

Phase I – Research and Planning – Due Date: Midterm

1. Identify the “Big” concept to be covered by the engineering design challenge.

Big Idea: Students will demonstrate the basic knowledge of bridges to solve a problem.

2. Research appropriate learning standards associated with the topic.

Students who demonstrate understanding can:

K-2-ETS1-1. Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.

K-2-ETS1-2. 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.

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.

3. Identify and discuss the different types of problem solving and declarative/procedure knowledge needed.

Algorithmic Problems (2000) Students will use data and evaluation of data to design a bridge to cross a span of space. This type of problem requires students to use both procedure knowledge and declarative knowledge.

The declarative knowledge is the second-grade math standards and data gather and evaluation of information.

Procedural knowledge is the following of the design process. Student will follow a series of steps to design and evaluate their design.

Second grade students to be able to draw a simple bridge design. They will use the design to build a model of bridge.

4. Explore objectives and ancillary concepts/content covered by the project.

Math:

CCSS.MATH.CONTENT.2.MD.A.1

Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.(CCSS)

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 problems¹ using information presented in a bar graph. (CCSS)

Written Expression:

CCSS.ELA-LITERACY.W.2.7

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).

Reading:

CCSS.ELA-LITERACY.RI.2.3

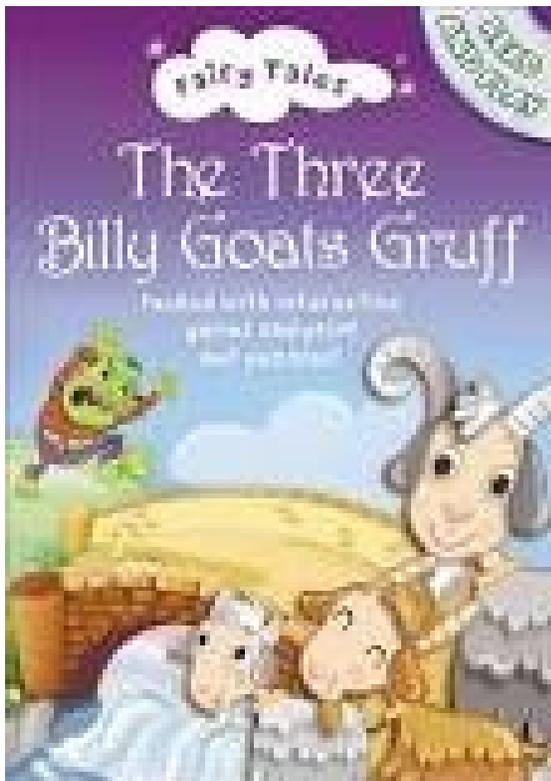
Describe the connection between a series of historical events, scientific ideas or concepts, or steps in technical procedures in a text.

5. Identify possible activities.

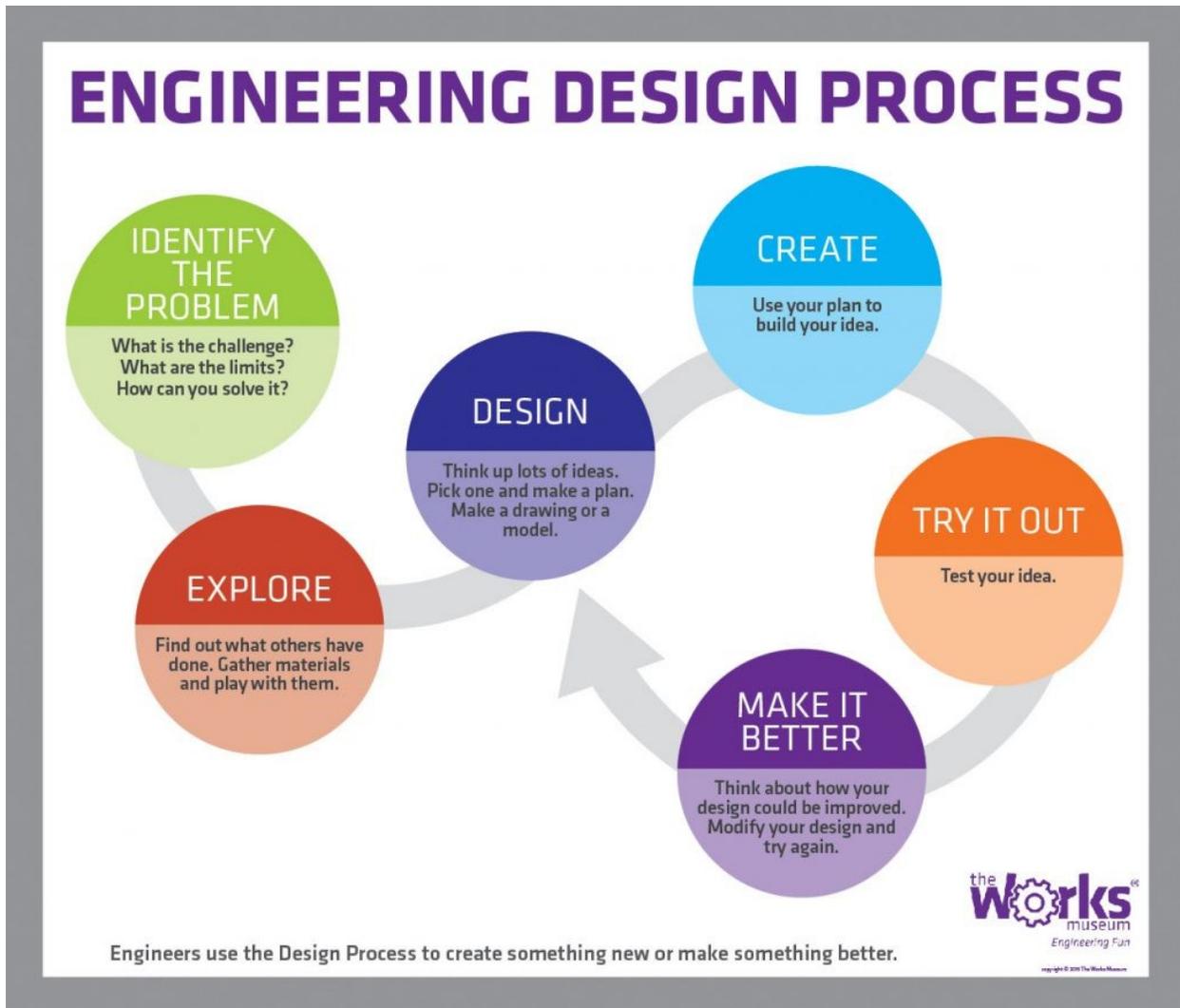
Students can build a bridge that will hold a set of objects.

6. Select the best activity for your classroom.

Design a bridge that allows “The Three Billy Goats Gruff” to cross.



Phase II



Identify Your Problem (Works)

The Three Billy Goats need to cross the river. Can you help them cross?

Explore: Find out what others have done and gather materials and play with them. (Works)

Engage students in exploring bridges with these two video clips.

Introduce bridges:

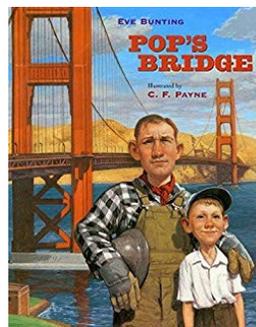
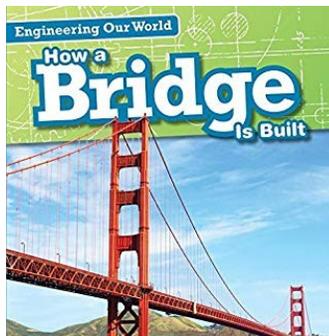
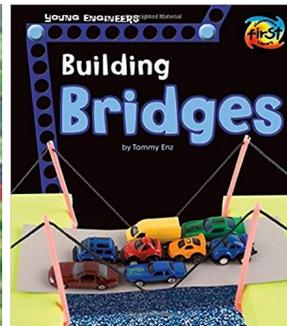
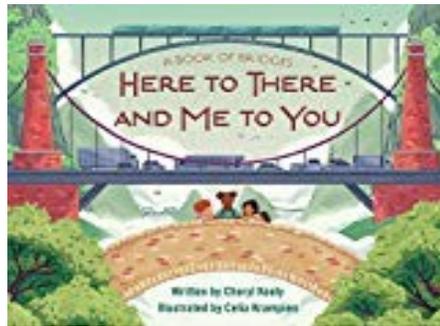
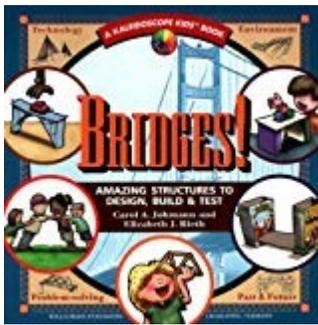
“What Makes Bridges So Strong”

<https://www.youtube.com/watch?v=oVOnRPefcno>

Spaghetti Bridge:

<https://www.youtube.com/watch?v=Pp9U6lyoIgg&feature=youtu.be>

Books to add to class library:



Materials to Gather

1. Blocks
2. straws.
3. toothpicks
4. Pipe cleaners
5. pipe cleaners
6. toothpicks
7. paper towel roll
8. Wood pieces

- | | |
|------------------------|-----------------------------------|
| 9. paint sticks | 9. sticks |
| 10. wire | 11. glue |
| 12. tape | 13. Plastic cars, trains, animals |
| 14. plastic/paper cups | 14. Blocks |
| 15. cardboard | 16. Recycled material |
| 17. play dough | 18. rocks |
| 19. twine | 20. Spaghetti |

Design: Think of lots of Ideas. Pick one and make a plan. Make a drawing or a model. (Works)

Students will pick a design and make a plan to make and test bridge.

Create: Use your plan to build your idea. (Works)

Students will draw their designs in their journals and pick one to build.

Try it out: Test your idea. (Works)

Students will try out their designs.

Make it better: Think about how your design could be improved. Modify your design and try again. (Works)

Students will modify their designs and make changes to their design.

Share student's Journals and bridges.

Pictures will be added to this section.

References

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Engineering Design Process |. (n.d.). Retrieved September 19, 2018, from <https://theworks.org/educators-and-groups/elementary-engineering-resources/engineering-design-process/>