Professional Development Proposal

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SCED 545: STEM Leadership Seminar

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Abstract

Professional Development is a critical part of the educational system. These trainings provide information, skills, collaboration, and community to teachers in their district. New policies, standards, and programs are presented in Professional Development courses to give them a fighting chance to be successful for the benefit of everyone involved in the learning experience. The following proposal is designed to address innovation in the classroom with educators. The ability to showcase innovation (new ideas) to students. Teaching them how to come up with their own way of thinking to create new designs, products, and solutions to problems yet to be solved. The Professional Development on Innovation would involve hands on learning, STEM, and research into possible innovation projects for a middle school classroom of various curriculums. The voluntary development course will be organized to be an hour long provided for 16 instructors in the Northern Cambria School District. The proposal below will address the schedule, measurement of progress, and tentative plan for the hour development session.

Building Innovators for Our Future

Professional Development Course

Northern Cambria School District

Topic

This Professional Development session will provide educators with time and resources with various content areas to explore innovation opportunities in the classroom. Innovation is a term that means to construct new ideas, methods, and solutions to problems. Innovation is necessary for our leaders of tomorrow to fix the multiple problems in the world. Our world needs new ideas, solutions, technology, programs, and more to address and act on the issues we face today. These problems may not find solutions in the middle school classroom, but students can learn this skill for their future careers. While researching innovation educators have found it comes easy in the classroom when paired with STEM (Science, Technology, Engineering, and Math). The innovation skill can be gained through project based, hands on, STEM projects. Allowing students to brainstorm collaboratively on their own. Providing them with tools and allowing them to find their own method of using them. The Professional Development course proposed in this paper would provide differentiated active learning to students ranging in ages from 10 to 14 years of age.

NASA and Endeavor assets

The Professional Development session will utilize resources in the form of Endeavor and their partnership with NASA. A mini lesson using project based, collaborative, innovative learning will be provided to teachers using a NASA resource. It would be simple to discuss

bringing this development into a science or math classroom, but to really challenge teachers this development session would begin by having a lesson in English class. Using the latest resource/competition from NASA, "Naming the New Rover". The resource can be found at the following site:

https://www.nasa.gov/press-release/nasa-invites-students-to-name-next-mars-rover

The Professional Development session will use this resource as an example and the instructor of the lessons will go about the middle school lesson as if the teachers were the middle schoolers. The instructors will be asked to design their own rover with labeled features that they believe would be vital to a rover going to explore Mars in 2020. The group will need to include measurements for their design. Laptops will be provided for research into existing NASA designs. This will be conducted as a group project of 3-4 in a group. Each member will have their own piece of scrap paper to brainstorm ideas to share with the group. The group will then combine their ideas on a large poster board. The group will then name their rover. In a real classroom this would then be submitted to NASA for review in the competition. English comes into play in this activity through the written explanation of the design and why they picked the name that they did. Does it mean something to the mission, is it historical, does it relate to science? Groups will present their design, name, and reasoning at the end of the session. Instructors will be given 30 minutes using this resource and other NASA resources.

The idea for this lesson was gained through Endeavor peer discussions.

Participants

The Professional Development session will consist of 16 middle school instructors. Northern Cambria Middle School in Pennsylvania consists of four teachers per grade level and the middle

school is broken down into four grade levels, 5th-8th grade. The session will also be open to any

other instructor in the middle school as well. This consists of aids, gifted instructors, special

teachers, and guidance counselors. The PD is voluntary and does not count for Act 48 hour

credit. The 5th grade class in the 2019-2020 school year consists of 58 students with each

teacher instructing 14-15 students per class. 6th grade has 65 students currently in attendance.

This would give each instructor roughly 16-17 students per class. The 7th grade has 80 students,

20 per class. The 8th grade has the largest group of students at 91 at this point in the school year.

The teachers in this grade level have 22-23 students per class.

STEM concepts/learning goals

- Explain the purpose of STEM and give examples of lessons in own content area.

- Support other educators in accessing resources available for conducting STEM activities
  with students.

- Practice intrinsic motivation in designing advanced lesson plans for students to
  collaborate, work with their hands, and problem solve.

Standards Addressed

NGSS

- <u>MS-ETS1-1 Engineering Design</u>: Define the criteria and constraints of a design problem
  with sufficient precision to ensure a successful solution, taking into account relevant
  scientific principles and potential impacts on people and the natural environment that
  may limit possible solutions.

- <u>MS-ETS1-4 Engineering Design</u>: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

- <u>MS-PS1-3 Matter and its Interactions</u>: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.

Common Core

- <u>CCSS.ELA-LITERACY.WHST.6-8.1.B</u>: Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources.

- <u>CCSS.ELA-LITERACY.W.6.2.A</u>: Introduce a topic; organize ideas, concepts, and information, using strategies such as definition, classification, comparison/contrast, and cause/effect; include formatting (e.g., headings), graphics (e.g., charts, tables), and multimedia when useful to aiding comprehension.

Location/Time/Resources

The Professional Development session will be held in my classroom (Northern Cambria Middle School, Pennsylvania) which is made to fit 26 students. The session will be one hour and will require laptops for each teacher to conduct research.

Expected Outcomes from the PD

- For educators to gain intrinsic motivation to incorporate STEM, hands on learning, or project based learning into their classrooms.

- For educators to collaborate with each other, sharing information about their content area, classroom management strategies, and experience.

- For educators to understand the value of innovation in their classrooms.

Follow Up

The following day after the Professional Development a collected list of resources will be sent out to all of the teachers from their session. All resources from the 20 minutes of research will be collected on a shared google drive document and shared with everyone in attendance. Participants have access to the document and can continue to share sources after the PD.

A month after the PD a small get-together with food and drinks will be organized. This will provide a space for educators to share their experiences in the classroom after adding in STEM, hands on learning, and any other strategy gained through the PD. This will keep communication continuing among the middle school staff.

Data collection methods

The pre-surveys and post-surveys will be compared side by side for each educator and analyzed into an excel sheet for easy scanning. One person from each grade level will also be interviewed on their thoughts on the PD and its effectiveness. Teachers will also be asked (voluntary) if I, the instructor, could sit in on one of their classes where the new skills from the PD are utilized.

Sample Measurement Tool

Pre/Post Survey
Directions: Answer the following questions to the best of your abilities.

1. What does STEM stand for?

2. How often is STEM incorporated into your classroom on a weekly basis?

3. List any hands on projects you want to try in your classroom.

Answer the following questions from a scale of strongly disagree to strongly agree by circling your choice.

I allow students to work collaboratively in groups at least once a day

Strongly disagree   disagree   neutral   agree   strongly agree

STEM is utilized in my classroom

Strongly disagree   disagree   neutral   agree   strongly agree

I am well equipped in using STEM and understand how to integrate it into the classroom

Strongly disagree   disagree   neutral   agree   strongly agree

I am confident in my ability to instill innovation skills in my students

Strongly disagree   disagree   neutral   agree   strongly agree

I plan on bringing more STEM, innovation, and collaborative work into my classroom

Strongly disagree   disagree   neutral   agree   strongly agree

Tentative Schedule:

1. Introduction to the Professional Development session (3 minutes)

2. Pretest Survey (7 minutes)

3. Lesson presented and conducted (50 minutes)

4. Research time for educators to use resources, such as NASA, to develop their own lesson involving innovative thinking and STEM (20 minutes)

5. Posttest Survey (7 minutes)

6. Closing thoughts and discussion (3 minutes)

Lesson Plan
The Next Mars Rover
80 minutes

Purpose:
To design a rover based on collected data on the terrain of Mars, along with the latest technology available for NASA.
To explore the latest technological advancements for space travel and exploration.
To create a name and mission statement for a Mars Rover.
To write a summary of the project proposal for NASA's approval.

Objectives:
- SWBAT (Students will be able to) design a Mars rover (blueprint) based on the terrain of Mars and technology available.
- SWBAT collaborate with peers to create their design and the name of the rover.
- SWBAT conduct research on Mars and NASA technology using laptops.
- SWBAT write a 3 paragraph summary of their rover giving reasoning behind the name, budget to build, and features.

Assessment:
Students will be assessed formally on their ability to create a plausible Mars rover based on a given rubric provided.
Students will be assessed informally by observations from the instructor during work time.

Standards:
NGSS

- MS-ETS1-1 Engineering Design: Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- MS-ETS1-4 Engineering Design: Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
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Materials:
- Poster paper
- Markers
- Laptops
- Resources- listed on worksheet
- Directions worksheet
- Pen/Pencil

Procedure:
1. The instructor will begin by introducing the activity for today with a discussion on Mars. Students will be asked what they already know about Mars and our exploration of the Red Planet. The class will discuss technology already made and used in exploring Mars and also discuss what else is needed for us, humans, to visit.
2. The instructor will introduce NASAs latest idea for a Rover that will be sent to Mars. The competition will also be introduced using the NASA site: https://www.nasa.gov/press-release/nasa-invites-students-to-name-next-mars-rover
3. The video from the site will be played for students as the instructor passes out the worksheet for today's activity. (Worksheet attached)
4. The instructor will introduce students to the latest technology available from NASA that could be attached to the rover. The class will also discuss the terrain of Mars (that the rover would need to navigate) and look at images. Students will be given one laptop per group to conduct their own research during the activity. Students will also need to research the cost of materials and transportation to Mars.
5. Students will get into groups of 3-4 to collaborate ideas for the design and the name of the latest rover to mars.
6. Students will have 40 to design (draw) their rover and name it.
7. Each group will present their rover by its name, features, and overall design.
8. These designs and summaries will be submitted to NASA for the competition.

Resources:

 NASA. (2019). "NASA Invites Students to Name Next Mars Rover". National Aeronautics and Space Administration. Received from:
https://www.nasa.gov/press-release/nasa-invites-students-to-name-next-mars-rover

 NASA. (2019). "Technology News". National Aeronautics and Space Administration. Received from: https://www.nasa.gov/topics/technology/news/index.html

Rubric:

Criteria					
Unique naming of the rover (agreed upon by the group) with reasoning.	5	4	3	2	1
Design includes plausible technology from NASA and takes the terrain of Mars into account.	5	4	3	2	1
Budget: Group has estimated their budget for equipment, labor, and getting the rover to Mars.	5	4	3	2	1
3 paragraph summary of rover giving reasoning behind the name, budget to build, and features.	5	4	3	2	1
Presentation (see further criteria on worksheet)	5	4	3	2	1
Participation: individual has contributed to the groups final product.	5	4	3	2	1

Extension:
The instructor will continue to update students on the competition in naming the rover and any new technology presented by NASA.

Resources used:

Common Core: State Standard Initiative. (2019). "Middle School Standards". Received from:
http://www.corestandards.org/ELA-Literacy/WHST/6-8/

 NASA. (2019). "NASA Invites Students to Name Next Mars Rover". National Aeronautics and
Space Administration. Received from:
https://www.nasa.gov/press-release/nasa-invites-students-to-name-next-mars-rover

Next Generation Science Standards. (2019). "Read the Standards". Received from:
https://www.nextgenscience.org/search-standards