

## Stem Leadership Seminar Presentation Proposal

### Professional Development Title: *Teaching 3-Dimensionally with Engineering Design Lessons*

This Stem Leadership Seminar professional development is intended to be used with the following additional resources that integrate NASA assets/or content from the Endeavor courses:

- Design Process from the E in STEM Endeavor course
- [Nasa Earth Observatory Earth's Temperatures](#)

### Purpose for Topic

The purpose of the topic, Teaching 3-Dimensionally with Engineering Design Lessons, is to inform teachers that engineering design lessons can be integrated in a 3-dimensionally aligned science lessons. Many times when teachers plan engineering lessons they are taught one dimensionally with that dimension being only the science and engineering practice of designing a solution.

### STEM Concepts and Standards

Oklahoma Science Concepts and Standards:

MS-PS 3-3 Apply scientific principles to design, construct, and test a device that either minimizes or maximizes thermal energy transfer.

- Temperature is a measure of average kinetic energy of particles of matter.
- The relationship between the temperature and the total energy of a system depends on the types, states, and amounts of matter present.
- Energy is spontaneously transferred out of hotter regions or objects and into colder ones.

Oklahoma Mathematical Concepts and Standards:

- 6.GM.3 Choose appropriate units of measurement and use ratios to convert within measurement systems to solve real-world and mathematical problems.
- 6.GM.3.1 Estimate weights, capacities and geometric measurements using benchmarks in customary and metric measurement systems with appropriate units.
- 6.GM.3.2 Solve problems in various real-world and mathematical contexts that require the conversion of weights, capacities, geometric measurements, and time within the same measurement systems using appropriate units.

Engineering Concepts and Standards:

- A solution needs to be tested, and then modified on the basis of the test results in order to improve it.

- There are systematic processes for evaluating solutions with respect to how well they meet criteria and constraints of a problem.

#### Technology Concepts and Standards:

- 4c Students develop, test, and refine prototypes as part of a cyclical design process.
- 5b Students collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.

#### **Audience:**

The audience will be middle school science teachers in Oklahoma.. There will be 6 districts represented with 3-4 teachers from each district. The grades taught by the teachers will include 5th through 8th grade. Each teacher has an average of twenty-five students per class and the number of classes they teach varies.

#### **Timing/Venue:**

This professional development has been developed as a 3 hour session that will take place on April 4th, 2020. The venue is TBA in Oklahoma City. Teachers will need to bring their own technology devices.

#### **Expected Outcomes:**

- Visualize the role 3-dimensional learning plays in a student's ability to design solutions.
- Experience a 3-dimensional STEM lesson that utilizes the design process.
- Develop an understanding of how to utilize NASA assets in a 3-dimensional design lesson.

#### **Professional Development Survey Questions: Google Form**

- How was this professional development helpful to you?
- In terms of this professional development, how will it help your students design solutions?
- How would you rate this professional development on a scale of 1-5 with 1 being needs improvement and 5 being good overall?
- How could this session be improved?

#### **Follow up Plan:**

I will send out "blast" notes to teachers periodically to give them more information and provide a shared platform for communication.

#### **Data Collection:**

- Google Forms
- Communication Platforms

### **Session Agenda:**

- **8:30-9:15** Engage in a 3D lesson as a student
- **9:15-9:30** Work in groups to make posters identifying 3 dimensions in lessons.
- **9:30-9:40** Share posters with whole group
- **9:40-9:50** Evaluate how Nasa tool helps students engage in 3D science
- **9:50-10:10** Engage in designing a solution to minimize thermal energy transfer without a design process.
- **10:10-10:25** Read article: Introducing Design Process and share noticings
- **10:25-11:00** Engage in designing a solution to minimize thermal energy transfer with a design process
- **11:00-11:15** Discussion about improved process.
- **11:15-11:30** Professional Development Survey