

# Advanced Down the Drain

Grade Levels: 8-12

Duration: 90 min

Design a robust learning experience by selecting resources from this guide that fit the needs of your students. Reinforce learning before, after, and even during your visit by diving deeper into some of the science and engineering concepts.



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## When to implement

The following icons indicate when the activities should be implemented for the greatest benefit to your students' experience in the lab.



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### Concepts/Skills

Negotiating trade offs, criteria, constraints, environmental impact, problem solving, engineering design process

### Objectives

Students will:

- Describe a watershed and explain the importance of keeping trash out of the watershed.
- Design and build a storm drain prototype to combat pollution from a specific source.
- Take on a career role, practice related skills, and reflect on connections to personal career interests.

### Career Connections

Civil engineers, Environmental technicians



## Career Connections



Let students know that during the lab, they will take on the role of someone in a specific career, collaborating with their peers to solve a design challenge. Students will be working together as **civil engineers** and **environmental technicians** to design and test new storm drains to keep trash from contaminating our watersheds.

## Pre-visit prompts

Before their field trip, have students review the civil engineer and environmental technician Career Profiles (see [Lab Related Resources](#)). These career profiles will give students context for the work these professionals do and the kinds of skills they use. Reviewing the profiles ahead of time will help students arrive prepared to participate. Have students discuss one or more of the following:

- What interests, skills, or goals do students notice they have in common with these careers?
- What things surprised students about these careers?
- What are students curious to learn about in the lab?

## Post-visit prompts

After their field trip, have students reflect on the lab experience and discuss one or more of the following:

- How did it feel to collaborate with different career roles during the activity?
- What skills did you use in the lab that you might want to use in a future career?
- Are the other careers you might be interested in now after exploring in the lab and exhibits?

Students can complete the [Lab Related Resource](#) Career Exploration Mosaic Lesson to consider potential career paths for themselves.

## Vocabulary



These are words and concepts that we will discuss in the lab. Your students' experience will be enhanced if they are familiar with these terms prior to your visit. If you need inspiration for vocabulary activities, please see our Vocabulary Choice Board activity.

Term	Definition
<b>Budget</b>	The amount of money reserved to spend on materials to complete a project.
<b>Filter</b>	Something that separates solids from liquids, eliminates impurities, or allows only certain things to pass through.
<b>Flooding</b>	The covering or submerging of normally dry land with a large amount of water.
<b>Gravity</b>	A force that pulls objects toward the center of the Earth.
<b>Hypothesis</b>	An educated guess as to what will happen in an experiment
<b>Landfill</b>	A system of garbage and trash disposal in which waste is buried between layers of earth.
<b>Natural resource</b>	Something that is not created by humans that is usually a finite material like clean water or forests.
<b>Pollution</b>	A substance or thing whose presence, when it enters an environment, has a harmful effect.
<b>Precipitation</b>	Water released from clouds in the form of rain, freezing rain, sleet, snow, or hail; an important part of the water cycle delivering atmospheric water to the Earth.
<b>Recreational area</b>	An area used by people for fun leisure activities, such as camping, hiking, horse riding, dog walking, swimming, boating, or cycling. Usually a national or state park or beach.
<b>Run-off</b>	Precipitation that did not evaporate or get absorbed into the soil and therefore collects uncontrolled on the ground surface in areas such as rivers, streams, drains or sewers. Run-off can collect things in its path, such as pollution, trash, vegetation, pebbles, and deposit them when the water slows down.
<b>Saturation</b>	The state or process that occurs when no more of something can be absorbed, combined with, or added.
<b>Storm drain</b>	A device that allows water to flow away from human developments and back into the watershed to prevent flooding of human communities.
<b>Sustainability</b>	To keep something at a certain level. For example, minimizing the use of a natural resource so it can be kept or conserved to be used in the future.
<b>Topography</b>	Physical features and shape of an area of land. These features typically include natural formations such as mountains, rivers, lakes, and valleys as well as human-made features such as roads, dams and cities.
<b>Watershed</b>	The highest point where water can start to the lowest point where it collects. For example, from a mountain top to a lake or ocean.

## Related Texts

The following titles may provide students with a greater contextual understanding of the field of environmental science and engineering and give additional opportunities to incorporate science and engineering into Language Arts lessons. We are not endorsing the following authors but feel that the information presented in these texts may benefit your students and enhance their learning experience.

Age Range	Title and author	Text Type	Description
Grades 5-9	"The Cartoon Guide to the Environment" by Larry Gonick and Alice Outwater	Reference	A humorous exploration of the basics of the environment, including sources of energy and raw materials, waste disposal and recycling, cities, pollution, deforestation, global warming and more.
Grades 7 and up	"Going Blue: A Teen Guide to Saving Our Oceans, Lakes, Rivers, & Wetlands" by Cathryn Berger Kaye M.A.	Reference	This book provides information on waterways with concepts of service learning to help students be informed and take action to protect this natural resource.
Grades 9-12	"The Water Will Come: Rising Seas, Sinking Cities, and the Remaking of the Civilized World" by Jeff Goodell	Narrative, non-fiction	An account of the future of sea level rise. Jeff Goodell travels across twelve countries and reports from the front lines in this journalistic approach to the reality of rising seas and the impacts society will face.

## Exhibit Connections

Make connections between learning from the lab and the exhibits and programs found in The Tech Interactive's galleries.



### Solve for Earth (Lower Level)

The Solve for Earth exhibit at The Tech Interactive creates a space where we can discuss as a community how to live sustainably and reduce the impacts of climate change. Solve for Earth looks at the whole picture: where we live, what we eat, how we move and more. Students can dive into a specific issue they are passionate about or look around the gallery to get the whole story.



#### The H<sub>2</sub>O Show













In The H<sub>2</sub>O Show quiz, students can compete to gain points based on their water knowledge and walk away with an ocean of water knowledge — and bragging rights!



#### Sea Level Rise and Sea Level Rise Future Solutions

In this pair of exhibits, students will get an in-depth look at future sea level rise and how it will impact different areas around the world. They will then become the engineers as they imagine and draw ways to help protect areas from sea level rise.

## Lab-Related Activities

Activity	Description	Time
<b>Career Exploration Mosaic</b> 	Students will create a mosaic that represents their current selves and future career aspirations, then explore careers and opportunities that align with their interests and goals.	 75 minutes
<b>Careers in Sustainability</b> 	Review these career profiles to get a snapshot of the variety of professions that support environmental issues.	 15 + minutes
<b>Connecting with Climate</b> 	Students will explore how to problem-solve when approaching large-scale, multidimensional issues like climate change.	 90 minutes
<b>Drain or Dispose?</b> 	Review these tips for what can and cannot go down the drain. Play a quick game: Pick something on the list. Should you drain or dispose?	 15 + minutes
<b>Irrigation Situation</b> 	Students will use the design process to create a hillside garden irrigation system that maximizes water efficiency.	 90-150 minutes
<b>#PlanetProtector</b> 	Students work together to create a Public Service Announcement (PSA) which educates others about protecting our planet.	 120 minutes



Looking for other hands-on activities or resources to use in your classroom? Check out our [education resources](#) page!

## Next Generation Science Standards

Advanced Down the Drain supports the following Next Generation Science Standards

Grades	Engineering Design	Earth and Space Science	Disciplinary Core Ideas	Crosscutting Concepts	Science and Engineering Practices
6-8	MS-ETS1-1 MS-ETS1-2 MS-ETS1-3 MS-ETS1-4	MS-ESS3-3 MS-ESS3-4	ESS3.C ESS3.D ETS1.A ETS1.B ETS1.C	Structure and Function Science is a Human Endeavor	1, 2, 3, 6, 7, 8
9-12	HS-ETS1-1 HS-ETS1-2 HS-ETS1-3	HS-ESS3-4	ESS3.C ETS1.A ETS1.B ETS1.C	Influence of Engineering, Technology, and Science on Society and the Natural World	1, 2, 3, 4, 6



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