

Boat of Knowledge in the Science Classroom (Books)

Funded by the National Science Foundation; Housed at Ohio University



Video Lesson Plans: Table of Contents

Please note: To help you find lessons in a specific subject, this table of contents has been sorted by three major categories: 1) Biology and Environmental Science, 2) Chemistry, and 3) Physics, Engineering, and Math. Due to the integrative nature of some lesson plans, lesson titles can be listed under multiple categories. Within each category, lessons have subcategory tags attached to better understand the content of a particular lesson.

Biology and Environmental Science Lessons

Video Title	Subcategories
Acid Mine Drainage	Chemistry, Environmental Science, Water Quality
Acid Mine Drainage: An Overview and Sustainability	Chemistry, Water Quality, Environmental Science
Acid Rain	Chemistry, Environmental Science
Air Quality	Chemistry, Environmental Science, Physical Science
Algae Blooms & Eutrophication	Environmental Science, General Biology, Water Quality
Bacteria	General Biology
Bacteria as an indicator of water quality	Environmental Sciences, General Biology
Bacteria, Viruses, and Fungi, Oh My!	General Biology
Big Orange Problem: Acid Mine Drainage	Water Quality, Chemistry, Environmental Science
Biofuels	Chemistry, Engineering, Environmental Science
Biomagnification	Environmental Science, General Biology
Blood Genetics	Genetics, General Biology
Blood Types	General Biology, Genetics
Cells are 3D - Did you knew?	General Biology
Clean Water Act: A Brief Introduction and History	Water Quality, Environmental Science
Creating an Index	Water Quality, Environmental Science
Delineating a Watershed	Water Quality, Environmental Science
Dissolved Oxygen: Water Quality	Chemistry, Water Quality, Environmental Science
DNA Part I: Structure and Replication	Genetics, General Biology
DNA Part II: Protein Synthesis	Genetics, General Biology
Effects of Urbanization on the Environment	Engineering, Environmental Science, Water Quality

Effects of Water Pollution - Are there any?	Water Quality, Environmental Science, General Biology, Chemistry
Environmental Causes of Endocrine Disruptors	Environmental Science, General Biology
Evolution: A Basic History of the Theory	General Biology
Evolution: An Introduction to Basic Concepts	General Biology
Fish Kills	Environmental Science, Water Quality
Flatworms, Crayfish, and Water Pennies, Oh My! Using Macroinvertebrates to Determine Water Quality	Water Quality, Environmental Science
Global Warming Debate	Chemistry, Environmental Science, Physical Science
Groundwater Basics and Environmental Applications	Water Quality, Environmental Science, Engineering
Groundwater Pollution Tracing	Water Quality, Environmental Science, Engineering
How Populations Grow	Environmental Science, General Biology
How Populations Grow: An Introduction	Environmental Science, General Biology
Invasive and Endangered Species in Ohio: Tied Together	Environmental Science, General Biology
Invasive Species General	Environmental Science, General Biology
Invasive Species: Great Lakes Case Study	Environmental Science, General Biology
Local Environment Pollution Legacies in Southeastern Ohio	Environmental Science
Luminescence	General Biology, Chemistry
Macroinvertebrates as Bioindicators	Water Quality, Environmental Science
Neurotoxins in our Everyday Lives	Environmental Science, General Biology
Not in My Backyard!	Environmental Science
Overpopulation	Environmental Science
Photosynthesis & Cellular Respiration in Sewage Treatment	Environmental Science, General Biology, Engineering, Water Quality
Physics of the Human Body: Motion and Balance	Physics, General Biology
Pigments & Photosynthesis	Environmental Science, General Biology
Punnett Squares	Genetics, General Biology
Rain Garden Ecology	Engineering, Environmental Science, Water Quality
Recombinant DNA (RDNA)	Genetics
Relative Humidity	Environmental Science, Physical Science
Scientific Method	Physics, General Biology, Chemistry
Soil Erosion	Engineering, Environmental Science, Physical Science

Soils	Environmental Science, Physical Science
Stream Discharge Measurement	Water Quality, Environmental Science
Structures, Statics, and the Environment	Engineering, Environmental Science
Sustainable Food Production	Engineering, General Biology
Sustaining Aquatic Biodiversity: Overfishing	Water Quality, Environmental Science
Testing for Bacteria in Fresh Water	Environmental Science, Water Quality
The Clean Water Act	Environmental Science
The Human Water Cycle Pt. 1: How Humans Interact With Water	Engineering, Environmental Science, Water Quality
The Human Water Cycle Pt. 2: Wastewater Treatment	Engineering, Environmental Science, Water Quality
The Water Quality Index: An Introductory Experience	Environmental Science, Water Quality
Topographic Maps	Engineering, Environmental Science
Toxicology	General Biology
Trees	Environmental Science, General Biology
Viruses	General Biology
Viruses - Living or Non-Living?	General Biology
Waste Management Pt. 1: Waste Generation & Characterization	Engineering, Environmental Science
Waste Management Pt. 2: Landfill Siting & Design	Engineering, Environmental Science
Water: Basic Properties	General Biology, Chemistry, Physical Science
Water Budgets: The Hydrologic Cycle and Topographic Maps	Water Quality, Environmental Science, Engineering
Water Filtration Basics	Water Quality, Environmental Science, Physical Science
Water Hardness	Chemistry, Engineering, Environmental Science, Water Quality
Water Parameters	Environmental Science, Water Quality
Water Pollution - A simple approach	Water Quality, Environmental Science, General Biology, Chemistry
Water Pollution - Contaminants and Testing Procedures	Water Quality, Environmental Science, General Biology, Chemistry
Water Pollution: A Problem for Everyone	Water Quality, Environmental Science
Water Pollution: Causes and Consequences	Water Quality, Environmental Science
Water Pollution: Contaminants & Testing Procedures	Environmental Science, Water Quality
Water Quality and Biological Monitoring using Macroinvertebrates	Water Quality, Environmental Science
Water Quality and Pollution - Am I drinking safe water?	Water Quality, Environmental Science, General Biology, Chemistry

Water Quality Index	Environmental Science, Water Quality
Water Quality Index: A Brief Overview	Environmental Science, Water Quality
Water Quality Variables	Environmental Science, Water Quality
Waterborne Illnesses	Water Quality, Environmental Science
Watersheds 101	Environmental Science
What's in the Fish?	Water Quality, Environmental Science

Chemistry Lessons

Video Title	Subcategories
Acid Mine Drainage	Chemistry, Environmental Science, Water Quality
Acid Mine Drainage: An Overview and Sustainability	Chemistry, Water Quality, Environmental Science
Acid Rain	Chemistry, Environmental Science
Acid-Base Chemistry	Chemistry
Air Quality	Chemistry, Environmental Science, Physical Science
An Introduction to Chemical Bonds	Chemistry
Big Orange Problem: Acid Mine Drainage	Water Quality, Chemistry, Environmental Science
Biofuels	Chemistry, Engineering, Environmental Science
Chemical Reactions	Chemistry
Conversion (Units)	Physics, Math, Engineering, Chemistry
Dissolved Oxygen: Water Quality	Chemistry, Water Quality, Environmental Science
Effects of Water Pollution - Are there any?	Water Quality, Environmental Science, General Biology, Chemistry
Electrochemical Sensors	Chemistry, Engineering
Global Warming Debate	Chemistry, Environmental Science, Physical Science
Luminescence	General Biology, Chemistry
Relative Humidity - Understanding and Applying the Concept	Engineering, Chemistry
Reverse Osmosis and Filtration	Chemistry, Engineering
Scientific Method	Physics, General Biology, Chemistry
Solubility and Solute-Solvent Interactions	Chemistry
Water Hardness	Chemistry, Engineering, Environmental Science, Water Quality

Water Pollution - A simple approach	Water Quality, Environmental Science, General Biology, Chemistry
Water Pollution - Contaminants and Testing Procedures	Water Quality, Environmental Science, General Biology, Chemistry
Water Quality and Pollution - Am I drinking safe water?	Water Quality, Environmental Science, General Biology, Chemistry
Water: Basic Properties	General Biology, Chemistry, Physical Science

Physics, Engineering, and Math Lessons

Video Title	Subcategories
3D Printing	Physics, Engineering
Air Resistance	Physics, Math, Engineering
Alternative Energy	Engineering
Archimedes' Principle	Physical Science
Bernoulli's Principle and Darcy's Law - Part I	Physics, Engineering
Bernoulli's Principle and Darcy's Law - Part II	Physics, Engineering
Biofuels	Chemistry, Engineering, Environmental Science
Bridge Engineering Basics	Physics, Engineering
Careers in STEM	Engineering
Communicating with Mars	Physics, Engineering
Computer Networks	Physics, Engineering
Conversion	Physics, Math, Engineering, Chemistry
Delineating a Watershed	Water Quality, Environmental Science
Density Applications	Physical Science
Earth Layers	Physics, Engineering
Electrochemical Sensors	Chemistry, Engineering
Engineering Challenge	Physics, Engineering
Float or Sink? Hypothesis Formation using Density	Physical Science
Global Warming Debate	Chemistry, Environmental Science, Physical Science
GPS and Mapping	Physics, Engineering
Groundwater Basics and Environmental Applications	Water Quality, Environmental Science, Engineering
Groundwater Flow	Engineering, Physics

Groundwater Pollution Tracing	Water Quality, Environmental Science, Engineering
Groundwater Pumping: Introduction and Effects	Water Quality, Environmental Science, Engineering
How Statistics Lie to you	Engineering
Hydroelectricity	Engineering, Physics
Not in My Backyard!	Environmental Science
Parallel Computing	Computer Science, Engineering
Physics of the Human Body: Motion and Balance	Physics, General Biology
Popsicle Bridges	Physics, Engineering
Potential and Kinetic Energy	Physics, Engineering, Math
Projectile Motion	Physics, Engineering, Math
Properties of Matter	Physical Science
Prove it!	Engineering
Rainfall	Physics, Engineering
Relative Humidity - Understanding and Applying the Concept	Engineering, Chemistry
Reverse Osmosis and Filtration	Chemistry, Engineering
River Transportation: Shipping Goods using Barge Tows	Engineering
Rockets	Physics, Engineering
Scientific Method	Physics, General Biology, Chemistry
Soil Erosion	Engineering, Environmental Science, Physical Science
Speed	Physics, Engineering, Math
Speed of Light!	Physics, Engineering
Spreadsheets in Science	Computer Science
Structures, Statics, and the Environment	Engineering, Environmental Science
The Human Water Cycle Pt. 1: How Humans Interact With Water	Engineering, Environmental Science, Water Quality
The Human Water Cycle Pt. 2: Wastewater Treatment	Engineering, Environmental Science, Water Quality
Thermal Energy	Physical Science
Toilet Paper and History	Physical Science
Topographic Maps	Engineering, Environmental Science
Waste Management Pt. 1: Waste Generation & Characterization	Engineering, Environmental Science
Waste Management Pt. 2: Landfill Siting & Design	Engineering, Environmental Science

Water Budgets: The Hydrologic Cycle and
Topographic Maps

Water Quality, Environmental Science, Engineering

Water Filtration Basics

Water Quality, Environmental Science, Engineering

Water Hardness

Chemistry, Engineering, Environmental Science, Water Quality

Boat of Knowledge in the Science Classroom (BooKS) was funded by the National Science Foundation (NSF) under STEM K-12 Graduate Program (GK-12), Grant No. 0947813. Housed at Ohio University, BooKS has brought school teachers and graduate fellows together from 2010 to 2018. The BooKS project has aimed to enhance and broaden communication skills of science and engineering graduate fellows, while providing teachers and students with a view into science and engineering careers. Activities completed by the project range from on-boat sampling field trips and experiments related to fellows' research projects along the Ohio River from Marietta to Gallipolis, to inquiry-based activities for required classroom subjects, to virtual Boat-of-Knowledge games (available on iTunes) and virtual lab bench demonstrations. To leave a lasting legacy of the BooKS project, the graduate fellows from 2015 to 2018 reformatted all previous lesson plans into interactive videos, so classrooms across the globe could benefit from this project. A team of people across the years made this project possible; university staff, graduate fellows, and participating teachers are listed below.

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