

The E in STEM: Meaningful Content for Engineering

Phase I of Major Project-Research and Planning

Grade 4

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Abstract

The students were presented with the Scientific Method, and I wanted to provide them with an opportunity to apply it. I'm not sure why I decided to have them explore the question, "How can we create a resistant bridge?", but I presented to the and they were excited about creating a bridge. After the readings of week 4, I realize that I should have used the Engineering process vs. the scientific method, to remedy this situation I will take time to: introduce the Engineering Design process, compare and contrast both processes, and apply it to our investigation during the "Elaborate/Extend" section. I wasn't ready with all the spanish vocabulary, and I should have researched a bit more the videos that I wanted to present to them. I also did not give them enough time to collaborate and talk about everyone's idea. My intention is to give the students the opportunity to reevaluate, redesign, and rebuild their bridge after being presented with the Engineering Design Process.

Lesson: [Designing Bridges](#)

Learning Standards:

Colorado Academic Standards:

Mathematics: Standard 4- Geometry A: Draw and Identify lines and angles, and classify shapes and properties of their lines and angles.

Science- Physical Science standard 4.1.4- Energy can be produced, used or released by converting stored energy.

Next Generation Science Standards:

3-5 ETS1-1 Engineering Design: Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.

3-5 ETS1-3 Engineering Design: 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.

[Designing Bridges -Lesson Plan](#): Lesson will be modified for 4th grade Dual Immersion Students (Spanish).

Declarative Knowledge needed: Students will need to know about: how energy is stored, structure, angles, geometry, and symmetry.

Procedure Knowledge needed- Ill structured problem- students will need to know, plan, illustrate, and discuss with their team prior to building. They need to be able to apply the Engineering design process.

Types of Problem Solving:

5E Lesson Plan	Big Idea “How can we construct a resistant bridge that can hold car of various sizes?”
<p>Engage The purpose for the ENGAGE stage is to pique student interest and get them personally involved in the lesson, while pre-assessing prior understanding.</p>	<p>Introduction of topic through Phenomena. First, I presented students videos of bridges (Construction Video, Video #2, and Video 3) as they watched the videos, I asked students to write notes or create illustrations of their ideas. After the video, we created a list of materials that might be needed in order to create a resistant bridge and wrote it down in their science journals. One of the students created an illustration of her idea as she watched the videos: Illustrations</p> <p>Vocabulary: Did not have any vocabulary until they finished watching the videos and explored, that they began to ask how to say specific actions, things and parts of the bridge.</p>
<p>Explore The purpose for the EXPLORE stage is to get students involved in the topic; providing them with a chance to build their own understanding.</p>	<p>Students gathered materials, I asked them to plan first, but they went straight to the building. As they started to build, many groups had to restart because the structure they had in mind did not work according to their vision. Many failed to keep the desks at the distance required which was 32 cm, but out of 6 groups, 5 of them were able to create a resistant bridge.</p> <p>Videos of Beginning of Project</p> <p>Hands in Action!</p>
<p>Explain The purpose for the EXPLAIN stage is to provide students with an opportunity to communicate what they have learned so far and figure out what it means.</p>	<p>Students presented their bridge on a gallery walk where they were able to explain their successes, struggles, “aha” moments, and failures.</p> <p>Videos of Gallery Walk- Finish Project</p>
<p>Elaborate/Extend The purpose for the EXTEND stage is to allow students to use their new knowledge and continue to explore its implications.</p>	<p>Students received videos and printed photographs of their bridge to make observations to help with their revisions.</p> <ul style="list-style-type: none"> ● Extension: I will introduce students to the Engineering Design Process, then we will practice the steps (like presented in class). We will revise our material list, I will actually allow time for collaborating prior to building. Also prior to building, we will research new videos, be intentional about the vocabulary, and research about different foundations/structures of bridges. ● Students will have the opportunity to rebuild their bridge based on their new ideas, and

	<p>the engineering design process.</p>
<p>Evaluate The purpose for the EVALUATION stage is for both students and teachers to determine how much learning and understanding has taken place.</p>	<p>Students will be evaluated on their new bridge design using a rubric. There is an opportunity for them to evaluate their own work, and that of their peers. I will also evaluate how well the engineering design process was used based on their journal entries.</p>

Resources:

Colorado Academic Standards

NGSS