Contact: tialukerputra@gmail.com for help!

SDG – Engineering Projects

Source: teachengineering.org

Each project includes:

Title: A House for Me: Materials and Design for Different Climates — Activity or lesson
Grade Level: the suggested grade level
Engineering Category: Partial design or full design
Total Time: 1 hours 15 minutes
Description: Students brainstorm and discuss the different types of materials used to build houses in various climates. They build small models of houses and test them in different climates.

Housing

SDG 9, 11, 15

A House for Me: Materials and Design for Different Climates — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 15 minutes
Students brainstorm and discuss the different types of materials used to build houses in various climates. They build small models of houses and test them in different climates.

The Need for Shelter — Lesson
Grade Level: 5
Engineering Category: Partial design
Total Time: 10 minutes
As part of the continuing adventure scenario for this unit, students build shelters to protect themselves from the rain. After the shelters are built, the class performs durability and waterproof testing on the shelters.

Temperature Tells All! Model House Testing for Clean vs. Warm Air — Activity
Grade Level: 5 (5-6)
Engineering Category: Full design
Total Time: 4 hours
Through this activity experimentation, students see the challenging trade-off between airtight houses that better hold in heat (resulting in warm, smoky houses) and well-ventilated houses that cool off faster (resulting in chilly houses with good...

Built to Last? Designing Experiments to Test Jungle Shelters — Activity
Grade Level: 5
Engineering Category: Partial design
Total Time: 45 minutes
In the continuing "Lost in the Amazon" scenario of this unit, students test the shelters they built in this unit's Lesson 3, Activity 1, for durability and water resistance

Space Shelter — Activity
Grade Level: 4 (3-5)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 1 hours 45 minutes
Students are given the following engineering challenge: "The invasion has taken place and we need to find a new home. To ensure your survival beyond Earth's occupation you must design a shelter that can be built on another planet." Then students...

Construct and Test Roofs for Different Climates — Activity
Grade Level: 4 (3-5)
Engineering Category: Full design
Total Time: 1 hours 15 minutes
We design and create objects to make our lives easier and more comfortable. The houses in which we live are excellent examples of this. Depending on your local climate, the features of your house have been designed to satisfy your particular...

Build It Better! — Activity
Grade Level: 5 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 45 minutes
Students apply their knowledge of tornadoes and resulting damage as they work in groups to design structures intended to withstand and protect people from extremely high winds. Each team creates a poster with the name of its engineering firm and a...

Home, Sweet Home! — Activity
Grade Level: 5
Engineering Category: Partial design
Total Time: 1 hour
Student groups use kite string and wax paper shaped as leaves to build shelters to protect them from the rain. Then they test the shelters for durability and water resistance.

Packaging/Materials
SDG 8, 3, 8, 12

Design Packing to Safely Mail Raw Spaghetti — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 15 minutes
Students use their creative skills to determine a way to safely mail raw (dry, uncooked) spaghetti using only the provided materials. To test the packing designs, the spaghetti is mailed through the postal system and evaluated after delivery.

Taking the Boat to Manaus — Activity
Grade Level: 5
Engineering Category: Partial design
Total Time: 1 hour
In the continuing (hypothetical) storyline of the Lost in the Amazon unit, students apply the concepts they learned regarding mass, volume and density in the previous activities to design boats to get them out of the jungle.

Eek, It Leaks! — Activity
Grade Level: 6 (5-7)
Engineering Category: Partial design
Total Time: 45 minutes
Students construct model landfill liners using tape and strips of plastic, within resource constraints. The challenge is to construct a bag that is able to hold a cup of water without leaking. This represents similar challenges that environmental...

Permeable Pavement — Activity
Grade Level: 6 (4-6)
Engineering Category: Partial design
Total Time: 1 hour
Students investigate how different riparian ground covers, such as grass or pavement, affect river flooding. They learn about permeable and impermeable materials through the measurement how much water is absorbed by several different household...

Designing a Package that Works — Activity
Grade Level: 3 (3-4)
Engineering Category: Partial design
Total Time: 1 hours 30 minutes
Student teams act as engineers and brainstorm, design, create and test their ideas for packaging to protect a raw egg shipped in a 9 x 12-in envelope. They follow the steps of the engineering design process and aim for a successful solution with no...

Environment

SDG 8, 13, 15,

Landfills: Building Them Better — Lesson
Grade Level: 6 (5-7)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 45 minutes
Waste disposal has been an ongoing societal problem since medieval times. In this lesson, students learn about the three methods of waste disposal in use by modern communities. They also investigate how engineers design sanitary landfills to prevent...

Mini-Landslide — Activity
Grade Level: 5 (3-5)
Engineering Category: Partial design
Total Time: 45 minutes
Students explore how different materials (sand, gravel, lava rock) with different water contents on different slopes result in landslides of different severity. They measure the severity by how far the landslide debris extends into model houses...

Cutting Through Soil — Activity
Grade Level: 5 (3-5)
Engineering Category: Full design
Total Time: 45 minutes
Students pretend they are agricultural engineers during the colonial period and design a miniature plow that cuts through a "field" of soil. They are introduced to the engineering design process and learn of several famous historical figures who...

Engineers Speak for the Trees — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 2 hours 30 minutes
Students begin by reading Dr. Seuss' "The Lorax" as an example of how overdevelopment can cause long-lasting environmental destruction. Students discuss how to balance the needs of the environment with the needs of human industry. Student teams are...

Build Your Own Insect Trap — Activity

Grade Level: 4 (3-6)
Engineering Category: Partial design

Total Time: 45 minutes
Students design and construct devices to trap insects that are present in the area around the school. The objective is to ask the right design questions and conduct the right tests to determine if the traps work .

Caught in the Net: Bycatch vs.Target Species in Ocean Fishing — Lesson
Grade Level: 5 (4-6)
Engineering Category: Partial design
Total Time: 1 hour
Bycatch is the act of unintentionally catching certain living creatures using fishing gear. A bycatched species is distinguished from a target species (the animal the gear is intended to catch) because it is not sold or used. Marine mammals (whales,..

Build a Birdhouse — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 15 minutes
Students construct bird nests and birdhouses. They research birds of their choosing and then design houses that meet the birds' specific needs. It works well to conduct this activity in conjunction with a grades 9-12 woodshop class by partnering the...

Pollution
SDG 13, 12, 15, 14, 17

Cars: Engineering for Efficiency — Activity
Grade Level: 3 (2-5)
Engineering Category: Partial design
Total Time: 2 hours 30 minutes
Students learn how the aerodynamics and rolling resistance of a car affect its energy efficiency through designing and constructing model cars out of simple materials. As the little cars are raced down a tilted track (powered by gravity) and...

Cars from the Future: Presenting Your Eco-Friendly Design Ideas — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 45 minutes
In some cities, especially large cities such as Los Angeles or Mexico City, visible air pollution is a major problem, both for human health and the environment. A variety of sources contribute to air pollution, but personal vehicles account for one...

Pollution Solutions — Lesson
Grade Level: 6 (4-6)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 45 minutes
To develop an understanding of modern industrial technologies that clean up and prevent air pollution, students build and observe a variety of simple models of engineering pollutant recovery methods: scrubber, electrostatic precipitator, cyclone and...

Sugar Spill! Bioremediation Cleanup Experiment — Activity
Grade Level: 6 (5-7)

Engineering Category: Relating science and/or math concepts to engineering
Total Time: 1 hours 15 minutes
In this activity, students act as environmental engineers involved with the clean up of a toxic spill. Using bioremediation as the process, students select which bacteria they will use to eat up the pollutant spilled. Students learn how engineers use

.Controlling Sound — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 30 minutes
In this activity, students use a variety of materials to design and create headphones that absorb sound.

Small-Scale Modeling of Oil Spill Cleanup Methods — Activity
Grade Level: 6 (5-7)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 1 hours 30 minutes
This hands-on experiment provides students with an understanding of the issues that surround environmental cleanup. Student teams create their own oil spills, try different methods for cleaning them up, and then discuss the merits of each method in...

Wind-Powered Sail Cars — Activity
Grade Level: 3 (3-5)
Engineering Category: Full design
Total Time: 2 hours
Student pairs design and construct small, wind-powered sail cars using limited quantities of drinking straws, masking tape, paper and beads. Teams compete to see which sail car travels the farthest when pushed by the wind (simulated by the use of an...

Health

SDG 3

Sounds All Around — Activity
Grade Level: 5 (4-6)
Engineering Category: Partial design
Total Time: 45 minutes
Students follow the steps of the engineering design process to create their own ear trumpet devices (used before modern-day hearing aids), including testing them with a set of reproducible sounds. They learn to recognize different pitches, and see...

Curing Cancer — Activity
Grade Level: 5 (3-6)
Engineering Category: Partial design
Total Time: 1 hours 45 minutes
Students learn about biomedical engineering while designing, building and testing prototype surgical tools to treat cancer. Students also learn that if cancer cells are not removed quickly enough during testing, a cancerous tumor may grow...

Energetic Musical Instruments — Activity
Grade Level: 6 (5-7)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 1 hour
Students learn to apply the principles and concepts associated with energy and the transfer of energy in an engineering context by designing and making musical instruments. They choose from a variety of provided supplies to make instruments capable...

Water
SDG 3, 6, 14,

Clean Enough to Drink: Making Devices to Filter Dirty Water — Activity
Grade Level: 3 (3-5)
Engineering Category: Full design
Total Time: 6 hours
Students act as engineers contracted by NASA to create water filtration devices that clean visible particulates from teacher-prepared "dirty water." They learn about the worldwide need for potable water and gain appreciation for why water quality is...

Where's the Water? — Lesson
Grade Level: 5
Engineering Category: Partial design
Total Time: 10 minutes
In this lesson, the students conduct an investigation to purify water. Students engineer a method for cleaning water, discover the most effective way to filter water, and practice conducting a scientific experime

Go with the Flow — Lesson
Grade Level: 4 (3-5)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 45 minutes
Students gain an understanding of the difference between electrical conductors and insulators, and experience recognizing a conductor by its material properties. In a hands-on activity, students build a conductivity tester to determine whether...

Groundwater Detectives — Activity
Grade Level: 6 (5-7)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 1 hours 15 minutes
Student teams locate a contaminant spill in a hypothetical site by measuring the pH of soil samples. Then they predict the direction of groundwater flow using mathematical modeling. They also follow the steps of the engineering design process to come...

Waterwheel Work: Energy Transformations and Rotational Rates — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 45 minutes

Students learn the history of the waterwheel and common uses for water turbines today. They explore kinetic energy by creating their own experimental waterwheel from a two-liter plastic bottle. They investigate the transformations of energy involved...

Designing Ways to Get and Clean Water — Activity
Grade Level: 4 (3-5)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 45 minutes
In this scenario-based activity, students design ways to either clean a water source or find a new water source, depending on given hypothetical family scenarios. They act as engineers to draw and write about what they could do to provide water to a...

Water Filtration Project: Make Your Own Water Filters — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hour
Students are asked to design methods to filter water using ordinary materials, while also considering their designs' material and cost efficiencies. They learn about the importance of water and its role in our everyday lives. They come to understand...

Modeling Oil on the Ocean: Testing & Improving Oil Booms — Activity
Grade Level: 5 (3-5)
Engineering Category: Full design
Total Time: 2 hours 30 minutes
Students learn about oil spills and their environmental and economic effects. They experience the steps of the engineering design process, starting by brainstorming potential methods for oil spill cleanup. They model small-size oil spills in plastic...

Heating

SDG 1, 7, 8, 9, 11,12

Spacecraft Design: Beat the Heat — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 45 minutes
To understand the challenges of satellite construction, student teams design and create model spacecraft to protect vital components from the harsh conditions found on Mercury and Venus. They use slices of butter in plastic eggs to represent the...

Keep It Hot! — Activity
Grade Level: 6 (5-7)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 3 hours 15 minutes
Student teams design insulated beverage bottles with the challenge to test them to determine which materials (and material thicknesses) work best at insulating hot water to keep it warm for as long as possible. Students test and compare their designs...

Stop Heat from Escaping: Testing Insulation Materials — Activity

Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 45 minutes
One way to conserve energy in a building is to use adequate insulation to help keep hot or cool air inside or outside of the structure. Inefficient heating and cooling of buildings is a leading residential and industrial source of wasteful energy...

Power

SDG 7, 8, 13,

Does It Cut It? Understanding Wind Turbine Blade Performance — Activity
Grade Level: 6 (5-6)
Engineering Category: Full design
Total Time: 1 hours 45 minutes
Students gain an understanding of the factors that affect wind turbine operation. Following the steps of the engineering design process, engineering teams use simple materials (cardboard and wooden dowels) to build and test their own turbine blade...

Powering Smallsburg — Activity
Grade Level: 4 (3-5)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 45 minutes
Students act as engineers by specifying the power plants to build for a community. They are given a budget, an expected power demand from the community, and different power plant options with corresponding environmental effects. Guided by a...

Optimize! Cleaner Energy Options for Rural China — Activity
Grade Level: 6 (5-7)
Engineering Category: Partial design
Total Time: 30 minutes
Students work in engineering teams to optimize cleaner energy solutions for cooking and heating in rural China. They choose between various options for heating, cooking, hot water, and lights and other electricity, balancing between the cost and...

Water Power — Activity
Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 45 minutes
Students observe a model waterwheel to investigate the transformations of energy involved in turning the blades of a hydro-turbine. They work as engineers to create model waterwheels while considering resources such as time and materials, in their...

Form vs. Function — Lesson
Grade Level: 3 (2-4)
Engineering Category: Relating science and/or math concepts to engineering
Total Time: 15 minutes

Students take a closer look at cars and learn about some characteristics that affect their energy efficiency, including rolling resistance and the aerodynamics of shape and size. They come to see how vehicles are one example of a product in which...

Gone with the Wind Energy: Design-Build-Test Mini Sail Cars! — Activity

Grade Level: 5 (4-6)
Engineering Category: Full design
Total Time: 2 hours
Students explore the use of wind power in the design, construction and testing of "sail cars," which, in this case, are little wheeled carts with masts and sails that are powered by the moving air generated from a box fan. The scientific method is...
Solar

Cooking with the Sun: Comparing Yummy Solar Cooker Designs — Activity

Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 45 minutes
Students learn about using renewable energy from the sun for heating and cooking as they build and compare the performance of four solar cooker designs. They explore the concepts of insulation, reflection, absorption, conduction and convection. Then,...

Design and Test Model Solar Water Heaters — Activity

Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 1 hours 45 minutes
To explore different ways of using solar energy, students build a model solar water heater and determine how much it can heat water in a given amount of time. Solar water heaters work by solar radiation and convection.

Capturing the Sun's Warmth — Activity

Grade Level: 4 (3-5)
Engineering Category: Partial design
Total Time: 2 hours
In the exploration of ways to use solar energy, students investigate the thermal energy storage capacities of different test materials to determine which to use in passive solar building design.