

ATLANTA SCIENCE FESTIVAL

| | |
|--|---|
| Lesson Title | Protecting Our City with Levees (Teach Engineering) |
| Grade Band | 5 th and/or 6 th |
| Submitted by | Donna Barrett, Metro RESA |
| Georgia Performance Standards: | |
| <p>S5E1c. Relate the role of technology and human intervention in the control of constructive and destructive processes. Examples include, but are not limited to</p> <ul style="list-style-type: none"> • Seismological studies, • Flood control, (dams, levees, storm drain management, etc.) • Beach reclamation (Georgia coastal islands) <p>S5CS4. Students will use ideas of system, model, change, and scale in exploring scientific and technological matters.</p> <p>a. Observe and describe how parts influence one another in things with many parts.</p> <p>S6E5i. Explain the effects of human activity on the erosion of the earth's surface.</p> | |
| Safety Considerations: | |
| Use caution when designing and testing levees. | |
| Materials & Time Required: | |
| Time required: 2-3 days | |
| Materials | |
| <ul style="list-style-type: none"> • Each group receives a plastic container such as a plastic shoe box in which to build the prototype levee. • Each team receives \$10 (fun money) to purchase levee supplies • Students can buy from the following list of approved materials: | |
| Material | Costs |
| 1 cup of sand or gravel | \$1 |
| 5 cotton balls | \$1 |
| Straws | \$1 |
| Popsicle sticks | \$1 |
| 1 foot of duct tape | \$2 |
| 1 sheet of paper board | \$2 |
| 1 plastic bag | \$2 |
| 1 sponge | \$2 |

This material is created and submitted by individual authors as recommended lesson plans to incorporate engineering design challenges and to review key science concepts. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the Atlanta Science Festival. For more info about the Atlanta Science Festival, visit <http://AtlantaScienceFestival.org>

Lesson Logistics (for teacher):

- Each group receives a plastic shoe box to build their levee.
- When testing the levees, set a timer to determine how long it takes for the levees to leak. Those with the greatest amount of time, have built the most effective levees.
- Talk about cost vs. effectiveness
- Give students an opportunity to redesign if time permits.
- See the weblink below for more details and resources from Teach Engineering

Background Information (from Teach Engineering)

- Civil engineers design projects to support the needs of people living together. Without civil engineers, we would not have roads and bridges to drive on, water systems to bring us fresh water for drinking and bathing, or sewage systems for carrying away our waste.
- In coastal regions, these engineers play an essential role in protecting people from natural hazards, such as hurricanes. To prevent flooding from hurricanes, they design and build levees, flood walls, pump systems and canals. When these designs fail, engineers are called back in to evaluate what happened and why, as well as to make improvements and redesign.
- In 2005, Hurricane Katrina caused immense human suffering for the people of New Orleans. Many factors led to people being stranded for hours or days, going without food and water for many days, and even dying.
- However, the flooding that occurred after the storm could have been prevented if the levees that surround the city had not broken in the first place.
- The people of New Orleans depend on engineers to build strong levees to protect their city from the ocean waters that surround it.

Vocabulary

- levee: A human-made barrier of earth intended to hold back water.
- hurricane: A tropical storm with winds of 39 mph (63 kph) or higher and occurring in the north Atlantic Ocean.

| | |
|--|---|
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Opening: ENGAGE</p> | <p>Engineering Challenge: Build a new levee system that will maintain the boundary between the lake/river and the city.</p> <p>Size: The real levee must be 5 meters higher than sea level and wide enough to prevent the surrounding lake or harbor from flooding.</p> <p>Your prototype must be at least 5 inches high, and wide enough to prevent the water on one side of a plastic container from flooding into the other side of the container.</p> |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Work Session: EXPLORE/EXPLAIN</p> | <p>Explore: Take at least two of the approved materials and test how well they slow down water. Put a small hole in a paper cup, and put your test material at the bottom of the cup. Measure a specific amount of water in another cup. Pour the water into the cup with a hole and observe how well the material absorbs the water. Describe what you see.</p> <p>More exploration:</p> <ul style="list-style-type: none"> ▪ Build and test. Purchase materials and build your levee prototype. Then, with the teacher’s help, test your levee by pouring water into one side of your container. Pour the same amount into one side (Example: 500 ml then another 500 ml). Use a stopwatch to measure how long it takes for water to breach the levee. <p>Explain:</p> <p>Share designs with the class. Compare and discuss designs. What worked best?</p> |
| <p style="writing-mode: vertical-rl; transform: rotate(180deg);">Closing: EXTEND/EVALUATE</p> | <p>Evaluate</p> <ul style="list-style-type: none"> ▪ Evaluate your design. After engineers test their prototypes, they think about how well it worked. This helps them make changes to improve the final, real version. ▪ How would you change your design? |

Documentation of Resources:

Source: Teach Engineering

https://www.teachengineering.org/view_activity.php?url=collection/cub_/activities/cub_weather/cub_weather_lesson05_activity1.xml

Student Worksheet

Each group receives a plastic container in which to build the prototype levee.

Each team receives \$10 to purchase levee supplies.

You may only buy from the following list of approved materials:

| Material | Costs | Amount You Want | Cost |
|-------------------------|-------|-----------------|------|
| 1 cup of sand or gravel | \$1 | | |
| 5 cotton balls | \$1 | | |
| Straws | \$1 | | |
| Popsicle sticks | \$1 | | |
| 1 foot of duct tape | \$2 | | |
| 1 sheet of paper board | \$2 | | |
| 1 plastic bag | \$2 | | |
| 1 sponge | \$2 | | |
| TOTAL | | | |

Engineering Challenge: Build a new levee system that will maintain the boundary between the lake/river and the city.

Size: The real levee must be 5 meters higher than sea level and wide enough to prevent the surrounding lake or harbor from flooding.

Your prototype must be at least 5 inches high, and wide enough to prevent the water on one side of a plastic container from flooding into the other side of the container.

Explore:

Take at least two of the approved materials and test how well they slow down water.

Put a small hole in a paper cup, and put your test material at the bottom of the cup.

Measure a specific amount of water in another cup.

Pour the water into the cup with a hole and observe how well the material absorbs the water.

Describe what you see.

More exploration:

- **Build and test.** Purchase materials and build your levee prototype. Then, with the teacher's help, test your levee by pouring water into one side of your container.
- **Evaluate your design.** After engineers test their prototypes, they think about how well it worked. This helps them make changes to improve the final, real version.