BUILD A LEVEE

LESSON OVERVIEW

Grade Levels: 3-5

In the book *I Survived: Hurricane Katrina, 2005* by Lauren Tarshis, students learn about the devastating results of the levee failure on the main character's family. In this activity students will work in teams to design a levee prototype, test their design, and redesign using newly "purchased" materials.

STANDARDS

CCSS.ELA-LITERACY.SL.3-5.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3-5 topics and texts, building on others' ideas and expressing their own clearly.
NGSS 3-5-ETS1-1.	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
NGSS 3-5-ETS1-2.	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
NGSS 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

- Students will discuss *I Survived: Hurricane Katrina, 2005* by Lauren Tarshis, hurricanes, and levees.
- In groups, students will discuss their levee prototypes and techniques that will be used to build.
- In groups, students will design, test & redesign a prototype using the engineering design process.

MATERIALS

- Levee build kit: 1 Paper lunch bag, 1 yard-long piece of twine or string, 6 popsicle sticks, 10 paper clips, 4 coffee filters, small plastic shoebox.
- Levee rebuild supplies: plastic lunch bags, sand, rice…
- Large plastic bin filled with water or classroom sink & one-cup measuring cup
- Optional: Play money, resupply order form
- Optional: Devices or reference books for research

PROCEDURE

STEP 1: Have a discussion on the book *I Survived: Hurricane Katrina, 2005* by Lauren Tarshis. Ask students what they know about hurricanes in general, Hurricane Katrina, and levees or other flood management systems.

STEP 2: Optional: Using a projector or the whiteboard, show the students images of hurricanes, levees or Hurricane Katrina. OR As a class, research hurricanes, Hurricane Katrina, and levees or other flood management systems.

STEP 3: Using the Engineering Design Process, explain that the students have a house (represented by a paper lunch bag) that they need to protect from floodwaters by building a levee.

STEP 4: Divide the students into groups; give each group a levee build kit. Groups should place their opened paper lunch bag "house" in the plastic shoebox and then use only the materials provided to build a protective levee around the house.

STEP 5: Groups will then test their levee prototype by bringing the build to a testing station, either a large plastic bin containing water or a classroom sink. A one-cup measure of water will be poured into the small plastic shoebox to test the strength of the levee prototype. If the paper bag house gets wet, the prototype has failed (NOTE: all students should fail this first test). Empty and dry the plastic shoebox and return to the group.

STEP 6: Now tell the students that they can collect an insurance settlement of $500 to repair their house and purchase new supplies to build a better levee. Provide a list of available supplies and their prices. Optional: give each group play money to spend.

STEP 7: Groups should discuss what went wrong with their original design, what new available materials would be useful to build a better levee, and work within their budget to fill out their order form.

STEP 8: Groups will present their order form and receive a new paper lunch bag "house" and requested supplies. Groups should place their new, opened paper lunch bag "house" in the plastic shoebox and then use only the new materials purchased to build a protective levee around the house.

STEP 9: Discuss as a class what were barriers to success for their first prototype? What design improvements worked? What additional supplies could have been used? How would this activity translate to the real world of hurricane disaster recovery? Discuss disaster relief efforts. Would enough needed supplies be readily available during a disaster? How do organizations help people after a disaster like Katrina? Optional: Using a projector or the whiteboard, show the students images of Hurricane Katrina recovery, New Orleans today, other disaster relief efforts. OR As a class, research Hurricane Katrina, New Orleans today, other disaster relief efforts.

ENGINEERING DESIGN PROCESS

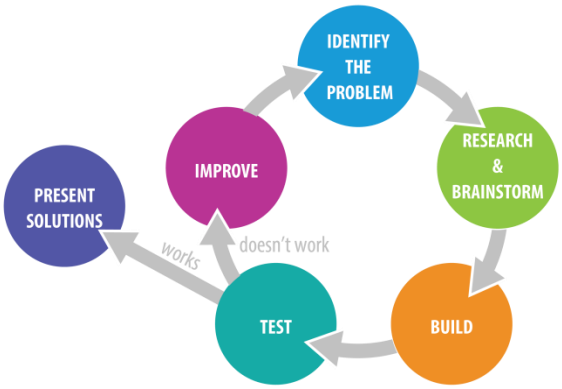
IDENTIFY THE PROBLEM

What is the problem, and why is it important?

RESEARCH AND BRAINSTORM

Research: What has been done to solve this problem? Who is affected by this problem? What current solutions are available?

Brainstorm: What sort of things can be used to solve this problem? How can current solutions be improved? What materials will you need? Create concept designs.



BUILD

Decide upon your best design, gather your materials, and build your prototype.

TEST

Test your prototype to determine its challenges, problems, and level of effectiveness.

IMPROVE

If the prototype does not work, repeat the process by identifying problems with the prototype design, conducting more research and brainstorming possible improvements, modifying or rebuilding the prototype, and performing additional testing until a solid solution is found.

PRESENT SOLUTIONS

Once an effective solution is discovered, present your work to others. Possible forms of presentation include a project board or multimedia presentation at a meeting or conference, documentation made accessible to those who can benefit from the work, and electronic communication of the solution via email, social media, blogs, websites, digital signs, videos, etc.

RESUPPLY ORDER FORM

Materials*	Cost per	Qty	Total
Replacement Secret Lab	$100		
Rice	$100		
Sand	$100		
Coffee Filters	$100		
String	$100		
Popsicle Sticks	$100		
Paper Clips	$100		
Sandwich Bags	$100		
		Total	

RUBRIC

	Target (3)	Meets (2)	Partially Meets (1)	Does Not Meet (0)
LEVEE DESIGN	Does a great job showing an understanding of design for a purpose.	Does an okay job with showing an understanding of designing for a purpose.	Tries but has great difficulty showing an understanding of the design process.	Tries but has great difficulty showing an understanding of the design process.
USE OF MANIPULATIVES	Student always listens and follows directions only using manipulatives as instructed.	Student typically listens and follows directions, using manipulatives as instructed most of the time.	Student sometimes listens and follows directions, using manipulatives appropriately when reminded.	Student rarely listens and often plays with the manipulatives instead of using them as instructed.
COLLABORATION	Works well with others and discusses ideas in a fair, respectful, encouraging way and is considerate of the feelings of others.	Works okay with others and discusses ideas in a fair, respectful way, but may not be encouraging. Considers the feelings of others.	Works with others, but does not contribute a fair share of work OR is discouraging and does not consider the feelings of everyone.	Does not work well with others and/or discusses ideas in an unfair, disrespectful way.
REQUIREMENTS	Meets all of the requirements for the project.	Meets most of the requirements for the project.	Meets some of the requirements for the project.	Does not meet the requirements for the project.
DEMONSTRATION OF KNOWLEDGE OF CONTENT IN DISCUSSIONS AND ACTIVITIES	Does a great job showing an understanding of the content covered in class.	Does an okay job with showing an understanding of the content covered in class.	Tries but has a difficult time showing an understanding of the content covered in class.	Does not show an understanding of the content covered in class.
Total				/15