.8(B) identify and describe the changes in position, direction, and speed of an object when acted upon by unbalanced forces 6.8(D)* measure and graph changes in motion 6.8(E) investigate how inclined planes can be used to change the amount of force to move an object

Next Generation Science Standards:

HS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

Science and Engineering Practices: Using Mathematics and Computational Thinking

Disciplinary Core Ideas: PS3.A: Definitions of Energy; PS3.B: Conservation of Energy and Energy Transfer

Crosscutting Concepts: Systems and System Models

MS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

Science and Engineering Practices: Analyzing and Interpreting Data

Disciplinary Core Ideas: PS3.A: Definitions of Energy

Crosscutting Concepts: Scale, Proportion, and Quantity

MS-PS3-2. Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

Science and Engineering Practices: Developing and Using Models

Disciplinary Core Ideas: PS3.A: Definitions of Energy; PS3.C: Relationship between Energy and Forces

Crosscutting Concepts: Systems and System Models

7th grade

7.8(A) predict and describe how catastrophic events such as floods, hurricanes, or tornadoes impact ecosystems

8th grade

8.6(A) demonstrate and calculate how unbalanced forces change the speed or direction of an object’s motion 8.6(C) investigate and describe applications of Newton’s three laws of motion such as in vehicle restraints, sports activities, amusement park rides, Earth’s tectonic activities, and rocket launches

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

Disciplinary Core Ideas: PS2.A: Forces and Motion

The motion of an object is determined by the sum of the forces acting on it; if the total force on the object is not zero, its motion will change. The greater the mass of the object, the greater the force needed to achieve the same change in motion. For any given object, a larger force causes a larger change in motion. All positions of objects and the directions of forces and motions must be described in an arbitrarily chosen reference frame and arbitrarily chosen units of size. In order to share information with other people, these choices must also be shared.

Crosscutting Concepts: Stability and Change

Science and Engineering Practices: Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 6-8 builds on K-5 experiences and progresses to include investigations that use multiple variables and provide evidence to support explanations or design solutions.

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

Science and Engineering Practices: Constructing Explanations and Designing Solutions

Disciplinary Core Ideas: PS2.A: Forces and Motion

Crosscutting Concepts: Stability and Change

Summary:

The purpose of delivering this Professional development session was to better inform my colleagues on the benefits of STEM education and provide sample lessons that can be used to foster this type of learning. I provided resource sites that could be used to find lessons that can be adapted to their current curriculum. The sample lessons that I provided include current curriculum standards that are/will be covered during the current school year. I hope this helps them adopt this type of lesson delivery to better serve their students.

Pre-Question Survey:

How familiar are you with STEM activities and lessons?

a. Very familiar
b. Somewhat familiar
c. Not familiar at all

Have you ever implemented a STEM activity in your classroom?

a. Yes
b. No
c. Maybe

What do you expect to gain from this session?

Brief Description of Training:

Due to the current situation,the session had to be delivered virtually. The session began with a brief explanation of what STEM involved and what the benefits of using this teaching method were. Then I moved forward to share sites of NASA resources that they can access to develop lessons, enhance already existing lessons or ignite learning and curiosity. Ideas on how to deliver STEM activities virtually were also shared with the

group of participants. Lastly, I shared developed lessons that targeted specific standards in the current curriculum being taught for each grade level represented.

Activity Outline & NASA Resources:

1. What is STEM? How does it benefit our learners?
   https://www.theedadvocate.org/7-benefits-of-stem-education/
2. Share of resource sites for data collection & analysis and to ignite student interest.
   https://www.nasa.gov/nasa-at-home-videos
   https://www.youtube.com/watch?v=5kjrPUP9X1g&feature=youtu.be
   https://www.nasa.gov/stemonstrations
3. 8th grade lesson sample
   https://www.nasa.gov/stemonstrations-newtons.html
4. 7th grade lesson sample
   https://www.jpl.nasa.gov/edu/teach/activity/pixels-on-fire/
5. 6th grade lesson sample
   https://www.jpl.nasa.gov/edu/teach/activity/straw-rocket/
6. ELA integration lesson sample, Blackout Poetry
   https://drive.google.com/file/d/1rEqc23tti70cl2_hFT58JbXhKuW2cmz6/view?usp=sharing

Follow up Activities:

Administration is very supportive when it comes to helping the teachers become leaders on campus, district and in the area. Our administration has set up PLC sessions once a week and departmental planning twice weekly. I plan to use some of these times to assist and follow up with the participants. I will answer any questions they may have,help them find resources, and even guide and collaborate in creating some lessons. I plan to slowly educate the partici[ants on aloof the aspects of STEM education that they can use, implement and develop.

Post-Questions Survey:

Was this PD useful?

1. Yes
2. No
3. Somewhat

After the training, are you familiar with NASA resources and how they could be incorporated for cross-curricular connections in your classroom?

1. Yes
2. Somewhat, need more clarification
3. Not at all

I can see myself using some of the ideas or lessons presented during the PD.

1. Yes
2. No
3. Not sure

Would you like additional training on how to integrate NASA resources into specific lessons?

1. Yes
2. No

Outcome:

I was so happy to see the participants who thought that they had never implemented a STEM lesson in their classroom realize that they were already doing STEM activities with their learners. It was an “Aha!” moment for them. I think this eased their mind and allowed them to be more open and accepting to implement STEM education throughout the year in conjunction with the curriculum and in collaboration with other colleagues. The Science Enrichment teacher was happy to hear about implementing virtual STEM activities through to-go bags that students can pick up for the necessary lessons. Many of them were amazed to see the STEMonstrations that NASA.gov offers on their site to ignite student learning and curiosity. All of the participants are interested in the continuation of learning about STEM. Delivering this Professional Development allowed me to get over my fear of presenting to my colleagues. This was my first presentation in my 15 years of education. Luft, et al. mentions in their article that teachers lead beyond their classroom, be it to other educators, community leaders, or the public (Luft, et al., 2016). I am excited to begin this new phase of my career and impact a larger audience than just my students. I am really looking forward to seeing a network of educators grow in the area to support STEM education and the developing innovative thinkers and creators. Developing my leadership skills and building networks will allow me to better serve my students and close the learning gaps that exist in our campus, district, and area (Berry, 2019). This has been an exciting and fruitful learning experience.

Appendix:

See attached documents.

References

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