Engineering Design Process: Weaving & Mills, Grades 3-5
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Standards:

3.3-5-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 that a potential solution must meet.

4.1: ELA: Reading Informational: Key Ideas & Detail

3. Explain events, procedures, ideas, or concepts in a historical, scientific, mathematical, or technical text, including what happened and why, b on specific information in the text.

Optional use as a pre-visit lesson before field trip to the Tsongas Industrial History Center.

Engage	Your Task
You wear clothes every day, but how often do you stop to think about how your clothing is made?	Look at the piece of cloth. Pull strings at the edges. What do you notice? Discuss with a partner how you think this piece of cloth was made.

Explore	Your Task
You saw that the strings followed an over and under pattern on a string that is perpendicular. Seems easy, right? Why is it?	Using your cardboard loom, yarn, and needle, create a piece of cloth at least 2 inches tall. Watch this video to help you (fast forward through the part about making "plarn" to 4:37 to setting up looms and weaving) How long did it take you? Submit a picture of your final product. If you had to make all your own clothes with this method, how many outfits would you have?

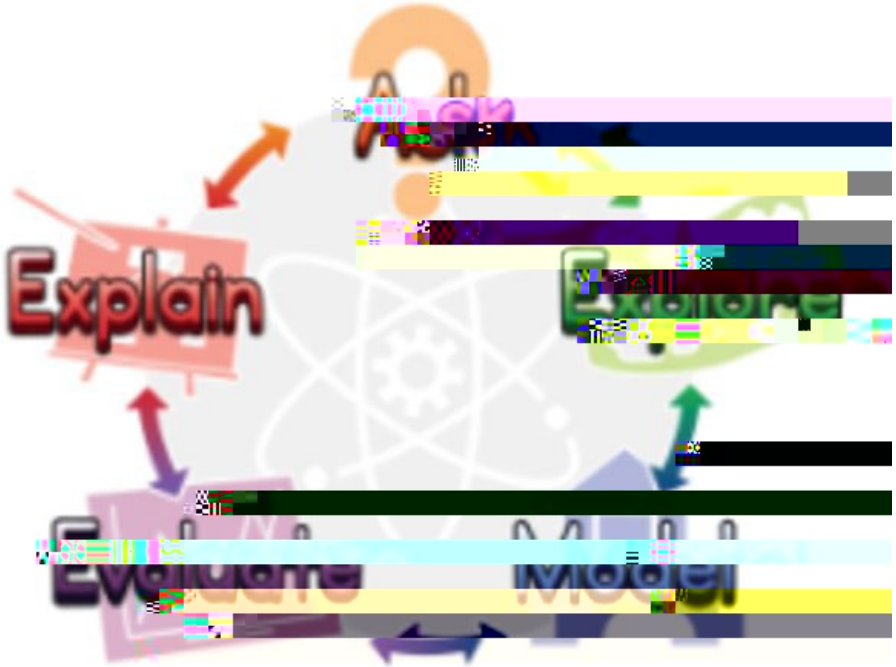
Explain	Your Task
Making cloth takes a long time! Might there be a way to make the process faster? Let's use the five steps of the Engineering Design Process to come up with a faster way to make cloth.	Watch this video to learn the five steps of the Engineering Design Process Follow along as we pause often to identify the steps taken in the mill's design as we learn more about mills in this video. (Don't worry, we aren't watching the entire video!)

Elaborate	Your Task
When the mills started production (solving many of the problems of making clothes by hand), engineers faced other issues that required the Engineering Design Process to solve.	Read the book Margaret Knight: Girl Inventor by Marlene Brill. As you read, complete page 1 of the worksheet.

Evaluate	Your Task
Now that you have seen/heard mills in operation and read about a problem that Margaret Knight solved at the mill, what other problem do you notice? How could you use the Engineering Design Process to help you solve them?	Brainstorm with your group problems at the mill. It could be a small problem (noise) to a big problem (safety). Your group should select one problem Fill out page 2 of the workshop to use the design process to start thinking about a solution

What problem is Margaret trying to solve?

Whom did she have to share her design with?



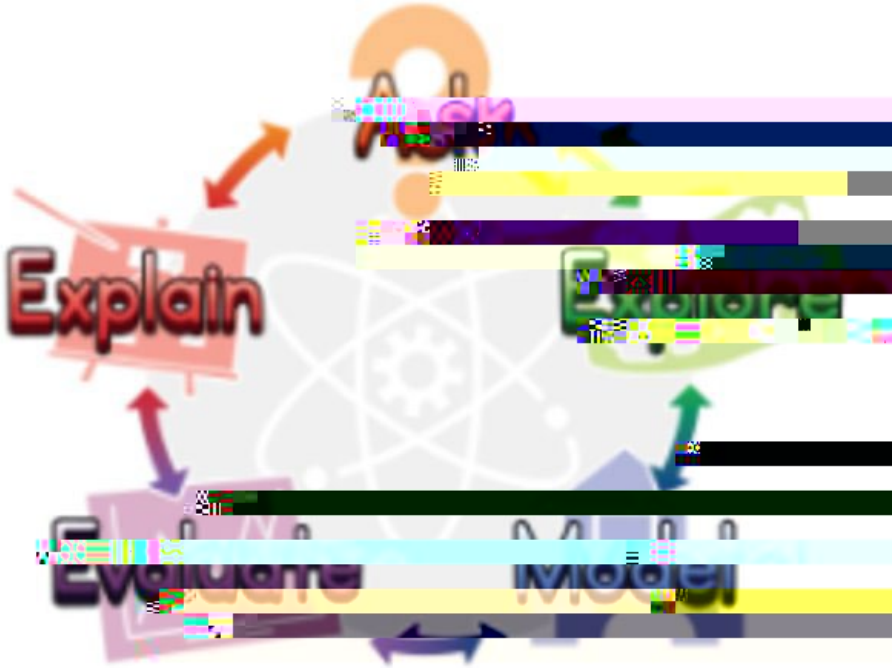
What did she examine to get ideas?

How did it work? What changes did she have to make?

What did she make her model out of?

What problem are you trying to solve?

Whom would you share your design with? Why?



What would you examine to get ideas?

How will you know if your design works? How will you judge it?

What would you make your model out of?