Flood Fight
Along the Mississippi River

Middle School Lesson Plan
for Science and Social Studies

Published by the Flood Protection Authority – East
floodauthority.org

MIDDLE SCHOOL LESSON PLAN FOR SCIENCE AND SOCIAL STUDIES

Easily Adapted for Lesser or Higher Grade Levels

TOPICS: Mississippi River Flooding, Levee Protection and Flood Flight

DURATION OPTIONS: 1 or 2 class periods.

BRIEF LESSON DESCRIPTION

The instructors will engage students in activities related to Mississippi River flooding and how the levees are inspected and maintained during the flood fight. The students will use interactive mapping and model building

MATERIALS

- Smart board, projector, computers, laptops, model building supplies, engineering design handouts

RESOURCES

Background Section included in lesson

Flood Protection Authority / Homepage / Map
https://www.floodauthority.org/

Google Earth
https://www.google.com/maps/

LOUISIANA STUDENT STANDARDS IN SCIENCE FOR 8TH GRADE

8-MS-ESS3-2

- Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

8-MS-ESS3-3

- Apply scientific principles to design a method for monitoring and minimizing human impact on the environment

LOUISIANA STUDENT STANDARDS IN SOCIAL STUDIES FOR 8TH GRADE

STANDARD 3

Geography Skills

Students develop spatial understanding through the study of location, distance, direction, pattern, shape, and arrangement.

8.3.1 Locate and describe the physical and political features of Louisiana

8.3.2 Use maps, charts, and diagrams to ask and answer questions about Louisiana's geographic features

STANDARD 5

Environment

Students analyze the effects of the environment on people and places in Louisiana.

8.5.1 Describe how natural phenomena impact the physical environment of Louisiana

8.5.2 Analyze and predict consequences of environment modifications of Louisiana and its inhabitants

SPECIFIC LEARNING OUTCOMES

By the end of the lessons, the students will:

- Analyze and interpret data from maps, thereby strengthening geospatial skills;
- Discuss the topographic region in which they live, identify the course of the Mississippi River;
- Locate the Mississippi River levees in relation to where they live and extrapolate how the flood fight protects them from overtopping;
- Build a hands-on model of a levee following the engineering design and construction process;
- Participate in a gallery walk around each model critique its design and function.

PRIOR STUDENT KNOWLEDGE

Students should have some background knowledge of the topography of the Greater New Orleans area.

POSSIBLE PRECONCEPTIONS/MISCONCEPTIONS

1. Many students think that maps are too complicated and that the information depicted on maps has no relevance to their lives.
2. Many students do not know the location of the Mississippi River and its levees and that there is a risk of overtopping during high water levels.
3. Many students do not know that the levees protect them from flood risks.
4. Many students do not know the amount of effort it takes to keep the levees and floodwalls well-maintained.

LESSON PLAN — 5E MODEL

ENGAGE

- Students will use the Flood Protection Authority's Website to get the geographical orientation of the Greater New Orleans Mississippi River Levees.
- Students will use Google Earth to enter the school's street address, zooming in and out inorder to identify the River's course in relation to their school.

EXPLORE

- In small groups, students will undertake a hands-on activity to design and construct a levee model and prove its effectiveness at protecting from flooding.
- Students will determine how to repair and maintain the levees during and after a flood.
- Students will determine an instrument that best measures water levels and the point at which over topping occurs.

LESSON PLAN — 5E MODEL

EXPLAIN

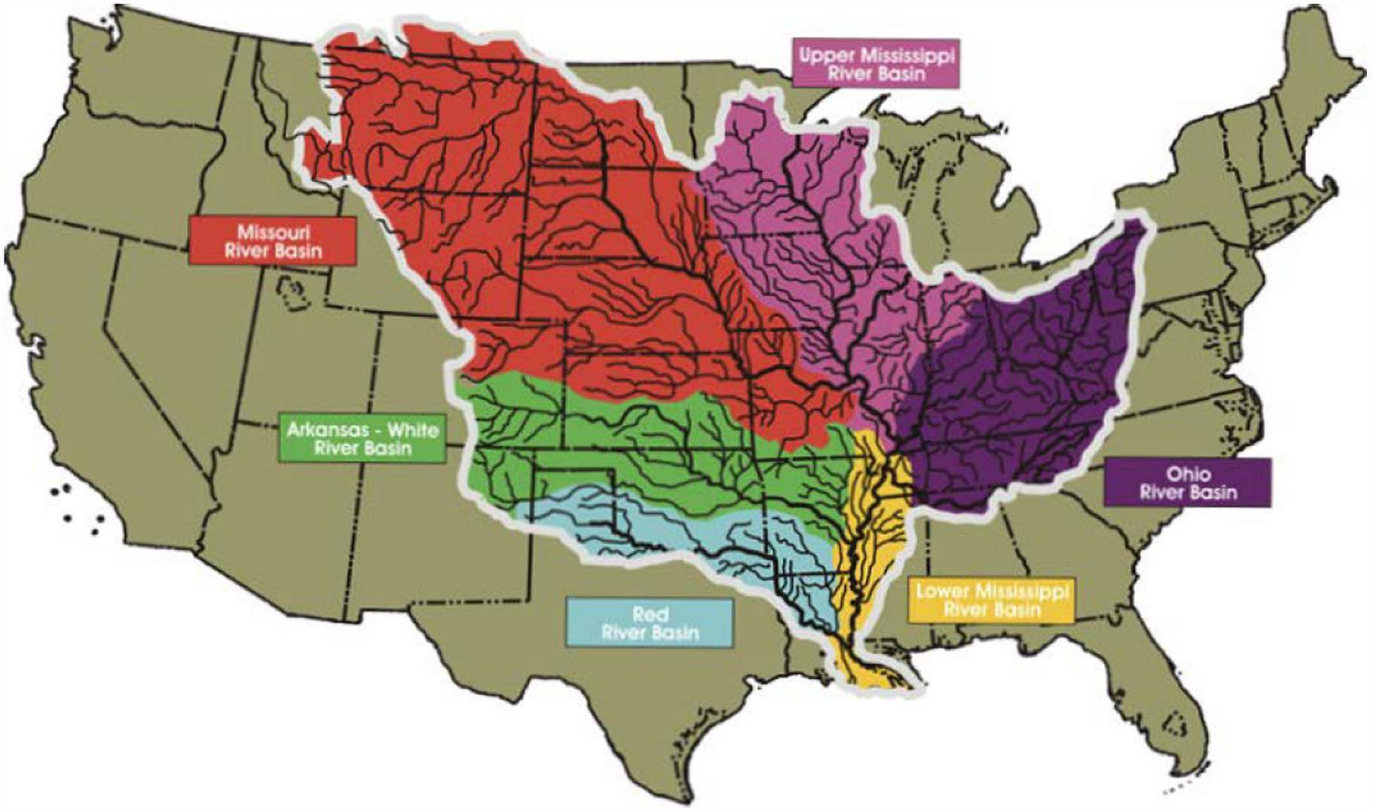
During the gallery walk, students will demonstrate and discuss how and why they built the levees.

EVALUATE

1. Students will assess what worked and did not work with their model.
2. Students will determine other options to make their model work as designed.

ELABORATE

1. Students will compile the information they learned from these lessons to teach their family and friends about the importance of levees along the Mississippi River.
2. Students will determine which type of outreach method they will use to organize and prioritize information for use in a brochure, video, poster, flyer, social media posts, etc.



Mississippi River Drainage Basin

The Mississippi River drains 41 percent of the continental United States. All of the rivers depicted in this graphic flow into the main channel of the Mississippi River, past New Orleans, finally emptying into the Gulf of Mexico.

The basin covers more than 1,245,000 square miles, includes all or parts of 31 states and two Canadian provinces.

Mississippi River Flood Fight

Background

The Flood Protection Authority is responsible for maintaining nearly 80 miles of levee, floodwalls and floodgates along the Mississippi River in East Jefferson, Orleans and St. Bernard Parishes.

When the Mississippi River rises to 11 feet above normal, the Flood Authority and the US Corps of Engineers immediately initiate the Flood Fight Program. They inspect the entire Mississippi River levee in in these parishes at least once per day, requiring approximately 30 staff-hours each day. As water levels rise, the number of inspections increase. The water level gage is at Carrollton and the River.

The inspections include:

1. looking for water seepage, sand boils, depressions, erosion, and other unusual conditions, that, if found, are immediately repaired.
2. assuring that all construction activities within 1500 feet of the levees have ceased until the river falls below 11.0 feet. No construction is allowed once the river reaches 15.0 feet.
3. monitoring the river for tug boats or barges that are too close in proximity to the bank.
4. maintain a constant Flood Protection Authority Levee Police presence.

The Flood Fight inspections are reported in writing to the U.S. Army Corps of Engineers. This information is included in the Corps' comprehensive reports that are forwarded to parish emergency managers.

The Flood Authority wants the public to be aware that as the river rises up the levee, currents become swift and wildlife may move to higher ground. We encourage people to stay alert to these conditions.

High Water Levels at New Orleans

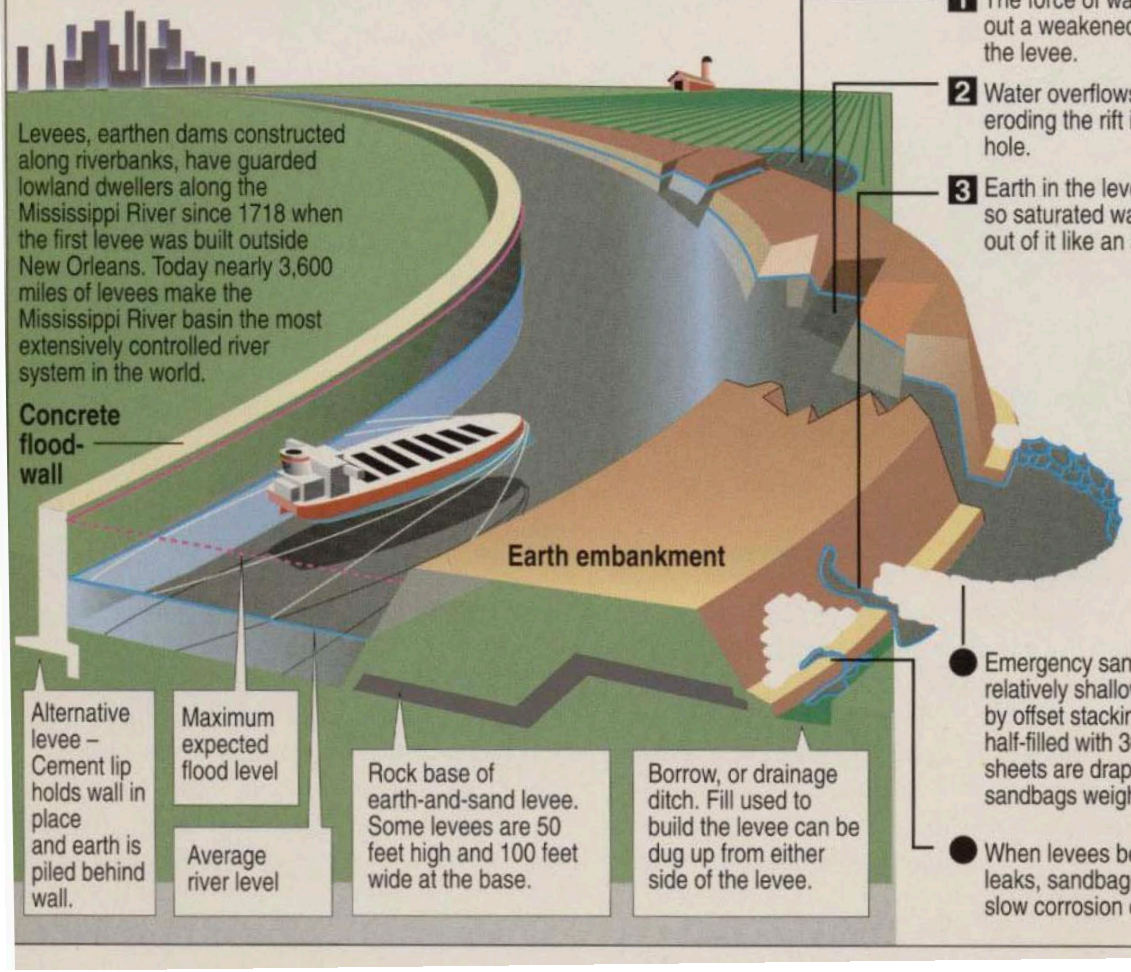
The Mississippi River Levee System

The levee system has been present along the Mississippi River since the first Europeans settled the region, but its design has changed many times since that first levee.
The changes were brought about mainly by flooding, which in turn drove other factors such as costs and politics.
Technology has also played a role in this development.

Levees are earthen embankments built on the natural levees parallel to the river channel and designed to protect the area behind it from high flows in the main channel.
Levees must be high enough to prevent overtopping and broad enough to resist deterioration.

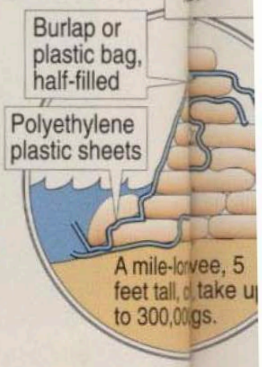
Levees: the first and last defense

How levees protect lowlands and how things can go wrong, and what is done once they do



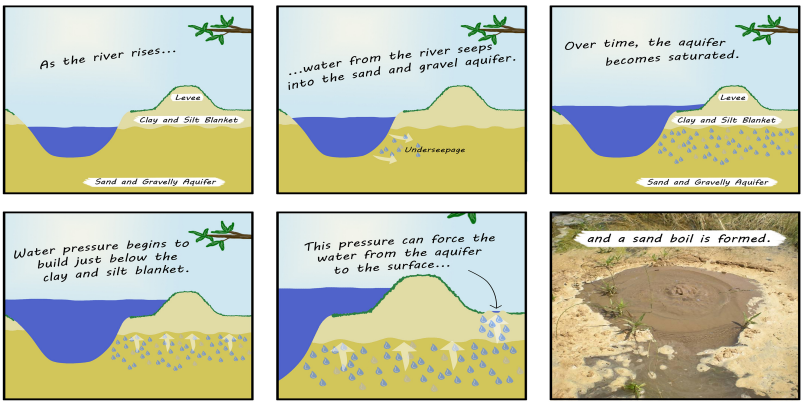
Three ways levees fail:

1. The force of water pushes out a weakened section of the levee.
2. Water overflows the banks, eroding the rift into a gaping hole.
3. Earth in the levee becomes so saturated water springs out of it like an artesian well.

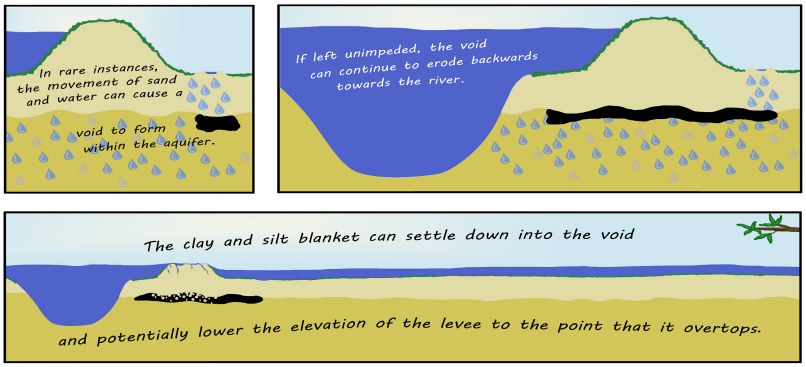


- Emergency sandbag levees protect h relatively shallow flooding. The levee made by offset stacking of plastic or burlap ks, half-filled with 30-45 lbs. of sand. Po ylene sheets are draped over the levees a ore sandbags weigh the plastic down.
- When levees become saturated and ing leaks, sandbagging the spot of the ch may slow corrosion caused by the water

What are Sand Boils?

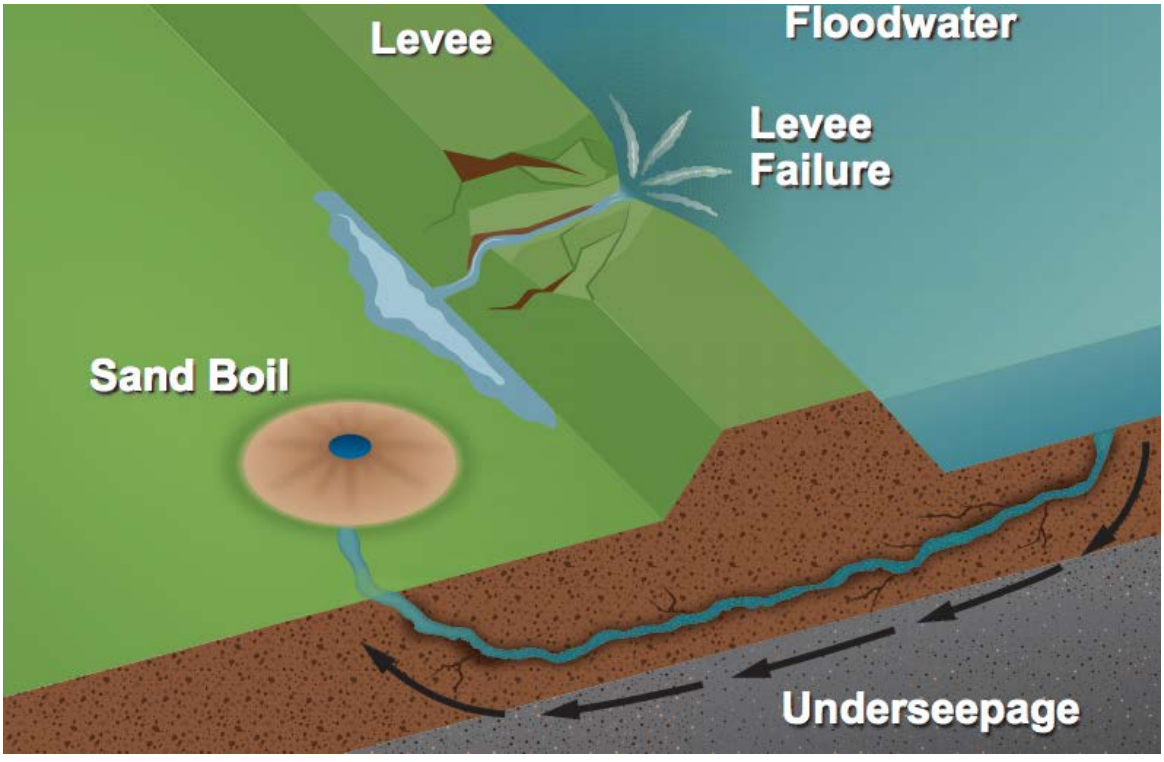


Sand boils are a natural phenomenon that can occur during floods and do not necessarily pose a danger to flood control works. The potential for a sand boil to cause harm is based on multiple factors, including the size, proximity to flood control works and the velocity of the water moving through it.



US Army Corps of Engineers
Vicksburg District

Disclaimer: This graphic was created for illustrative purposes only and designed to be a general explanation of sand boils.



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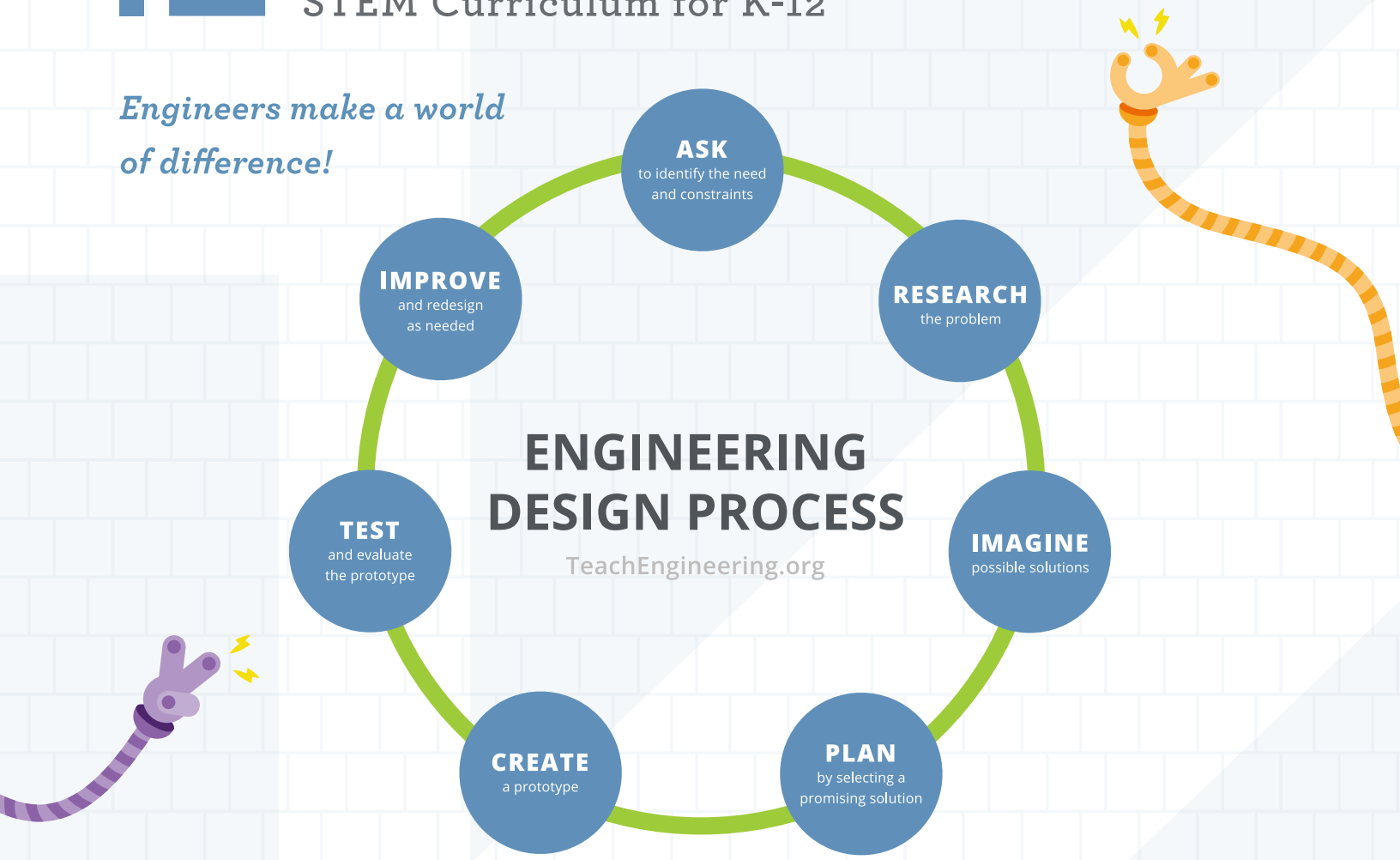

1. **ASK TO IDENTIFY THE NEED** Engineers ask critical questions about what they want to create: What is the problem? What do we want to design? Who is it for? What do we want to accomplish? What are the project requirements and limitations? What is our goal?

2. **RESEARCH THE PROBLEM** This includes talking to people from many different backgrounds and specialties to assist with researching what products or solutions already exist, or what technologies might be adaptable to your needs.

3. **IMAGINE POSSIBLE SOLUTIONS** Work with a team to brainstorm ideas and develop as many solutions as possible. Encourage wild ideas and defer judgment! Stay focused on topic, and have one conversation at a time. Good design is all about teamwork!

4. **PLAN BY SELECTING A SOLUTION** Revisit the needs, constraints and research from the earlier steps, compare your best ideas, select one solution and make a plan to move forward.

5. **CREATE A PROTOTYPE** Building a prototype makes your ideas real! Early versions of the design solution help your team verify whether the design meets the original challenge objectives. Push yourself for creativity, imagination and excellence in design.

6. **TEST THE PROTOTYPE** Does it work? Does it solve the need? Communicate the results and get feedback. Analyze and talk about what works, what doesn't and what could be improved.

7. **IMPROVE AND REDESIGN** Discuss how you could improve your solution. Make revisions. Iterate your design, continuously improving it, to make your product the best it can be within your design constraints.

And now, ITERATE YOUR DESIGN!

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TeachEngineering

STEM Curriculum for K-12

DESIGN THINKING SKILLS

TeachEngineering.org

Engineers make a world of difference!

- FORMULATING PROBLEMS
- SEEKING SOLUTIONS
- THRIVING IN UNCERTAINTY
- COLLABORATING CONSTANTLY
- PROTOTYPING IDEAS
- ITERATING OPTIONS
- REFLECTING FREQUENTLY

FORMULATING PROBLEMS

Engineers take time to observe, infer and apply their breadth and depth of knowledge to thoughtfully frame a problem within the limits of available time, money, and resources.

SEEKING SOLUTIONS

Engineers incorporate their personal experiences and intellect with empathy and understanding for all stakeholders to develop human-centered products or services.

THRIVING IN UNCERTAINTY

The unknowns and limitations of a problem, especially wicked problems, offer engineers opportunities to be creative in developing innovative and practical solutions.

COLLABORATING CONSTANTLY

Engineering team members bring their own perspective and collective expertise together to scope problems and negotiate desirable, feasible and viable solutions to problems.

PROTOTYPING IDEAS

After generating ideas and gathering information about a problem, the rapid and rough creation of models and sketches (prototypes) inspire engineers to visualize options and inform possible solutions.

ITERATING OPTIONS

Engineers test many versions of their prototypes as they develop, implement, and evaluate possible solutions - which over time improves their understanding of the problem.

REFLECTING FREQUENTLY

Assessing and talking through iteration cycle outcomes allows engineers to simultaneously and repeatedly define and refine both their understanding of the problem and ideas for solutions.

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