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Practicum in STEM Leadership

Mini-STEM Professional Development

1. What is the title of your mini STEM professional development?

   Implementing Engineering Design in the Classroom

2. Why did you select the topic?

   I am the director of the science research program at my high school (Manhasset High School) and teach grades 10-12. I want to introduce the concept of engineering design and show that it can and should be implemented in all science classes. I also want my focus to be on resources that science teachers can implement in their classes to increase student engagement and provide hands-on learning experiences that are easily accessible.

3. Who is your proposed audience? Which teachers will you serve with your PD and activities? What grades, subjects, and how many students do they teach?

   My proposed audience is two-fold. I would like to hold two professional development sessions (if I am able to).

   1. My first target audience is the science department at my school. I am in a building that houses both the middle school and high school (grades 7-12). In total, there are roughly 25 teachers in the science department, approximately 4-5 teachers per subject area (7^{th} grade general science, earth science, living environment, chemistry, physics, technology, and engineering) with roughly 20-28 students in each of their classes.

   2. My second target is science research teachers from across Long Island, NY, who participate in the New York State Science and Engineering Fair (NYSSEF) or the WAC Invitational Science Fair (organized by the Research Association). I am on the Executive Board for both NYSSEF and the Research Association. I would like to share the resources that I have learned with everyone on the executive board in hopes that they can implement some of the aspects that I plan to discuss into their science research programs at their respective schools. (I do not know the amount of students that they teach as this varies for each school district.) This mini PD would be discussed at an upcoming executive board meeting (target audience is 15 teachers from different school districts).

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4. What "general" science or mathematics concepts or learning goals will you and your materials address which can potentially replace other classroom activities?

   For the first half of my presentation, I would like to introduce concepts of engineering design. I would like to introduce them to: (1) NASA Engineering Design Model (NASA, 2018), (2) NGSS Engineering Design Model (NGSS, 2013), and (3) Dartmouth Design Process (Garmire, 2003). NASA has several videos on their website that further illustrate each of the steps of the NASA Engineering Design Model:

   - NASA's Best – Introduction: https://www.youtube.com/watch?list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&time_continue=8&v=c0wh4GxoL28&feature=emb_logo).
   - NASA's Best – Ask: https://www.youtube.com/watch?v=Oy1DrYTfwiI&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=2
   - NASA's Best – Imagine: https://www.youtube.com/watch?v=laPUvKFP-GY&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=3
   - NASA's Best – Plan: https://www.youtube.com/watch?v=bYxO3iXfu-Y&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=4
   - NASA's Best – Create: https://www.youtube.com/watch?v=VzVJbGucZw8&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=5
   - NASA's Best – Experiment: https://www.youtube.com/watch?v=lCXIhe66pfs&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=6
   - NASA's Best – Improve: https://www.youtube.com/watch?v=Kt1oVv2D_ns&list=PLTUZypZ67cdsM-asYGpX0L6NaIPqhjIjP&index=7

   In the second half of my presentation, I would like to showcase some of the NASA resources that I have been introduced to and that I have implemented in my classroom. I would like to introduce them to the following websites:

   - https://www.jpl.nasa.gov/edu/teach/tag/type/Classroom+Activity
   - https://www.nasa.gov/education/materials/

   I would also like to review NASA's Design Squad Challenges and illustrate how I incorporated the "Feel the Heat Challenge" into my classroom. (https://www.nasa.gov/pdf/308966main_On_the_Moon.pdf)

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5. How and where do you intend to carry out your PD? How long will the session be? When will it be held? Will teachers have access to computers?

   I am still working out the logistics for how/when I will carry out the mini PD.

   1. Carrying out the mini PD at my school: This would be either during a planned department meeting or a separate meeting afterschool that teachers can sign up to attend. (I am still working out the logistics with my school.) The session will be 30 minutes. Teachers will have access to computers.

   2. Carrying out the mini PD with other science research teachers: This would be carried out during an executive board meeting. (I am still working out the logistics.) The session will be 30 minutes. Teachers will have access to computers.

6. What outcomes or expectation do you hope to see for your educators?

   I want the teachers who attend the mini professional development session to be exposed to resources that they can implement into their classroom. It is my hope that by implementing some of this material into their lessons, more effective and engaging lessons can be created that challenge students to think critically and creatively. I am also hoping this will encourage teachers to implement more engineering based activities into their curriculum and expand upon the number of hands-on lessons.

7. How will you follow up with the teachers in attendance?

   I will send out emails that contain the resources that were discussed as well as a copy of the power point that was presented. (For the science teachers in my district, we have monthly meetings so I can talk to everyone who attended the mini STEM professional development at a future department meeting. For the science research teachers target audience, I can follow up with them at a future executive board meeting or via email.)

References:

Garmire, E. (2003). Engineering Design Method. The Technology Teacher, 62, 22-28.

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NGSS Lead States. (2013). Next Generation Science Standards: For States, By States.

Appendix I – Engineering Design in NGSS. Retrieved from http://www.nextgenscience.org/sites/default/files/Appendix%20I%20-%20Engineering%20Design%20in%20NGSS%20-%20FINAL_V2.pdf

https://www.jpl.nasa.gov/edu/teach/tag/type/Classroom+Activity
https://www.nasa.gov/education/materials/
https://www.nasa.gov/pdf/308966main_On_the_Moon.pdf