LESSON PLAN: Trash Mover

Description
This activity is meant to extend your students' knowledge of the topics covered in our Down the Drain lab. Through this activity, your students will design a prototype of a device to remove trash from a storm drain!

Grade Levels
3-8

Duration
40 minutes

Student Outcomes
Students will:
- Imagine ways to solve a problem.
- Draw and build a prototype to solve a problem.

Next Generation Science Standards
**The Earth and human activity standards relate to the weather-related hazard of flooding.*
Matter and Its Interactions
- **Grade 3:** Earth and Human Activity 3-ESS3-1
- **Grade 4:** Earth and Human Activity 4-ESS3-2
- **Grade 5:** Earth and Human Activity 5-ESS3-1
- **Grades 6-8: E**arth and Human Activity MS-ESS3-3
- **Grades 3-5:** Engineering Design 3-5-ETS1-1, 2
- **Grades 6-8:** Engineering Design MS-ETS1-2

Common Core ELA Standards
- **Grade 3:** Speaking and Listening 1. b, c, d; 3, 3.4a
- **Grade 4:** Speaking and Listening 1. b, c, d, 4
- **Grade 5:** Speaking and Listening 1. b, c, d, 4
- **Grade 6:** Speaking and Listening 1. c, d, 4, 6
- **Grade 7 & 8:** Speaking and Listening 1. b, c, d, 4, 6

Materials

Below there are categories of materials for students to build with that include suggestions for types of items. Look around your classroom, school, or ask students to bring in the materials you all can use during the design challenge. Each category provides a suggested amount of total items to gather from each category for a classroom of 30 working in groups of 4.

Things that can grab/lift (40 Total)	Things that can swipe (20 Total)	Things that scoop (20 Total)
• Tongs • Binder clips • Chip clips	• Broom heads • Squeegees • Dusters	• Cups • Funnels • Bowls
Long things (40 Total)	**General build materials (80 Total)**	
• Wooden dowels • Chopsticks • Utensils	• String • Rubber bands • Paper clips	

Vocabulary

Familiarity with these terms and concepts will enhance students' experience in the activity.

- **Pollution:** A substance or thing that, when it enters an environment, has a harmful effect.
- **Watershed:** The highest point that water can start to the lowest point where it collects. For example, from a mountain top to a lake or ocean.
- **Storm Drain:** A device that allows water to flow away from human developments and back into the watershed to prevent flooding of human communities.
- **Sustainability:** To keep something at a certain level. For example, minimize the use of a natural resource, so it can be conserved for future use.

Set-up

- Create trash and storm drain for students to test their devices. For classrooms that need a very short prep time for the activity, we recommend large pieces of trash like crumpled paper laid out over a masking tape rectangle to represent a storm drain.
- Have students work in teams of 2-4.

Procedure

1. Review the Down the Drain lab with students with a focus on the importance of keeping storm drains clear to prevent flooding. During the lab they worked as a team to keep larger physical trash out of the watershed. Discuss what they would want to try to remove trash from the storm drain grate.
2. Have students imagine and draw out ideas for removing trash from the storm drain grate. Encourage them to think about ways people currently remove trash from the streets and storm drains to prevent flooding. (For example: street sweeper machines, brooms, and rakes).
3. Introduce the design challenge:

Design Challenge: Design a tool to remove trash from a storm drain to prevent flooding
Criteria: • Remove trash from the storm drain grate
Constraints: • No hands can be used to prevent injury from any possible sharp trash • **Time**: 30 minutes • **Materials**: Only use the materials provided on the build table

4. Give students 30 minutes of build time and test as much as they want. Consider having students work in teams of 2-4 students. Visit each team and ask facilitative questions:
    a. *What are you designing?*
    b. *How does this work?*
    c. *How does your design meet the criteria and constraints for this challenge?*
5. Have students create a one-minute share out where each team member talks and addresses:
    a. Their design.
    b. Their challenges.
    c. What they would do if they had unlimited supplies or time.

6. Lead a class closure where the educator recaps ideas students captured through their prototypes and also from their share-outs. If there is time, consider allowing for another round of iterations.

Extended Learning

- Research current methods for removing trash from storm drains. Evaluate these methods and then iterate their current design or draw a model of how they would iterate a current method.