

**Lesson Plan Template**  
**Megan Helget**  
**Engineering Lesson**

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| <b>Grade:</b> Second Grade  |   | <b>Subject:</b> Science – Engineering ( <b>Day 1</b> )  |  |
| <b>Materials:</b> Sheets of paper (printer paper, construction paper), small boxes or thick books (21 students @ 2/group – 20 total), pennies (15/group), tape, ruler (10)  |   | <b>Technology Needed:</b> Computer, Smartboard  |  |
| <b>Instructional Strategies:</b><br><input type="checkbox"/> <b>Direct instruction</b> <input type="checkbox"/> <b>Peer teaching/collaboration/cooperative learning</b><br><input type="checkbox"/> <b>Guided practice</b> <input type="checkbox"/> <b>Visuals/Graphic organizers</b><br><input type="checkbox"/> Socratic Seminar <input type="checkbox"/> PBL<br><input type="checkbox"/> Learning Centers <input type="checkbox"/> <b>Discussion/Debate</b><br><input type="checkbox"/> Lecture <input type="checkbox"/> <b>Modeling</b><br><input type="checkbox"/> Technology integration<br><input type="checkbox"/> Other (list) |   | <b>Guided Practices and Concrete Application:</b><br><input type="checkbox"/> <b>Large group activity</b> <input type="checkbox"/> <b>Hands-on</b><br><input type="checkbox"/> Independent activity <input type="checkbox"/> Technology integration<br><input type="checkbox"/> <b>Pairing/collaboration</b> <input type="checkbox"/> Imitation/Repeat/Mimic<br><input type="checkbox"/> Simulations/Scenarios<br><input type="checkbox"/> Other (list)<br>Explain:   |  |
| <b>Standard(s)</b><br>K-2-ET1-2 - 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.  |   | <b>Differentiation</b><br><b>Below Proficiency:</b><br>- Decrease the length of the bridge (distance between the two books). Encourage these students to fold the paper.<br><b>Above Proficiency:</b><br>- Increase the length of the bridge (distance between the two books). The students will have to modify to accommodate for the extra distance. Encourage them to think about other materials that they would like to try.<br><br><b>Modalities/Learning Preferences (Auditory, Visual, Tactile, Kinesthetic):</b><br>- <b>Tactile</b> – working with the materials to build a bridge<br>- <b>Auditory</b> – hearing discussion, conclusions, and predictions out loud. Discussion between partner to determine what they will build.<br>- <b>Visual</b> – the model, the video and seeing the bridge collapse |  |
| <b>Objective(s)</b><br>By the end of the lesson, the students will be able to illustrate why the shape of an object helps it function as needed, by developing a sketch, drawing and a physical model.<br><br><b>Bloom’s Taxonomy Cognitive Level:</b> Synthesis – Evaluation   |   |   |  |
| <b>Classroom Management- (grouping(s), movement/transitions, etc.)</b><br>- <b>Whole group – video, discussion (Sit Spots)</b><br>- <b>Partner Groups – determined by who their “elbow buddy” is (Choose a “smart” spot in the classroom to work</b><br>- <b>Group Share – Other set of “elbow buddy” in their pod</b>  |   | <b>Behavior Expectations- (systems, strategies, procedures specific to the lesson, rules and expectations, etc.)</b><br>- Participation in the video discussion, discussion on model procedure<br>- Appropriate behavior (as talked about before dismissal) when transitioning between “sit spots” to getting materials and then to the work spot<br>- Choosing an appropriate work area<br>- Appropriate behavior during partner work<br>- Engaged and taking part in the activity, staying on task  |  |
| <b>Minutes</b>  | <b>Procedures</b>   |   |  |
| <b>5 min</b>  | <b>Set-up/Prep:</b><br>- Bring video up on the SmartBoard.<br>- Have books and paper ready as an example<br>- Prepare worksheet. Make copies.<br>- Gather materials up and have them ready on the back table.   |   |  |
| <b>3 – 5 min</b>  | <b>Engage: (opening activity/ anticipatory Set – access prior learning / stimulate interest /generate questions, etc.)</b><br>- Today, we are going to be civil engineers. Who knows what a civil engineer is? What is there job? (Allow students to think, turn and talk and then take a few responses from the group)<br>- Civil engineers are people who design roads and buildings, airports, bridges, water systems etc. There are many types of engineers in the world, but today we are going to focus on civil engineering.<br>- As we watch this video, I want you to think like an engineer. I want you to watch to see what the problem is and then think about ways that we could change it to make it better.<br>Show this video to the students <a href="https://www.youtube.com/watch?time_continue=60&amp;v=knaNXcKS-qM">https://www.youtube.com/watch?time_continue=60&amp;v=knaNXcKS-qM</a><br><br>Have a discussion with the students about the following questions: |   |  |

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|                           | <ul style="list-style-type: none"> <li>- What did you notice in the video? (The more people that walked onto the bridge, the more it sagged lower and lower to the water until it broke and fell into the water. Water was shallow enough, so the people were saved.)</li> <li>- Why do think the bridge collapsed? (Too much weight on the bridge from the people walking across it).</li> <li>- Why do we need bridges? (So, we can cross bodies of water, roads etc.)</li> <li>- Why is important that bridges are strong and sturdy? (So, we do not fall through them, there is a lot of weight on a bridge)</li> </ul>   |
| <p><b>5 – 10 min</b></p>  | <p><b>Explain: (concepts, procedures, vocabulary, etc.)</b></p> <ul style="list-style-type: none"> <li>- Today, we are going to make bridges out of paper. We will use pennies to represent the people and paper to make the bridge.</li> <li>- Model how to make a bridge with the two big textbooks and the paper. Measure 10 inches between the books.</li> <li>- Talk about the term <i>prediction</i> (what we think will happen based off what we already know)</li> <li>- What do you think will happen if we put a flat piece of paper between the two books? Will it be able to hold the pennies? Why or why not?</li> <li>- Place the paper between the books and place a few pennies on the paper. The paper will fall, and the bridge will collapse. Question the students on what happened. Why did the bridge collapse? Why did the paper fall? (The paper fell because it was too flexible, and it was not attached)</li> </ul> <p><b>Activity Explanation:</b></p> <ul style="list-style-type: none"> <li>- Explain to the students that they will be working in pairs and completing the same activity.</li> <li>- When you are with your partner, your job is as a team try and design a bridge that will hold the most weight. We know as a class that we cannot just lay the piece of paper between the books because it is not strong enough. So, what can we do to make the “bridge” stronger? What ideas and techniques will you try with your partner to make the bridge strong enough to hold all the pennies or to hold the most weight? (folding the paper, which way? What type of paper should we use?) Take a few ideas.</li> <li>- When you get to your workspace with your partner, first start by making a prediction. Can someone remind us what a prediction is? Call on student. (What they think will happen) Talk to your partner on what you think you need to do to make the strongest bridge. You will probably need to try a few different styles before you determine what bridge style is the strongest.</li> <li>- Once you have decided on the design of your bridge you will fill in the information on the recording sheet. Fill in your name, partner’s name and the date. Then, in the box, you will draw a picture of your model. You might choose to label different things on your bridge. Below the box, you will write a list of materials you used. These are the things that you used to create your model. Then, on the back you will write a description of your bridge. You may want to include how you made it, how many pennies it could hold, or other details you think are important for someone else to know in order to understand your drawing. We are not worried about spelling here, so you can sound out the words and give it your best guess. Also, ask your partner for. Engineers never work on a project by themselves. Your partner is there to help you, so ask them and they can help you.</li> </ul> <p><b>Classroom Management:</b></p> <ul style="list-style-type: none"> <li>- Talk about what partner work looks like? What should it sound like? What does it sound like when we go and get our materials? Call on students to answer these questions.</li> <li>- You and your partner will go and get your supplies. Choose the type of paper you would like to use. You may want to choose a couple different thicknesses of paper. Two books, a ruler and a bag of pennies. The materials are on the back table.</li> <li>- Ask if there are any questions about what they are doing.</li> <li>- Release students by pods and have them spread out to with their partner.</li> </ul> |
| <p><b>15 – 20 min</b></p> | <p><b>Explore: (independent, concrete practice/application with relevant learning task -connections from content to real-life experiences, reflective questions- probing or clarifying questions)</b></p> <ul style="list-style-type: none"> <li>- First you will make a prediction. Think about what you will need to do to make your bridge the strongest. Write a sentence or draw a picture to show what your prediction is.</li> <li>- Allow students time to explore with their materials.</li> <li>- Walk around to asked questions to the students. Watch to see what they are trying.</li> </ul> <p><b>Question:</b></p> <ul style="list-style-type: none"> <li>- Why are you deciding to do ___?</li> <li>- What have you tried already? Did it work? What will you change this time?</li> </ul> <p>- <b>Give the students a warning of time left before it was time to clean up. (10 min, 5 min etc.)</b></p>  |
| <p><b>5 min</b></p>       | <p><b>Review (wrap up and transition to next activity):</b></p> <ul style="list-style-type: none"> <li>- Have students return to their pod. They will share what they did with the other partner group at their pod.</li> </ul>   |

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- Have the students group share on what they did. What worked the best? Did other groups do the same thing? How many pennies was your bridge able to hold?
- Ask the students to share if they liked the activity. What were the challenges?
- Make sure their names are on everything and place in a box for Day 2.

#### **Formative Assessment: (linked to objectives)**

**Progress monitoring throughout lesson- clarifying questions, check- in strategies, etc.**

#### **Questions throughout the lesson:**

What did you notice in the video?

What happened to the bridge? Why?

What do you think will make your bridge the strongest?

What materials are you using for bridge?

What could you change to make the bridge even stronger?

What have you noticed about bridges in roads that you could think about for you design?

Are the materials that you are using the most effective ones? If not, what would be better?

#### **Consideration for Back-up Plan:**

#### **Summative Assessment (linked back to objectives)**

##### **End of lesson:**

- Completion of the attached worksheet. This document shows a depiction of their bridge model and a brief description, and material list.

(I would like to follow this lesson up with a day 2 activity. This would have a different variety of materials that the students could experiment with. They would attempt to build a stronger bridge. They would determine the best material for the strongest bridge.)

##### **If applicable- overall unit, chapter, concept, etc.:**

- Final design model of the bridge, with a list of materials, description, and reasoning as to why their bridge would be the best design to use.

#### **Reflection (What went well? What did the students learn? How do you know? What changes would you make?):**

I got this lesson idea from <https://www.sciencebuddies.org/teacher-resources/lesson-plans/paper-bridge-design#summary>