

Mandatory 3: Brenda Williams' Proposal Submission.

What is the title of your STEM professional development?

"E" is for Engineering

Why did you select the topic? Who is your proposed audience (minimum 12)? Which teachers will you serve with your PD and activities? What grades, subjects, and how many students do they teach? 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?

The University of North Texas (UNT) STEM Collaborative (formerly known as the UNT Texas Regional Collaborative for Science and Mathematics Teachers) meets four times a year at the Environmental Science Building on the University of North Texas campus. This group consists of PreK-12 science teachers from across the Dallas/Fort Worth Metroplex. These charter school and public-school educators teach science or STEM in elementary schools, intermediate schools, middle schools, and high schools. The number of students in each of these teacher's classrooms vary due to these teachers working in rural, suburban, and urban districts.

The group is under the direction of Dr. Crocker and Dr. Roberts, retired professors at the University of North Texas. Attendance typically consists of fifteen to twenty teachers. Each four to five-hour meeting consists of professional development provided by Dr. Crocker, Dr. Roberts, and participating teachers. Since we are not university students, we do not have access to the university's Wi-Fi. Therefore, participating teachers only have access to one computer in the classroom which is accessed by the mentoring professors. After each meeting, the group's educators are responsible for sharing the ideas, activities, and science content with fellow teachers on their home campus and/or in their district.

Through my eight-year membership, the collaborative teachers have participated in a variety of engineering activities such as building a spaghetti tower, creating a chair for Goldilocks, and designing

a purse made from duct tape. While these activities were thoroughly engaging, the lessons lacked a correlation to the engineering design process (EDP). Preliminary brainstorming was not recorded and an initial design plan was not created. The UNT STEM Collaborative teachers would benefit from professional development (PD) regarding the entire EDP since it has not been shared in our meetings. Therefore, I will present a one-hour “E” is for Engineering” PD at the UNT STEM Collaborative on Saturday, September 29, 2018. There should be fifteen to twenty teachers in attendance.

How does your PD integrate NASA assets and/or content from the Endeavor courses?

Using information from the E in STEM Endeavor course and NASA’s Best Engineering Design Model’s Educator Professional Development series, (<https://www.nasa.gov/audience/foreducators/best/edp.html>), participating teachers will view short videos which thoroughly explain each step of the EDP. The videos include examples of children using the EDP to complete an engineering design activity. At the completion of each short video, I will integrate a modified professional development workshop notepad from PBS.org’s Design Squad for training. The notepad will include discussion questions pertaining to each video and reflection questions on integrating the EDP into each participating teacher’s curriculum. The PD will conclude with an EDP student guide worksheet which can be implemented into any engineering design activity, a rubric for grading EDP projects, EDP job cards, and a variety of resources for integrating the EDP.

List NGSS and CCSS or your state standards.

K-2-ETS1-2. 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-ETS1-3. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.

MS-ETS1-4. 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.

HS-ERS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering (NGSS Lead States, 2013).

NGSS Science and Engineering Practices

Asking Questions and Defining Problems
Developing and Using Models
Planning and Carrying Out Investigations
Analyzing and Interpreting Data
Using Mathematics and Computational Thinking
Constructing Explanations and Designing Solutions
Engaging in Argument from Evidence (NRC, 2012)

Science TEKS

K.3 Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to: (A) identify and explain a problem such as the impact of littering and propose a solution.

1.3 and 2.3 Scientific investigation and reasoning. The student knows that information and critical thinking are used in scientific problem solving. The student is expected to: (A) identify and explain a problem and propose a solution.

3.3 Scientific investigation and reasoning. The student knows that information, critical thinking, scientific problem solving, and the contributions of scientists are used in making decisions. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing.

4.3 and 5.3 Scientific investigation and reasoning. The student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using evidence, logical reasoning, and experimental and observational testing (Texas Education Agency, 2018).

6.3, 7.3, and 8.3 Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student (Texas Education Agency, 2018).

Aquatic Science, Astronomy, Biology, Chemistry, Earth and Space Science, Environmental Systems, Integrated, Integrated Physics and Chemistry, and Physics (3) Scientific investigation and reasoning. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions and knows the contributions of relevant scientists. The student is expected to: (A) analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, so as to encourage critical thinking by the student (Texas Education Agency, 2018).

What, in general, will your pre-survey and post-survey ask?

The pre-survey and post-survey questions will ask about the participating teachers' knowledge of the EDP, the purpose of integrating the EDP into a science curriculum, and how to integrate the EDP into a science curriculum.

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

I hope the teachers will begin integrating the EDP into their own classrooms and encourage other teachers in their district and on their campus to do the same thing.

How will you follow up with the teachers in attendance?

Since I meet with these teachers four times a year at UNT, follow up can be accomplished when we meet again in December. Also, these teachers have access to my email if they have any questions.

What data collection methods (e.g. surveys, interviews) will you use to analyze the PD's success?

I will integrate a modified professional development workshop notepad from PBS.org's Design Squad for training. The notepad will include discussion questions pertaining to training videos. It will also include reflection questions relating the integration of the EDP into each participating teacher's curriculum. The discussions, pre-survey questions, and post-survey questions will allow me to analyze the PD's success.

Reference

National Research Council (NRC). (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, D.C.: The National Academies Press.

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Next Generation Science Standards. (2013-b). Read the standards. Retrieved from

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