Kelsie Schmidt

SOLAR LESSON PLAN *ENGINEERING DESIGN*

Age Level: 4th Grade
Subject(s) Area: Science
Materials Needed: Bridges (previously made from the following materials: paper, straws, and masking tape), science textbooks, journals, pencils, graphic organizers

Standards:

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.

Objectives:

What will the students know or be able to do? At what Bloom's Taxonomy Level? To what accuracy?

The students will **investigate** the structural support of their bridges using a variety of materials with reflection at *95% accuracy.*

The students will **report** on their findings of structural support using their journals and graphic organizers at *90% accuracy.*

Learning Activities:

Technology: N/A

Required Vocabulary: Structural support: How much weight your bridge can hold in order to be safe for travel

Opening Element: Today, you'll finally be testing out your bridges that you made earlier this week! We already know that we're the architects behind this bridge, so now we're doing the final steps to make sure our bridge is sturdy enough for travel.

Reflective Questions: How many books do you think your bridge can support? How many books could your bridge support? How would you make your bridge stronger? Did your predictions about your bridge come true?

Instructional Methods:

- **This is the final day of this lesson, it's the experimental portion, not the building portion. Students already completed the building the bridge portion earlier in the week.**
- Have students meet with their bridge partner and have the tallest member get the bridge, and the shortest member get their partner's journal and a pencil. Meanwhile, pass out the graphic organizer.
- Explain what will be happening today: Students will be experimenting the structural support of their bridges using our science textbooks. We will make predictions in our journals and collect our data on graphic organizers. RULES: Be respectful of all other persons and things in this process. Be great scientists/architects/engineers (use your

proper thinking hats), Only use one book at a time, do not place more than one book on your bridges at a time, Remain in your designated workspace (decided earlier in the week) unless you are getting more materials.

- Students will answer the following question in their journals "How many of our science books do you think your bridge can support?"
- Once done with the reflection question, students will then fill out the designated portions of the graphic organizer before, during, and after experimentation (link to the graphic organizer is listed below).
- After the initial reflection question and some portions of the graphic organizer are filled out, student will then begin to experiment and place the books on top of their bridges. Meanwhile, students will mark their findings.
- After a certain amount of time/experimentation has occurred (15 minutes maximum) set out more bridge building materials (paper, straws, and tape). Allow students who are struggling to possibly add to their bridge to make it stronger. Allow students to test the books again.
- Once students are done filling out the graphic organizer, allow time for cleanup before the final reflection.
- Clean up: Clap a pattern for the students' attention and have the tallest person hand in the graphic organizers, and the shortest person put the bridge and supplies away.
- After clean up, allow the students time to journal on these questions:
    - *Already previously done* How many books do you think your bridge can support.
    - How many books did your bridge support?
    - Did you initial bridge break, if so, why do you think that was?
    - What did you do to improve the structural support of you bridge?
    - If you were a real engineer, would your bridge be safe to travel on?
    - Please state any other observations/findings you think are important to this experiment.
- Independent Concrete Practice/Application:
    - I do: *Previously, explain/teach the prior lessons* I will give students time to experiment while I observe their experiments.
    - You do: Experiment and report on your findings via journal and graphic organizer.
    - We do: *The following class/morning meeting/later on in the day* We will discuss our findings by asking questions and having each group report on how well their bridge stood up to the book test.
- Differentiation:
    - Below Level: I would place the struggling students together for this project to let them work on the same level. I could give them a model of the bridge and have them build one exactly like it if they were struggling that much. Their journals/graphic organizers could have less questions.
    - At level: These students would have the lesson as it is laid out with the initial journal/graphic organizer responses.
    - Above level: These students would be placed together and would have more questions in their journals/graphic organizers. These students could possibly have a different textbook for their weight portion.

Wrap-Up: The wrap-up would be discussed as in the "We do" portion of the lesson plan. We would gather as a class and report our findings.

Assessment:

Formative: I would observe the students and lead them on with some guided questions. Because the graphic organizer is done in groups, the students would use this as their formative assessment. The whole-class report would also be in this formative assessment.

Summative: The journaling would be the summative assessment. Even though the students are journaling about the same bridges and about the same questions, they will be completing the journal portion independently.

Graphic organizer link: http://love2teach2read.blogspot.com/ It is the graphic organizer listed as "Problem and Solution". With this graphic organizer, I would like to change some components. I would have the "problem circle" be the students hypothesis of the number of science textbooks their bridge could support. The "final solution" box would be the number of books their final product could support. The "steps in the solution" portion would have the following questions listed in order: Did you bridge meet your expectations? Why did/didn't it meet your expectations? How could/did you make your bridge meet your expectations?

Reflection: