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Spring 2021

STEM Leadership Seminar Proposal

I. Title of project

The Road to Building a STEM Unit: Understanding how NGSS and the 5E Instructional Model Fit

II. The why behind this project

The emphasis in our district is on initiating STEM practices in the K-12 classroom as a vehicle for teaching students 21st century skills and giving students authentic experiences focused on creating, designing, and building. Replacing our Colorado science standards with NGSS this year naturally complements this push. By adopting NGSS, students have a better understanding of the natural laws and systems of science and how it relates to the processes of STEM fields. Additionally, students are able to see how connections, applications, and needs in the real world are tackled and solved. While much attention has focused on specific STEM middle and high schools, not enough attention in STEM education has been given to elementary schools in our district. Many teachers in my building are tinkering with STEM projects which is fantastic, but don't have enough knowledge about the "whys" and how it relates to NGSS. I want to be a thought partner in changing the understanding of STEM at the elementary level.

I conducted an informal survey of a few teachers in my building to clarify the focus for my PD. Overwhelmingly, teachers wanted a basic understanding of NGSS and how it relates and fits with STEM education. Many teachers feel like they are "flying blind" when asked about NGSS and STEM. Many teachers find their STEM ideas on Pinterest or Teachers Pay Teachers but are unsure if they are doing true STEM work. My aim is to share resources and NASA websites that will help grade-level teams build a strong STEM project, lesson, or unit. I'm encouraged about the motivation and enthusiasm I'm already hearing, and I hope that as a staff, we can build on this learning moving forward. My building principal is fully committed to this PD and excited about the outcomes.

III. NASA data included and content from Endeavor courses

1. NASA Resources Basic search tool for finding NASA resources
2. NGSS Science of Nature Matrix
3. Why NGSS Video explaining the need for standards
4. 5E lesson template
5. Designing a Musical Instrument Engineering Challenge
6. Concord Consortium STEM resources from Coding and Robotics course
7. PhET simulations
8. NASA Space Math

IV. Proposed Audience: School Name, Educators, Grade Levels, Number of students

Westridge Elementary School is a public K-5 gifted and talented center school located in Littleton, Colorado, a suburb south of Denver. Center schools in our district have gifted and

talented options within a traditional school setting. Each grade level has one gifted and two traditional classrooms. The student population at Westridge is roughly around 400 students with 17% on free and reduced lunch.

I'm anticipating at least 6 classroom teachers, grades 3-5, to participate in the professional development, as well as one principal, one instructional coach, and one art teacher.

V. Learning Goals and NGSS/CCSS standards addressed

Some of the anticipated standards this PD will address are listed below. Additional NGSS and CCSS standards will be added that pertain to the participant's unit of study.

Next Generation Science Standards: Engineering Design

Crosscutting Concepts:

Influence of Engineering, Technology, and Science, on Society and the Natural World

- People's needs and wants change over time, as do their demands for new and improved technologies. (3-5-ETS1-1)

Disciplinary Core Ideas:

Developing Possible Solutions

- At whatever stage, communicating with peers about proposed solutions is an important part of the design process, and shared ideas can lead to improved designs. (3-5-ETS1-2)
- Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints. (3-5-ETS1-3)

Science and Engineering Practices:

Constructing Explanations and Designing Solutions

- Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. (3-5-ETS1-2)

Asking Questions and Defining Problems

- Asking questions and defining problems in 3–5 builds on grades K–2 experiences and progresses to specifying qualitative relationships. (3-5-ETS1-1)

Common Core State Standards:

Standards for Mathematical Practice

CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them.
CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively.
CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning of others.
CCSS.MATH.PRACTICE.MP4 Model with mathematics.
CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically.
CCSS.MATH.PRACTICE.MP6 Attend to precision.
CCSS.MATH.PRACTICE.MP7 Look for and make use of structure.
CCSS.MATH.PRACTICE.MP8 Look for and express regularity in repeated reasoning.

VI. PD Recruitment, Advertisement, Number, and Length

The building principal informed teachers at a recent staff meeting about my professional development and intended goals. My professional development is optional during district professional development days in February and March. The proposed times and dates have been posted on a weekly staff bulletin and discussed during staff meetings. Additionally, I've been meeting with teachers individually to discuss specific needs. Right now, I plan on presenting three 45-minute sessions.

VII. Pre and Post Survey Questions

Pre-Survey Questions

1. How familiar are you with NGSS?
2. How familiar are you with the 5E Instructional Model?
3. Have you incorporated an engineering activity or STEM project in your curriculum?
4. How comfortable are you with technology in your classroom?
5. What is your biggest technology challenge in the classroom?
6. Who is your go-to person for STEM related questions and activities?
7. What is your comfort level in planning lessons or units with your colleagues?
8. Are you familiar with where to find NASA resources?

Post Survey Questions

1. What is your comfort level in understanding NGSS?
2. Will you implement any of the NASA resources you found or activities you designed with colleagues into your classroom this year?
3. How motivated are you in implementing more STEM lessons in your classroom?
4. What do you foresee as the biggest obstacle in developing STEM in your current classroom?
5. Do you notice a difference in student engagement after implementing lessons you and your colleagues used as a result of this professional learning?
6. What is your one takeaway from this professional learning experience?

VIII. Expected Outcomes and Expectations

Many teachers in my building are not familiar with NGSS and the reasons for the change in our science curriculum. After my PD, I hope teachers are more familiar with NGSS, the 5E model, and how they can use both to build a STEM lesson or project. My building principal and I want this PD to be a catalyst for more learning and growth in STEM education. Additionally, I hope the participants find the information and resources I provide helpful in engaging students and motivating enough for them to build lessons and units with NGSS in mind and try more STEM related activities and lessons in their classrooms.

The staff in my building tends to be older and more experienced. Some teachers shy away from technology for all kinds of reasons, but what I find is some teachers feel uncomfortable relinquishing control when they use new technology platforms with their students. It's difficult and frightening for some to switch from a teacher role who understands and knows all to learning alongside kids. This professional learning may be an informal way to support teachers in using technology. This really isn't the main intent or expectation, but it would be a welcome outcome.

IX. Follow-up Procedures

I plan on using Google Classroom to create a collaborative space for sharing resources. I also plan on following up with teachers after the three sessions for additional support either one-on-one or as a grade-level team.

X. Data Collection Methods for Effectiveness

A pre and post survey is planned to be administered before and after the PD sessions via Google forms. Some teachers are electing to video a small chunk of a STEM lesson they found or created as a result of this PD. Time for reflection and feedback is planned after viewing the classroom videos during a future staff meeting.