



BILL NYE THE SCIENCE GUY

Science
Health
Math
Environmental Studies



40 24-min. Programs
Grades 3-9
Teacher's Guide
SOL Correlations Below

Bill Nye knows how to provide easy access to hard science. The series uses a fast-paced approach blending humorous hi-jinks and hands-on activities. Bill encourages kids to ask interesting questions and then shows them how to discover fascinating answers. He works his magic across a range of topics, so teachers can even enlist his help when it comes time to teach Health, Math, Nature, and Environmental issues.

1. Earth's Crust — By carefully studying the Earth's surface, scientists have discovered that the Earth is made up of gigantic layers. Bill Nye goes to the depths of the earth (literally) to explain how the earth's surface and its inner mantle differ.
Science: 3.9, 4.7, 5.7, 6.3, 6.6, 6.8, ES.4

2. Gravity — In this program, student will learn what holds the ocean on the Earth and what makes the earth round. Bill Nye also answers other questions about the earth's gravity.
Science: 3.9, 4.7, 5.7, 6.3, 6.6, 6.8, ES.4

3. Digestion — Bill Nye explains how the body's digestive system is like a fine-tuned machine that processes food into energy.
Science: LS.3, BIO.5

4. Magnetism — The two key concepts in this program are that all magnets have certain things in common and all magnets have two poles—north and south. Bill Nye shows unexpected places where magnets can be found—even the Earth's hot, churning, iron core is like a giant magnet. He explains how to make a compass.
Science: 2.2, 4.3, PS.11, PH.12

5. Chemical Reaction — Students will learn that everything is made of chemicals. Chemical reactions occur when chemicals combine to form new substances. Bill Nye shows that fire is a chemical reaction and tries to extinguish a "tornado of fire."
Science: 6.4, LS.6, PS.2, PS.4, CH.4

6. Food Web — The lives of living things are intertwined—that's why scientists call it a food web. Mice are eaten by bats, snakes, birds and foxes, to name a few. Insects are eaten by other insects, birds, snakes, cats, rats, raccoons and even humans. All living things on the Earth's surface need plants. The cool part about the food web is that living things are made of other living things. It's a cycle of either eating or being eaten. Bill Nye gets tangled in a complex food web in his quest to show students that all living things depend on each other to survive.
Science: 4.5, LS.6, LS.7, LS.9

7. Light Optics — Light is energy that normally travels in a straight line, unless it hits something or is pulled by gravity. When it hits something, light can be bent, bounced or absorbed. Students will see that often all three things happen at the same time.
Science: 4.3, 5.3, PS.6, PS.9

8. The Sun — Bill Nye harnesses the power of the Sun to teach students that the Sun is the source of energy for all life on Earth. The Sun is made of gas. It has so much gravity that its atoms constantly crash into each other. When the atoms collide, they form new atoms and release energy. Scientists call this atom smashing "nuclear fusion," which gives off a lot of energy. A very small portion of this energy beams straight through space to Earth, giving living things like people the power to live, grow and eat.
Science: 3.9, 3.11, 4.4, 4.7, 6.2, 6.8, ES.4

9. Atmosphere — In this program, Bill Nye explores the atmosphere, the thin layer of air that surrounds the Earth.
Science: 6.3, 6.4, 6.6, ES.12

10. Respiration — Breathing is how bodies get oxygen from the air. Air is a mixture of gases, and a human's lungs are only set up to absorb the oxygen. Cells in the body use oxygen to combine with chemicals from food to make energy. The process of combining chemicals with oxygen to make energy is called respiration. Bodies need respiration to grow, move, think and live.
Science: LS.3, BIO.3

11. Planets and Moons — Students can see some of the planets with just their eyes on a clear night, but to get a good look at other planets, astronomers have to use powerful telescopes. Planets bounce light from the Sun into our eyes here on Earth. All planets, including the Earth, go around the Sun in nearly circular orbits. Gravity keeps the planets moving around the Sun in their elliptical orbits. Each planet is different in size, color, atmosphere and more.
Science: 3.8, 4.7, 6.8, ES.4, ES.12

12. Plants — Unlike animals, plants make their own food. Plants use sunlight to take carbon dioxide from the air and release oxygen. Although most plants cannot move around, they have developed many other ways of living on Earth. In this program, Bill explores the fascinating world of plants.



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Science: 3.6, 3.7, 3.8, 3.10, 4.4, 4.5, 4.8, 5.5, 6.9, LS.2, LS.4

13. Evolution — All living things are made of the same stuff, but look different because they've gone through lots of small changes over millions and millions of years. This process is called evolution. By passing along changes, living things can give their offspring advantages in surviving and reproducing. Fossils show that living things have been changing for billions of years.
Science: LS.14, ES.10, ES.12, ES.14, BIO.1, BIO.8

14. Friction — In this program, students will learn that friction is the resistance to motion of things that are touching. It slows things down when they rub against each other. Friction changes the energy of motion to heat.
Science: 4.2

15. Climates — Deserts, plains, mountains and forests have different climates. Students will understand that climate is the average weather of a place. The most important parts of a climate are the amount of rain or snow the place gets and how warm it is. Climate determines what plants and animals live in different places. This program explores different types of Earth's climates.
Science: 6.5, LS.11, ES.11, ES.13

16. Ocean Life — Most living things in the ocean are too small to see with just your eye. These small organisms, called plankton, support many different ecosystems in the ocean. Bill explores the importance of plankton to the ocean ecosystems.
Science: 3.6, 5.6, 6.3, 6.4, ES.11

17. Mammals — In this program, Bill Nye looks at the characteristics mammals have in common. Every single mammal has hair of some sort on its body. All mammals feed their babies milk, which comes from the mothers' mammary glands. Mammals are warm-blooded which means they keep their body temperature the same no matter how hot or cold their environment is. Mammal parents take good care of their little ones to make sure they'll survive.
Science: 4.5, 5.5, 6.9, LS.2, LS.3, LS.4, LS.5

18. Populations — A population is a group of living things of the same kind in one area. Populations need a couple of basic things to survive—food and a place to live. When two or more populations of living things are crowded into a small area, there can be competition for food and space. Competition is a natural part of life, but problems can arise if populations get out of balance. Humans are the fastest growing population on Earth,

constantly taking up more and more space. When humans move in, a lot of other populations are forced to move out to different areas. Sometimes there's no place for them to go. In this program, students will understand that the human population has a big effect on all the other populations on Earth.
Science: 3.6, LS.8, LS.9, LS.11, LS.12, BIO.8

19. Earthquakes — Bill Nye shakes it up in this program on earthquakes! The Earth's surface is broken up into plates. Earthquakes happen when energy stored in the plates is released suddenly. The program looks at the impact earthquakes have on the surface of the Earth and on living things.
Science: 5.7

20. Pollution Solutions — Students will learn that people are the only animals on Earth that make pollution. Garbage, burning fuel, chemicals, sewage, oil and pesticides are all human-made things that make the Earth's atmosphere, water and soil unclean. In this program, Bill demonstrates how important it is for all humans to prepare for the future by recycling, researching and developing innovative solutions to combat pollution.
Science: 3.6, 3.10, 4.8, 6.7, 6.9, LS.8, LS.9

21. Probability — There's a good chance this will be one of Bill's best episodes! In fact, he'll probably make the complicated concept of probability very simple to understand, showing how it allows people to predict events. Probability is a way to measure how likely it is that something will happen. Students will learn that when a scientist wants to calculate a probability, she or he gathers data and then uses the data to make her or his prediction. Scientists use probabilities to predict the future, to decide if and when things will happen.
Science: 3.1, 4.1, 5.1, 6.1, LS.1
Math: 3.23, 4.19, 5.17, 6.20, 7.14

22. Flowers — Bill Nye shows that flowers are more than just pretty faces: they make seeds, play a key role in pollination and help plants to reproduce. This program covers plant parts, including the pistil and stamen, as well as the different shapes, smells and colors of flowers that evolved to help those particular plants survive and thrive.
Science: 3.6, 3.7, 3.8, 3.10, 4.4, 4.5, 4.8, 5.5, 6.9, LS.2, LS.4, LS.5, LS.6

23. Deserts — A desert is a large area of land that gets very little rain or snow. Desert plants and animals have special ways of finding, storing and using water. Most deserts are hot, but some are cold. Bill travels to Arizona's stunning Sonora desert and has a close encounter of the camel kind. He

explores this unique ecosystem and demonstrates the special ways its native plants and animals flourish.
Science: 3.6, 4.5, LS.7

24. Heart — Bill will check out the heart's function in the body, by pulling nine "G's" with the United States Navy's Blue Angels. Key concepts include that the heart is a muscle that works all of the time, the heart pushes blood around the body, and that the heart is a pump with valves that control the flow.
Science: BIO.5

25. Inventions — Humans invent things to solve problems and make life easier. Inventions are the results of careful thought or accidental discovery. In this program, Bill examines the process of inventing and helps students realize that each of them can become inventors.
Science: 3.1, 4.1, 5.1, 6.1, PH.1, PH.2, PH.3

26. Genes — Bill explores the chromosomal world of DNA and visits with a veterinarian who helps to save endangered animals using gene technology. All living things have genes in their cells. Genes are long strings of chemicals that determine the shapes, sizes and behavior of things. Living things pass their genes on to their offspring.
Science: LS.13, LS.14, BIO.2, BIO.6, BIO.8

27. Do It Yourself — Do-it-yourself science involves a question, observations, a hypothesis and experimentation. Using the scientific method, Bill shows students some classic home experiments, and some brand new ones he likes to perform around Nye Labs.

28. Lakes and Ponds — Lakes and ponds are large bodies of water surrounded by land. Lakes and ponds have special ecosystems and are teeming with all sorts of plants and animals. Bill travels to the Great Salt Lake to explain why some lakes are salty and others are not.
Science: 3.6, 5.6, 6.3, ES.11

29. Storms — Where do wild, dangerous and necessary tornadoes, hurricanes and thunderstorms come from? Storms happen when huge air masses collide. Students will learn how along the border of these air masses, water vapor condenses into clouds, strong winds form and the clouds rub against each other with the ground often becoming electrically charged waiting to send lightning bolts across the sky. Bill explores the eye of a hurricane, the heart of a raging blizzard, and the middle of a thunderstorm. Other key concepts include that storms are driven by heat from the Sun and

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the spin of the Earth and storms also happen on other planets

Science: 2.6, 4.6, 6.3, ES.13

30. Motion — Everything needs a force, either a push or pull, to make it move or stop moving. All motion requires force. Bill rides roller coasters and merry-go-rounds to show that the only thing harder than getting something to move is getting it to stop. Students will also learn that the way things appear to move depends on the movement of the observer.

Science: 4.2, 4.7, 6.3, PS.10, PH.1, PH.5, PH.7

31. Architecture — When constructing a building, whether a tower or a teepee, some kind of planning must occur. Architects are people who design buildings and landscape areas. These professionals draw on a computer or on a drawing board to show the dimensions of all parts of a building. Architects try to design with the purpose of the building in mind. They use different shapes and materials to make buildings unique. Columns, arches, and different holes (windows and doors) give a building a personality while being useful at the same time. Wood looks cozy, while steel looks cool. Rounded shapes look soft, and angled shapes look hard. Architects use different shapes and materials to create a feeling or mood while keeping the building useful for people.

Science: 3.1, 3.2

32. Biodiversity — Ecosystems are areas where things live. Ecosystems that are biodiverse are home to a variety of plants and animals. A healthy ecosystem is one with a lot of biodiversity. If one species only ate one kind of food they would be in big trouble if that food disappeared! Luckily, our ecosystem covers a big part of the Earth, and there are lots of different plants to eat. Ecosystems are quite diverse. The lives of animals and plants are closely intertwined. Humans have a big effect on the other living things around. We are the only animals to leave lots of stuff around, such as houses, cars, and malls. It's important for us to think about the choices we make and how they will affect the other living things around us.

Science: 3.6, 3.10, 4.5, 5.5, 5.6, 6.7, LS.7

33. Brain — Your brain is constantly. You're using it to understand the words you're seeing and hearing. Not only that, your brain is doing a whole lot more that you don't even think about. It's controlling your heart, your breathing, your body temperature, and even your stomach. Your brain helps you develop a personality, smells, sees, thinks, moves, and remembers all kinds of things. Your brain, your spinal

cord, and all of your nerves make up what scientists call your "nervous system."

Everything your body does is controlled by this system of electrical and chemical connections. We still don't know everything that goes on in our brains. But we're sure of this. Brains are complicated. Scientists have figured out that our brains are divided into sections that handle different tasks; the cerebellum, the cerebrum, and the medulla oblongata.

Science: 3.3, 3.4, LS.3

34. Computers — Computers are used in cars, calculators, and televisions throughout the world all the time. Humans use computers to take information—things like pictures, words, numbers, and sound, and turn it into electricity. The computers are designed to tell the difference between pieces of information. Computers change the information you give them, into electrical pulses, make changes to it, and give it back to you in a form you can understand in a matter of thousandths of seconds. It's the electricity that makes computers so fast. Computers usually store information, and lots of it. In the early days, computers used cards with holes punched in them, now there are CD-ROMs, hard drives, and floppy disks. Scientists have made computer parts tiny but very powerful. Thirty years ago, a computer as powerful as the one you're using now would have been the size of an entire city.

Science: 3.1, 4.1, 5.1, 6.1, LS.1

35. Flight — Things that fly need air. Even though we walk through it, breathe it, and sneeze it, air seems to be a whole bunch of nothing. Yet air is powerful enough inflate balloons and tires that support the weight of bikes, buses, trucks, cars, and planes. Air that moves around pushes, too. Birds, planes, kites, Frisbees, and helicopters fly because moving air creates lift, or a push up. Airplane wings are shaped to push air down. The momentum of the air going down pushes wings up. Every flying thing, from the tiniest flying insect to the biggest airplane, uses momentum and these differences in air pressure to fly. The pressure force is called the Bernoulli Effect, named after the scientist who discovered it.

Science: 3.2, 4.2, PS.6, PS.10

36. Forensics — Forensic scientists try to find out the who, what, when, where, and why of events in past—crimes. Most forensic scientists work in police labs. They collect evidence from the scene of a crime and analyze the evidence in a lab. Forensic scientists look for clues that will help them solve a crime. Fingerprints, footprints, hair, blood, and traces of gunpowder can be helpful evidence. Forensic scientists use all sorts of scientific instruments to analyze even the

smallest bit of hair or the tiniest chip of paint. By scientifically testing evidence from the crime scene, and by knowing about evidence from past cases, forensic scientists can piece together what happened, to figure out who did what, and to help police catch a criminal.

Science: 3.1, 4.1, 5.1, 6.1, LS.1, PS.1

37. Garbage — Garbage is either biodegradable or non-biodegradable. Biodegradable waste is garbage that will break down and go back into the soil—things like apple cores, vegetable peels, and the stuff we flush down the toilet. Things like pens, plastic wrapping, and computer disks are examples of non-biodegradable waste—things that will be sitting around for a very long time. Humans make millions of tons of waste, and we are the only animals that make non-biodegradable garbage. The best way to get control of the garbage problem is to reduce the amount of stuff we throw away. Garbage such as aluminum cans, glass, plastics, and paper can be recycled. Reusing is another option—instead of throwing stuff away. The most important step you can take in recycling is to buy recycled products.

Science: 3.5, 6.7, 6.9, LS.9

38. Patterns — One of the ways we deal with huge amounts of information is by finding patterns. Patterns are a human way to organize and understand stuff. A pattern can be almost anything that repeats in a predictable way. Bees make honeycombs that repeat hexagon shapes. Bird songs often repeat musical phrases over and over again. Waves hit the shore in steady, repeated patterns. Nature is filled with patterns. To define and describe the patterns we see in nature, humans invented a special language called math. Math provides the words and symbols necessary for describing every pattern. Math formulas are ways of defining geometric patterns. Computers can also find, create and study patterns.

Science: 3.8, 4.7, 5.2, 6.7, 6.8, LS.3

39. Science of Music — Music has been a part of human lives for a long time—even before people used words, they used music to communicate. Music is the art and science of expressing ideas and feelings through sound. A sad song can say more about how someone feels than most words, and a familiar song can make crowds clap together and feel like one happy family. Whatever the emotion, music seems to have a way to communicate it. The music we listen to today is the result of years of experimentation with sounds. As people figured out what they liked best, they invented instruments that could play their favorite tones, rhythms, or patterns of beats. Each

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note of music is a sound wave. Some sound waves sound great together. Some not so good. Getting the exact sound waves in the pattern you want—now that’s science.

Science: 5.2, PS.8

40. Static Electricity — Static electricity is a buildup of charged electrons. Electrons are a part of all atoms, the building blocks of all stuff. All electrons have a negative charge. Negatively charged electrons push away from other negatively charged electrons. Like charges repel each other. When electrons build up in an area, a charge builds up, and it’s just waiting to be released. This buildup of charge is called static electricity. Charges can jump around between things, as when 2 objects are rubbed together or When you drag your feet on the carpet. As the charge builds up, the electrons get too close to each other, and they need a place to escape. They get their chance when you touch something or someone else. The electrons jump onto your pal, making both of you jump at the electric shock.

Science: 3.3, 4.3, 5.4, 6.4, PS.3

Additional Resource Information:

The website to support this series is found at www.billnye.com