Engineering Design K-2 ETS1-3

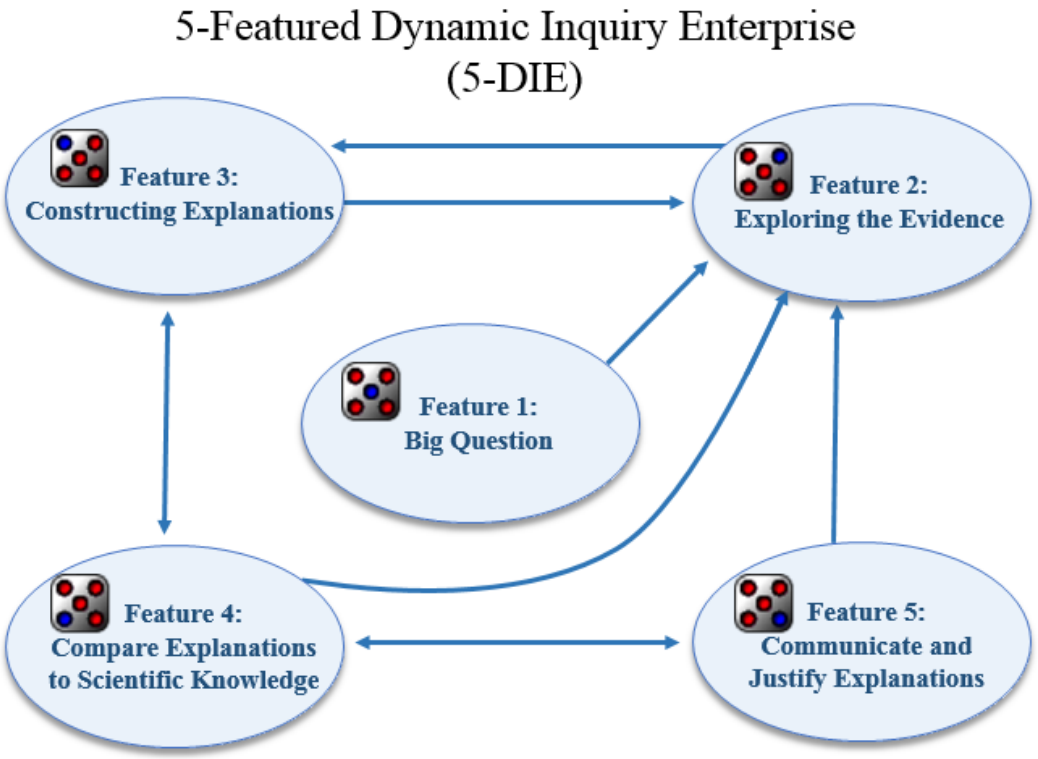
Course Overview

In this course, elementary school teachers grades K-2 will investigate the disciplinary core idea of ETS1.C: Optimizing the Design Solution through the Performance Expectation K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs.

Several conceptual shifts are present in these new standards, one of which is the elevation of Engineering, Technology, and Applications of Science (ETS) as a disciplinary core idea - placing it on the same level as Physical Science, Life Science, and Earth and Space Science. By integrating technology and engineering into the science curriculum, students can be encouraged to apply their developing scientific knowledge to solve practical problems.
This course is focused on the topic of ETS1.C: Optimizing the Design Solution as it pertains to the Performance Expectation K-2-ETS1-3. Analyze data from tests of two objects designed to solve the same problem to compare the strengths and weaknesses of how each performs. You will experience information through a variety of media formats targeted to the following objectives:

- Describe the three dimensions of learning (Science and Engineering Practices, the Disciplinary Core Ideas, and the Crosscutting Concepts) within the Performance Expectation.
- Present an argument for the types of lessons that you will need to implement in your classroom to help students reach a level of understanding needed to master a Performance Expectation of the Engineering Design page for grades K-2.
- Articulate what should be expected from a scientifically literate student at this grade level.
- Generate a general description of a lesson to target the three dimensions represented in the Performance Expectation.
- Translate your general description of a lesson into an instructional design model.
- Explain how the Science and Engineering Practices and Crosscutting Concepts support students in deepening their understanding of the Science Disciplinary Core Idea.

Goals & Purpose: This course is focused on a Question (Big Question). The activities are divided into five features.



Feature 1 –Big Question

In Feature 1 of the course, you will be asked to respond with your initial ideas related to the Big Question. In every additional feature of the course, you have the opportunity to provide any further thoughts or questions that arise.

- What Do I Need to Know to Help Students Understand Engineering Design: Optimizing the Design Solution?
- Investigate the ideas and major science and engineering concepts behind the Performance Expectation of the Next Generation Science Standards topic: ETS1.C: Optimizing the Design Solution.

Feature 2 – Explore the Evidence

Feature 2 of the course is a group of related activities where you are required to collect and explore some evidence related to the content of the Big Question. This evidence is used throughout the remaining features of the course.

- Explore the three dimensions; Science and Engineering Practice (SEP), Disciplinary Core Idea (DCI), and the Crosscutting Concept (CCC) of the Performance Expectation
- Collect evidence from both a reading and video clip related to the Scientific Big Idea

Feature 3 – Constructing Explanations

Feature 3 of the course involves analyzing your evidence and using it to generate an explanation (also called a claim statement) about the ideas of the course. Typically, your analysis will produce an artifact that you will describe and justify to your peers and teacher in Feature 5's Research Council.

- Develop an argument for what type of lesson you would need to develop to explicitly target the three dimensions represented in the Performance Expectation
- Brainstorm a general description of your lesson

Feature 4 – Compare Explanations to Scientific Knowledge

The research associated with teaching and learning science described in the course is further presented in Feature 4. In addition to demonstrating a thorough understanding of the knowledge of the content, you will be asked to compare and contrast your explanation from Feature 3.

- Explore instructional design models as a mechanism to help you think about three-dimensional learning
- Correlate your lesson description with the sections of the instructional design model selected

Feature 5 – Communicate and Justify Explanations

Finally, Feature 5 of the course involves sharing and justifying your explanation and artifact from Feature 2 and 3 among your peers and with your instructor at Research Council. The culminating activity of the course is to reflect on the Big Question of Feature 1 and synthesize your understanding by using your collected evidence to compare and contrast your ideas with those of your peers and teacher.

- Share your lesson design comparison from Feature 4
- Critically evaluate the comparison made by other participants
- Compare your understanding of three-dimensional learning as evidenced by your arguments with your peers understanding

Throughout the course, opportunities are provided for you to connect your learning across sessions and to explicitly consider the implications of your learning for your classroom practice. You will also be able to revisit your work and reflections by viewing your individual Course Portfolios.