Budding Genius Online Summer Camps

Science course outline for grades 3 till 5

Make an Anemometer to Measure Wind Speed

Overview

Help the budding meteorologists in your classroom learn how to measure wind speed by building their own anemometers (wind speed meters) with paper cups and straws. Then do a simple experiment in which students change the "wind" speed using a fan and measure how fast their anemometer spins.

NGSS Alignment

This lesson helps students prepare for these Next Generation Science Standards Performance Expectations:
3-ESS2-1. Represent data in tables and graphical displays to describe typical weather conditions expected during a particular season.

This lesson focuses on these aspects of NGSS Three Dimensional Learning:

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
Planning and Carrying Out Investigations. Make predictions about what would happen if a variable changes. **Analyzing and Interpreting Data.** Represent data in tables and various graphical displays (bar graphs and pictographs) to reveal patterns that indicate relationships.	**ESS2.D: Weather and Climate.** Scientists record patterns of the weather across different times and areas so that they can make predictions about what kind of weather might happen next.	**Patterns.** Patterns of change can be used to make predictions.

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Modeling Blood Flow

Overview

Why is it important to eat healthy and exercise? In this hands-on lesson plan, students will build a simple model to explore the effects of plaque buildup in arteries. The model allows them to demonstrate what happens to blood flow when heart disease narrows a person's arteries.

NGSS Alignment

This lesson helps students prepare for these Next Generation Science Standards Performance Expectations:

- **4-LS1-1**. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.

This lesson focuses on these aspects of NGSS Three Dimensional Learning:

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting C
Asking Questions and Defining Problems. Ask questions about what would happen if a variable was changed. **Developing and Using Models.** Develop and/or use models to describe and/or predict phenomena. Use a model to test cause and effect relationships or interactions concerning the functioning of a natural or designed system. **Planning and Carrying Out Investigations.** Make predictions about what would happen if a variable changed. **Engaging in Argument from Evidence.** Use data to evaluate claims about cause and effect.	**LS1.A: Structure and Function.** Plants and animals have both internal and external structures that serve various functions in growth, survival, behavior, and reproduction.	**Cause and Effect.** Cause an relationships are routinely i and used to explain change **System and System Model** described in terms of its co interactions.

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Brainstorming for Engineering Projects using SCAMPER

Coming up with new ideas is hard! How do engineers design new things or improve existing ones? Engineers and inventors use different brainstorming techniques to help them think outside the box and come up with new ideas. In this lesson plan, your students will practice brainstorming with a method called SCAMPER

The engineering design process typically calls for a brainstorming step where students are asked to think of new solutions to a problem. Some students might struggle with this and find it difficult to be creative or think of new ideas. It might seem like all the good ideas are already taken! SCAMPER is a brainstorming method that asks a series of open-ended questions about an object or process. Think of it as exercise for your brain—SCAMPER alone might not solve a problem for you, but it can get you in the right mindset to think of new ideas that might lead you down the right path.

Build a Machine to Lift Water

Overview

What would happen if your town's water supply was cut off due to an equipment failure or natural disaster in this lesson plan they will tackle a real-world engineering challenge by building a prototype of a device that can manually pump water during an emergency. They will also think like entrepreneurs and come up with a business plan for how their device could be produced, sold, and used in the real world.

NGSS Alignment

This lesson helps students prepare for these Next Generation Science Standards Performance Expectations:

- **3-5-ETS1-1**. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
- **3-5-ETS1-2**. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
- **3-5-ETS1-3**. Plan and carry out fair tests in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.
- **MS-ETS1-1**. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
- **MS-ETS1-2**. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
- **MS-ETS1-4**. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

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This lesson focuses on these aspects of NGSS Three Dimensional Learning:

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
3rd–5th grade **Asking Questions and Defining Problems.** Define a simple design problem that can be solved through the development of an object, tool, process, or system and includes several criteria for success and constraints on materials, time, or cost. **Constructing Explanations and Designing Solutions.** Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design problem. **Planning and Carrying Out Investigations.** Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered.	**3rd–5th grade** **ETS1.A: Defining and Delimiting Engineering Problems.** Possible solutions to a problem are limited by available materials and resources (constraints). The success of a designed solution is determined by considering the desired features of a solution (criteria). Different proposals for solutions can be compared on the basis of how well each one meets the specified criteria for success or how well each takes the constraints into account. **ETS1.B: Developing Possible Solutions.** Research on a problem should be carried out before beginning to design a solution. Testing a solution involves investigating how well it performs under a range of likely conditions. Tests are often designed to identify failure points or difficulties, which suggest the elements of the design that need to be improved. **ETS1.C: Optimizing the Design Solution.** Different solutions need to be tested in order to determine which of them best solves the problem, given the criteria and the constraints.	**3rd–5th grade** **Influence of Science, Engineering, and Technology on Society and the Natural World.** Engineers improve existing technologies or develop new ones to increase their benefits, decrease known risks, and meet societal demands. **6th–8th grade** **Influence of Science, Engineering, and Technology on Society and the Natural World.** The uses of technologies and limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions.
6th–8th grade **Asking Questions and Defining Problems.** Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. **Engaging in Argument from Evidence.** Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. **Developing and Using Models.** Develop a model to generate data to test ideas about designed systems, including those representing inputs and outputs.	**6th–8th grade** **ETS1.A: Defining and Delimiting Engineering Problems.** The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. **ETS1.B: Developing Possible Solutions.** A solution needs to be tested, and then modified on the basis of the test results, in order to improve it.	