

Kacey Legare

Engineering CUP: Paper Bridge Construction

Teaching and Learning LAP 2: Initial Designs and Paper Bridge Trial

I. Content: Describe *what* it is you will teach. What is the content?

- This lesson builds upon the introduction lesson. In this lesson, students will be assigned to their pairs and workspaces for the project. One table will be the designated “test table” where students can test their bridges on the two books. Students in this lesson will have to create a plan for their bridge by drawing a model of how they plan to use the construction paper. Students will practice labelling their diagrams and listing all necessary materials. Students will also practice collaboration as both partners must have matching models or at least their models must be showing the same concept. After planning out their bridges, students will get one piece of construction paper and two 1.5 inch long pieces of scotch tape. They will get to construct an initial model for their bridge design. Then students will test their models and record the class results. Students will also be expected to write briefly to reflect on which models were the most successful and why.

II. Learning Goal(s): Describe what specifically students will *know* and *be able to do* after the experience of this class.

- SWBAT create a diagram of a bridge model with labels and appropriate features.
- SWBAT identify the materials needed to complete a task.
- SWBAT equally participate in the construction of a paper model of their bridge.
- SWBAT count pennies and record the results data in a chart.
- SWBAT analyze which models were successful and reason why.

III. Rationale: Explain how the content and learning goal(s) relate to your Curriculum Unit Plan learning goals.

- The above learning goals relate to my CUP because they build upon the previous introductory lesson and allow the students to begin to test out models while practicing their collaboration skills. Students will use this experience to begin to test out designs and familiarize themselves with the material and task. This is also the first time they will know who their partners will be and begin to share ideas, collaborate, and work together to create a working model bridge. This lesson is their first time seeing what the expectations are for model building, group work, and testing for this unit. This lesson will set up the classroom expectations and layout for future lessons and allow students to establish a routine around how this project will unfold.

IV. Assessment: Describe *how* you and your students will know they have reached your learning goals.

- I will know my students have reached their learning goals by if they are able to produce a model bridge from construction paper to test. Students must work together to design their model and create the model. I expect each pair to have a similar design. I will only allow one piece of paper per group. I also expect my students to be able to fill in some to most of the recording sheet, showing each groups’ initial results. Students must also explain which bridges were most successful and why in a few sentences.

- V. Personalization and equity: Describe how you will provide for individual student strengths and needs. How will you and your lesson consider the needs of each student and scaffold learning? How specifically will ELL students and students with learning disabilities gain access and be supported?
- ELL students are supported in this lesson through the nature of the lesson. This hands on, collaboration-based exploration lesson allows all students to access the concept of the “Plan” and “Create” through physical and kinetic learning. Because students are required to draw their design and label the materials needed, there are minimal vocabulary or linguistic barriers to the lesson. I will provide the vocabulary words on the board if needed. The group work is another key aspect for enhancing all students’ learning experience. By being able to develop their ideas together and practice their communication skills in the process, students must work on articulation of ideas and sharing social skills for decision making. This type of project requires students to rely on their partner and get creative without requiring heavy language scaffolding.

VI. Activity description and agenda

- a. Describe the activities that will help your students understand the content of your class lesson by creating an agenda with time frames for your class. Be prepared to explain why you think each activity will help students on the path toward understanding.

Schedule:

Time	Students	Teacher	Materials
2:40-2:50	<ul style="list-style-type: none"> • Fill Out “Plan” section with partner • List Materials needed 	<ul style="list-style-type: none"> • Overview EDP • Explain Sequence of events 	<ul style="list-style-type: none"> • EDP Chart • Packets
2:50-2:55	<ul style="list-style-type: none"> • Check Design with teacher • Receive materials 	<ul style="list-style-type: none"> • Check Designs • Pass Out Paper and Tape 	<ul style="list-style-type: none"> • Construction Paper • Tape
2:55-3:05	<ul style="list-style-type: none"> • Construct Model with Partner 	<ul style="list-style-type: none"> • Facilitate Construction Process 	<ul style="list-style-type: none"> •
3:05-3:15	<ul style="list-style-type: none"> • Test Bridges • Record Class Results 	<ul style="list-style-type: none"> • Test Bridges 	<ul style="list-style-type: none"> • Dictionaries • Pennies
3:15-3:20	<ul style="list-style-type: none"> • Reflect on Successful Models and Their Structure 	<ul style="list-style-type: none"> • Clean Up 	<ul style="list-style-type: none"> •

- b. What particular challenges, in terms of student learning or implementing planned activity, do you anticipate and how will you address them?
- I anticipate management to be my main issue in this lesson. I am most concerned about how students will know the expectations for working in partners, for testing, and for sharing spaces and materials. I am also worried students will forget to write their findings down and ignore the formal assessment aspect of the lesson. I plan on being extremely specific about my instructions including where all of the testing will happen

and how we can all be successful and respectful of one another doing so. I also will be pausing the high energy and fast paced environment to allow for students to write and record data. I will be sure to allow time at the end of the lesson, or if need be, the following day for students to reflect on what had happened with the models.

VII. List the Massachusetts Learning Standards this lesson addresses.

- Grade 2 Common Core standards
 - **2.K-2-ETS1-3.** Analyze data from tests of two objects designed to solve the same design problem to compare the strengths and weaknesses of how each object performs.
 - Data can include observations and be either qualitative or quantitative.
 - **2.W.7.** Participate in shared research and writing projects (e.g. read a number of books on a single topic to produce a report; record science observations).
 - **2.W.8.** Recall information from experiences or gather information from provided sources to answer a question.
 - **2.W.10.** Write routinely for a range of tasks, purposes, and audiences.
 - **2.SL.1.** Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.
 - a. Follow agreed-upon rules for discussions (e.g., gaining the floor in respectful ways, listening to others with care, speaking one at a time about the topics and texts under discussion).
 - b. Build on others' talk in conversations by linking their comments to the remarks of others.
 - c. Ask for clarification and further explanation as needed about the topics and texts under discussion.
 - **2.SL.4.** Tell a story, recount an experience, or explain how to solve a mathematical problem with appropriate facts and relevant, descriptive details, speaking audibly in coherent sentences and using appropriate vocabulary.
 - **2.SL.6.** Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.
 - **2.L.1.** Demonstrate command of the conventions of standard English grammar and usage when writing or speaking; retain and further develop language skills learned in previous grades.
 - **2.L.2.** Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
 - **2.L.3.** Use knowledge of language and its conventions when writing, speaking, reading, or listening.
 - **2.L.6.** Use words and phrases acquired through conversations, activities in the grade 2 curriculum, reading and being read to, and responding to texts, including using adjectives and adverbs to describe.
 - **2.MD.9.** Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Organize and record the data on a line plot (dot plot) where the horizontal scale is marked off in whole-number units.
 - **2.MD.10.** Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems,11 using information presented in a bar graph.

VIII. Reflection

- a. In light of all areas of planning, but especially in terms of your stated purpose and learning goals, in what ways was the activity(ies) successful? How do you know? In what ways was it not successful? How might the activity be planned differently another time?

- This lesson was chaotic in the sense that I was not the source of knowledge and did not control my students' exploration and construction of models. Of course I was there to facilitate their thinking, probe necessary questions, push them to think about the next couple of lessons and what is coming up, and to help them test their models. It was predictably difficult to have students all wanting to test and have the patience to be able to watch others test their models and record while also being excited to test their own bridges. When I think about my management for this lesson I realize that I should have been more clear about what my expectations were because many students did not record a lot of the data other than their own as you can see in the student work below.

As for the reflection part of this lesson, students were expected to think about the models and find similarities of the ones which were successful in holding pennies and be able to identify the flaws which caused the weaker or poorly designed bridges to fail. We had not gone over much vocabulary and I had not modelled what a good reflection would sound or look like. This is apparent when you review their reflections they wrote in student work. In hindsight, I should have allowed more time and scaffolding for this part of the lesson. The reflection part of each lesson is what allows students to really think about what they did and how they can use the information they got from their experiments to better inform their construction of their bridges. Because of its importance, this part of the lesson required more attention than I allowed it. If I were to reteach this lesson, I would model the reflection, have a vocabulary box, and a sentence stem available to my students. I might have also made the reflections exit slips instead of part of the packet.

- b. What did you learn from the experience of this lesson that will inform your next LAP?

- Moving on to the next lesson, I am thinking about how my students will explore the different materials and ways to fold paper. I know my students need to expand their options for this project. Almost all of my students bridge models were the same. They all folded their paper flat and then taped it shut. I predicted this happening and along with the standard for engineering, I wanted to see if they could make informed choices about improvements after exploring other options for bridge making. The next lesson is exploring materials and I am confident that my students will notice the stark differences between the materials and be able to make decisions regarding which is a better material for bridge building and why. Likewise, they will also explore different ways to fold their material of choice to expand their techniques and options for the way they fold their papers. We will continue to build upon the routine and structure of the classroom presented in this lesson to help with the management of the unit.

Student Work on Next Pages

If you go to the links below, you can see Cesar and Joseph who were the first people to test. Their [first test](#) could only hold 4 pennies. They were the only group allowed to retest in this lesson. See their first improvements and revisions [here](#).

A. Student Designs

Plan
 Draw out your idea. This is your design. Show all the parts of your design.

two tape two books 1 fold paper

Pick out materials you need. Write a list of what you will need.

Two piece of tape two books. 1 fold paper

Plan
 Draw out your idea. This is your design. Show all the parts of your design.

Pick out materials you need. Write a list of what you will need.

2 books in a cupel of pen/ink
 2 pieces of tape. 1 piece of paper

Plan
 Draw out your idea. This is your design. Show all the parts of your design.

books paper pens

Pick out materials you need. Write a list of what you will need.

I am Faden the paper. I need paper a tape.

Plan
 Draw out your idea. This is your design. Show all the parts of your design.

two tape two Books one paper one construction

Pick out materials you need. Write a list of what you will need.

two tape. two Book - one paper.

B. Student Data Recordings and Reflections

Create and Test
Build your design. Test your model with pennies. Record the results.

Group	Number of Pennies
Michael Kayle	0
Joseph Ceaser	4/17
Camilla Prince	10
Natalia Lyanna	32
Claishlee Jashays	8
Jeremy Shannon	38
Elizah Nyshyla	23

Reflect
Which models held the most? Which held the least? What did they do differently?

they folded there paper and on the tip they put tape and some folded it a little. some where sized as a rectangle

Create and Test
Build your design. Test your model with pennies. Record the results.

Group	Number of Pennies
Kayli and Michael	10
Caia Jashi	18
Camila Ye	10
Cash Joss	8
Natalia Lanray	32
Family Smart	38
elijah.	23

Reflect
Which models held the most? Which held the least? What did they do differently?

the one with the most put tap to make it strong the rest same did not put tap.

Create and Test
Build your design. Test your model with pennies. Record the results.

Group	Number of Pennies
Kayle Meichil	0
Joseph and Ceasar	4/17
Lyanna Natalia	32
Camilla Prince	10
Claishlee Jashays	8
Jeremy and Shannon	38
Elizah Nyshyla	23

Reflect
Which models held the most? Which held the least? What did they do differently?

Kayle and Meichil's were too little and it didn't fit. But if they fix it and make it better

Create and Test
Build your design. Test your model with pennies. Record the results.

Group	Number of Pennies
Kayle Meichil	0
Joseph Ceasar	4/17
Camilla Prince	10
Natalia Lyanna	32
Claishlee Jash	8
E	2

Reflect
Which models held the most? Which held the least? What did they do differently?

They folded the paper 2 times. then they use tape. It was long and scary. And part of it they left as open.

C. Student Initial Models

