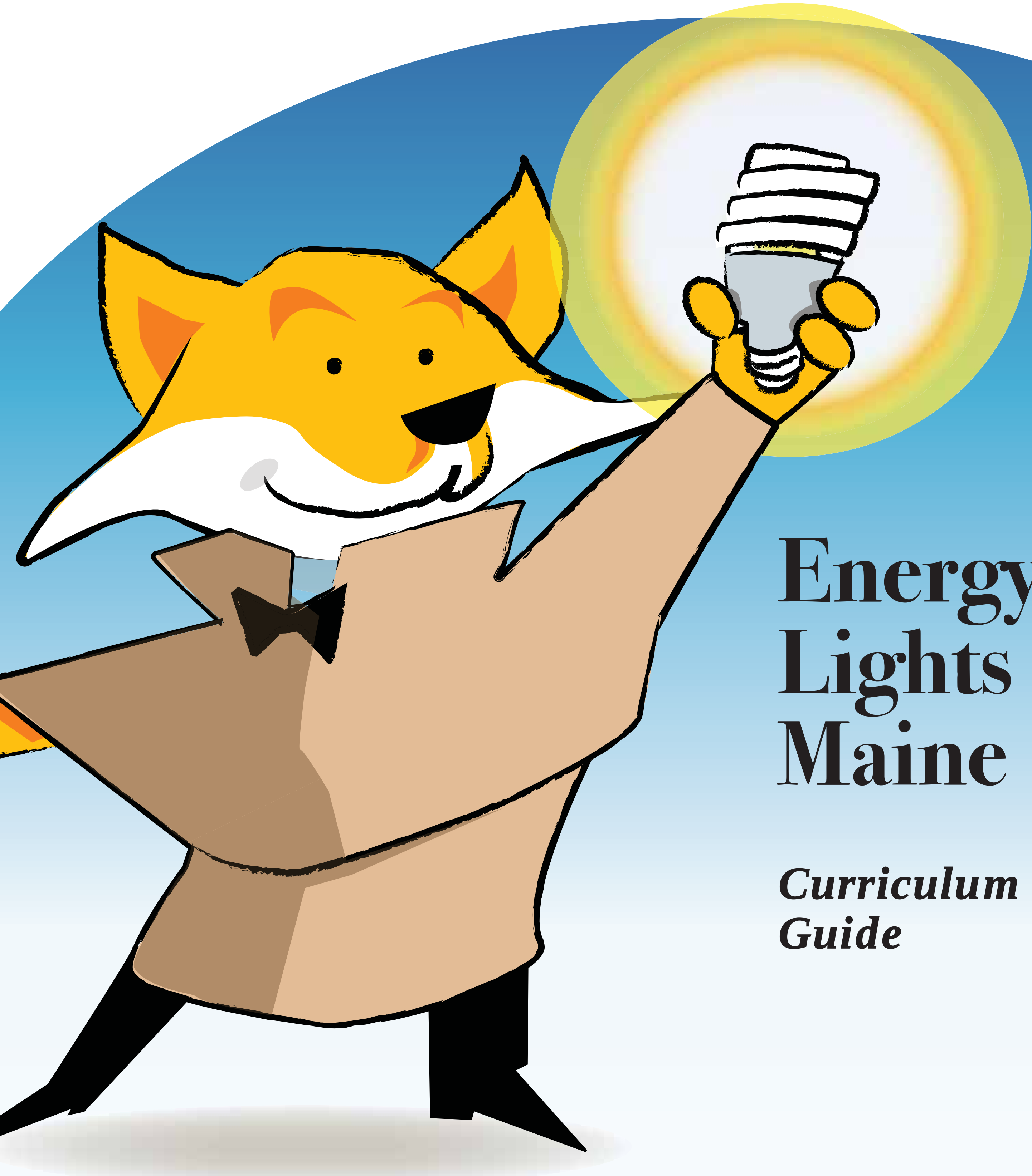
PowerSleuth



Energy Lights Maine

Curriculum Guide

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Energy Lights Maine (2009) is a curriculum created and disseminated by the Maine Mathematics and Science Alliance (mmsa.org) and funded by Efficiency Maine, a program of the Maine Public Utilities Commission.

Energy Lights Maine is available for download at no cost at www.powersleuth.org

Energy Lights Maine

Contents

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Energy Education Curriculum for Maine Students in Grades 4-8

Introduction

Developing an understanding of energy as a source of light, heat, and power is essential for making advancements in energy-related technology and for making responsible and informed decisions about its use. The Sun is the initial source of all light and heat energy on Earth. Harnessing that energy for power and using that power to satisfy the wants and needs of humans requires a conceptual understanding of energy. *Benchmarks for Science Literacy* states: "Energy is a mysterious concept, even though its forms can be precisely defined and measured....Although learning about energy does not make it less mysterious, it is worth trying to understand because a wide variety of scientific explanations are difficult to follow without some knowledge of the concept of energy."

PowerSleuth presents energy concepts that have been identified as essential knowledge in the state and national science standards for students in grades 4-8. *Maine Learning Results: Parameters for Essential Instruction* is the resource for the state standards, and *Benchmarks for Science Literacy* and the *National Science Education Standards* are the sources for the national standards. Through this curriculum, students develop a conceptual understanding of energy while, simultaneously, becoming aware of the pervasive use of energy in their lives and strategies to use energy wisely and efficiently.

Background

The *PowerSleuth* curriculum was developed as part of a three-year project, funded by Efficiency Maine, a program of Maine's Public Utilities Commission (PUC). The project's primary goal was to develop a coherent set of standards-based energy education curriculum materials and companion website (www.powersleuth.org) for Maine students in grades 4-8. Three units were developed: *Energy Lights Maine* for grades 4-5; *Energy Heats Maine* for grades 6-7; and *Energy for Maine* for grades 7- 8. Each curriculum unit consists of lessons that follow a conceptual storyline mindful of Maine students and designed with consistent pedagogy. The lessons are research-informed and aligned with the 2007 *Maine Learning Results: Parameters for Essential Instruction*. Although the curriculum units were designed for specific grade spans, teachers can use them flexibly across the 4-8 grade levels. Several agencies across Maine served as content advisors to the Maine Mathematics

and Science Alliance in making connections to Maine's energy context including the Maine Public Utilities Commission, Maine Energy Education Program, Maine Public Service, Maine Department of Environmental Protection's Air Quality Division, and the Maine Lung Association. The *PowerSleuth* materials were reviewed and field tested by Maine educators. The development of a connected, coherent set of energy education curriculum materials designed with a conceptual flow establishes an important and necessary teaching resource for teachers in Maine and beyond.

Instructional Goals

Students will:

- understand essential energy-related concepts identified in state and national standards
- identify uses of energy in their Maine-based daily lives
- become aware of the efficient and responsible use of energy

Inquiry-Based Instructional Model

The lessons in these units are inquiry-based to help students construct an understanding of energy related concepts through direct experiences over time. The content of the lessons target essential knowledge about energy as identified in state and national standards. Through the experiences provided to the students, common misconceptions about energy related concepts are also addressed.

"Scientific inquiry refers to the activities of students in which they develop knowledge and understanding of scientific ideas as well as an understanding of how scientists study the natural world." (*National Science Education Standards*). The format of the *PowerSleuth* lessons supports an inquiry-based instructional model, and each lesson includes three phases. The first phase, **Engage**, sets the stage for learning by providing a common experience for all students, generating interest in the focus of the lesson, and eliciting prior knowledge. Providing a common experience for all students at the beginning of each lesson allows students from various backgrounds, interests, and expertise to make predictions, based on that experience, during the upcoming science investigations and offers all students an equal opportunity to learn. In addition, research on how students learn science shows that when students are expected to identify their current understanding of a concept, their awareness of how their own thinking changes over time is enhanced as they confront situations that challenge that current understanding. The second phase, **Explore**, is designed to provide students with direct, hand-on experiences that help build conceptual understanding of energy related concepts. During this stage, students carry out focused investigations that target the specific learning goal identified in each lesson, collecting, organizing, and analyzing data related to each investigation. The last stage, **Reflect and Discuss**, brings closure to each lesson as students reflect on the claims they generate, based on their data, and supported by the evidence they collected during their investigations. Students draw conclusions that reveal their conceptual development.

Scientists' Notebooks and Science Talk

Two specific features are incorporated into each lesson. The **scientist's notebook** is a place where students record all aspects of each investigation, including their evolving understanding of the targeted concept. Entries include predictions, focus questions, data, observations, drawing, claims, evidence, conclusions, and reflections. Several student recording sheets are included in these lessons. These can be inserted into students' notebooks without modifications, revised to make them more student-directed, or eliminated in favor of open-ended student entries into the notebooks. Several informative resources are available that provide background information on scientists' notebook as well as suggestions for implementing the notebook strategy in the classroom. Teachers are encouraged to refer to these resources:

Campbell, B., and Fulton, L. (2003). *Science notebooks: writing about inquiry*. Portsmouth, NH: Heinemann.

Fulwiler, B. (2007). *Writing in science*. Portsmouth, NH: Heinemann.

Klentschy, M. (2008). *Using science notebooks in the elementary classroom*. Arlington, VA: NSTA Press.

Worth, K., Winokur, J., Crissman, S., and Heller-Winokur, M. (2009). *Science and literacy – a natural fit: A guide for professional development leaders*. Portsmouth, NH: Heinemann.

Science talk through discussions is an essential component of the inquiry process. Besides being a rehearsal for writing, it provides a vehicle for students to develop academic vocabulary specific to the discipline of science. It also provides an opportunity for all students to enhance their verbal fluency and skill. This is particularly critical for students who are learning English as a second language, for students with special needs, and for those who need language enrichment opportunities. Demonstrations by students with concrete materials as they are explaining an idea to their classmates often enhances the clarity of the explanation, connects specific words to specific objects, and encourages students into using more precise vocabulary as they talk.

Lesson Planning and Pacing

For planning purposes, each lesson is divided into a certain number of sessions. Each session is designated as a 40-50 minute instructional period. Some lessons require one or more sessions to teach. Those that require more than one session often have suggestions as to how the lesson can be divided into multiple instructional periods. The actual number of sessions a lesson spans will depend on the prior experiences of students and the depth of instruction.

Formative Assessment

In an era of accountability, educators agree that assessment is an integral part of the educational experience for students. Formative assessment strategies help teachers become aware of students' current thinking about an idea or concept and guide instructional decisions. Seeing the connection between the variety of ideas that students often bring to a new learning experience and the targeted learning goal contributes to the design of effective learning experiences for all students. *PowerSleuth* incorporates several formative assessment strategies throughout the units. The source for several of these techniques is *Science Formative Assessment* (Keeley, P. 2008), a valuable resource for teachers with an interest in expanding their repertoire of formative assessment strategies. Another valuable reference is *Uncovering Student Ideas in Science* (Keeley, P.), a series of four books with formative assessment probes designed to elicit students' current thinking about a particular concept. Volumes 1-4 in this series offers probes in life, earth/ space, as well as physical science.

Research on Student Learning

Students often come to classroom science with a wide range of preconceptions about everyday science phenomena. Being aware of common misconceptions provides a wealth of knowledge to teachers about their students and the design of learning experiences that will help students develop an understanding of essential science concepts. Research about how students learn science is available and that research base is incorporated in the *PowerSleuth* curriculum. All lessons target energy concepts deemed as essential in the state and national standards and are designed to address common misconceptions identified in the research. A rich source of this research is *Making sense of secondary science* (Driver, R. 1994).

Home Involvement

Efforts are made throughout the units to include families in the learning process. However, accommodations in the form of school assistance are required for students whose families cannot, for whatever reason, collaborate in the learning process or establish a supportive learning environment at home. Sensitivity to this issue when assigning home projects is recommended.

Materials and Safety

Most of the materials that are used in the *PowerSleuth* lessons are relatively inexpensive and readily available. It may be necessary to obtain a few materials from a scientific supply company or a local high school science department. Consider using recycled materials and/or purchasing supplies locally when appropriate. Some advanced planning is necessary not only when it comes to gathering materials for lessons, but in thinking about how materials will be stored, distributed, and managed when working with students. Tips and suggestions for managing materials are offered throughout the lessons as a guide.

Specific safety concerns are noted at the beginning of each lesson however, students should be made aware of and follow safety rules according to school policy. The National Science Teachers' Association www.nsta.org has several resources regarding elementary science safety. Teachers are encouraged to refer to:

Kwan, T. (2002). *Exploring safely: a guide for elementary teachers.* Arlington, VA: NSTA Press.

PowerSleuth Companion Website

The *PowerSleuth* website, wwwpowersleuth.org, is the online resource to supplement the *Energy Lights Maine*, *Energy Heats Maine*, and *Energy for Maine* modules. The companion website features activities, projects, video clips, links, the lesson plans, and other resources for each of the *PowerSleuth* modules. Teachers are encouraged to check the site frequently for updates and tips from other *PowerSleuth* teachers.

Energy Lights Maine

Overview

Whether it's Cadillac Mountain in Bar Harbor, Mt. Katahdin in Baxter State Park, or Mars Hill Mountain in the town of Mars Hill, Maine is the first state in the United States to receive the morning's sunlight. Humans are intimately connected to and dependent on light, whether natural or artificial, and have been devising ways to illuminate their environment for thousands of years. Looking back through time at how humans have accomplished this task, it may at first appear simple, but upon further investigation, it is evident that developing light emitting devices for specific tasks is complex and poses challenges. People continue to make improvements on lighting technologies, striving to make them as functional, economical, energy-efficient, and earth-friendly as possible. As new innovations in lighting technologies emerge, people will undoubtedly apply these technologies in ways that were never imagined.

Light is the main theme for the *Energy Lights Maine* instructional unit and includes lessons that investigate where light comes from, how light was and is used by people, simple circuitry, electrical generation of light on a wide scale basis, resource and energy conservation, and lighting technologies of the future. The following learning goals are targeted in *Energy Lights Maine*; students will:

- develop a basic understanding that light is a form of energy derived from the sun.
- consider changes in light emitting technologies over time including light bulbs.
- devise a simple circuit that will light a bulb.
- recognize that materials have different conduction and insulation properties and that the application of these properties is used in electrical devices and electrical systems to help ensure that electricity is used safely.
- identify electrical hazards and suggest ways to use electricity safely.
- compare and contrast methods of wide scale electricity generation.
- explore the role of turbines in electricity production and design a simple model wind turbine.
- develop an understanding of energy conservation and recognize that everyone has a role in using available resources wisely.

Lesson One

In the first lesson of *Energy Lights Maine* students explore the role of light in the daily lives of humans and review the historical development of light emitting technologies. This lesson uses a Native American folktale to motivate and engage students in thinking about light and its importance to people. In the second part of the lesson, students examine, sort, and discuss pictures of man-made lights used throughout history, allowing students to examine their current knowledge of light and light emitting devices. The goal of Lesson 1 is to raise awareness of the challenges humans face in using light and in developing safe, purposeful, and efficient light emitting devices.

Lesson Two

Lesson 2 of *Energy Lights Maine* uses a familiar, portable man-made light emitting device, a battery powered flashlight, to initiate investigations of simple circuitry. Using a battery, a small incandescent light bulb, and one wire, students find as many ways as they can to light the bulb. Students record each of their trials and “discover” the necessary elements of a complete circuit.

Lesson Three

The idea that a complete pathway or loop is required for an electric current to flow is reaffirmed in Lesson 3 as students take an in depth look at the parts of an incandescent light bulb. Additionally, close examination of the parts making up light bulbs is used to introduce students to the concept of systems. *Benchmarks for Science Literacy* states, “One of the essential components of higher-order thinking is the ability to think about a whole in terms of its parts and, alternatively, about parts in terms of how they relate to one another and to the whole.” Providing opportunities for students to think in terms of systems is an important component of science understanding. As students examine the components of a light bulb, they consider how the parts are interrelated and work together to achieve the specific result of emitting light. This focused look at incandescent light bulbs aids in developing a small-scale understanding of electrical systems and prepares students for the examination of electrical systems on a larger scale.

Lessons Four and Five

In Lessons 4 and 5 students are introduced to conductors and insulators. Students begin by observing first-hand that electricity readily passes through certain materials (conductors) while other materials do not allow electricity to flow through them readily (insulators). As students test various materials, they keep a record of their findings and use the evidence they collect to make claims based on that evidence. Students extend and apply their understanding of conductors and insulators in Lesson 5 using the context of electrical safety. Students identify potential electrical hazards, discuss what makes them hazardous, and suggest ways to prevent injury.

Lesson Six

Through the use of "Power Puzzles" and a virtual tour of a power plant, Lesson 6 introduces students to the generation of electricity on a wide-scale basis. Students become familiar with the major components of traditional electrical generation methods including a turbine, a generator, and an energy source. During this lesson students are also introduced to the idea of natural resources, and discuss renewable and nonrenewable energy sources.

Lesson Seven

Using a technological design process, students work in pairs to design, construct, and test the blades of a model wind turbine in Lesson 7. In addition to helping students recognize that wind, water, or steam can "make things happen" (for example, lift a paper cup filled with pennies or generate electricity), this lesson also provides an opportunity for students to apply scientific knowledge to solve a problem. The opening paragraph of *Maine Learning Results: Parameters for Essential Instruction* states, "…it is important for students to learn how science and technology connect with the demands of society… It is equally important that students are provided with learning experiences that integrate tools, knowledge, and processes of science and technology. Instruction should support students in asking questions, making inquiries, and understanding and solving problems that require the integration of knowledge and processes in authentic contexts." Lesson 7 allows students to apply their knowledge and learn through trial and error by designing and redesigning solutions to a problem in much the same way engineers work to solve problems.

Lessons Eight and Nine

Lessons 8 and 9 of *Energy Lights Maine* focus on energy efficiency and energy conservation. In Lesson 8 students use various criteria to compare the efficiency of several different types of light bulbs. In Lesson 9 students conduct an informal light survey of their school to determine where electric lights are used and if there are alternative sources or strategies that can be used to reduce the amount of energy used for lighting. As students apply their new understanding of energy efficiency, they develop a sense of empowerment. Armed with new knowledge, students develop and carry out an action plan that will promote the wise use of energy for lighting their schools and homes.

Lesson Matrix

Overview	Key Ideas	Lesson Goals Students will:	Connection to Learning Goals from • *Benchmarks for Science Literacy (BSL)*, • *National Science Education Standards (NSES)*, • and *Maine Learning Results (MLR)*
Lesson 1: In Search of Light ***Exploring the Ongoing Role of Light Energy in Human Lives*** *(2 sessions)* In this introduction to the *Energy Lights Maine* module, students consider the ongoing role of light energy in humans' lives. Through a folktale about the Sun, students are reminded that sunlight is the primary source of light energy on Earth. Students investigate a variety of early light emitting devices and consider their benefits and drawbacks.	• Light is a form of energy. • The Sun is the primary source of Earth's light energy. • Human knowledge and skill to create light emitting devices has evolved throughout history.	• Develop a basic understanding that the Sun is the primary source of Earth's energy including light. • Explore light emitting devices of the past and consider their benefits and drawbacks. • Make the connection that natural resources are used to produce (as sources of) light.	• Recognize that the Sun is the source of Earth's surface heat and light energy. MLR D2(3-5) e • Explain that natural resources are limited, and that reusing, recycling, and reducing materials and using renewable resources is important. MLR C3(3-5) e • Science helps people understand their natural world. MLR C4(3-5)
Lesson 2: Circuits and Electric Light *(2 sessions)* Students begin this lesson by examining the components of a portable lighting device- a battery operated flashlight. This initial exploration and the discussion it generates is used to begin a guided exploration of simple circuitry. Students attempt to light a bulb using a battery, a wire, and a light bulb. Students keep a record of each attempt using words and sketches, noting which ones are successful and which are not.	• A complete path to and from a source is needed for an electric current to flow. • The flow of a complete electric current can produce light.	• Determine how to light a bulb with a battery and wire. • Recognize that electric current needs to travel in a complete loop in order to light a bulb. • Identify the essential components of a circuit including a pathway and a source. • Draw a complete circuit needed to light a bulb.	• Electricity in circuits can produce light, heat, sound and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass. NSES B(K-4) • Offer reasons for their findings and consider reasons suggested by others. BSL 12A (3-5) • Keeping records of their investigations and observations and not change the records later. BSL 12A (3-5) • Give examples of how gravity, magnets, and electrically charged materials push and pull objects. MLR D4 (3-5)d

Lesson Matrix

Overview	Key Ideas	Lesson Goals Students will:	Connection to Learning Goals from • *Benchmarks for Science Literacy (BSL)*, • *National Science Education Standards (NSES)*, • and *Maine Learning Results (MLR)*
Lesson 3: A Systematic Look at the Incandescent Light Bulb *(2-3 sessions)* Through first hand observations of an incandescent light bulb, students discover the internal components. Students expand their circuitry knowledge by considering the pathway of electrical energy through a light bulb and by incorporating the bulb into an entire electrical system – a complete circuit. They also explore the concept of a system by considering the implications of a nonworking component of a light bulb.	• Light bulbs are made up of smaller parts, each with its own function. The parts work together to light the bulb. • In a complete circuit, electrical energy not only flows to the light bulb but through the light bulb. • If a part of the bulb or circuit is missing, broken, worn out, mismatched, or misconnected, the circuit will not be complete. • Many circuits incorporate switches. The simplest switch has two metal contacts that, when touching, complete the circuit and allow electricity to flow, and, when separated, break the circuit and not allow the electricity to flow.	• Recognize that light bulbs have parts and that the parts work together as a system. • Describe the flow of electrical energy through a light bulb. • Explain how a simple switch can be used to control the flow of electrical energy.	• Give examples that show how individual parts of organisms, ecosystems, or human-made structures can influence one another. MLR A1(3-5) a • Explain ways that things including organisms, ecosystems, or human-made structures may not work as well (or not at all) if a part is missing, broken, worn out, mismatched, or misconnected. MLR A1(3-5) b • Electricity in circuits can produce light, heat, sound, and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass. NSES B(K-4) 10
Lesson 4: The Case of the Missing Wires ***Conductors!*** *(2-4 sessions)* After reviewing the essential components of electrical circuits students will be guided through a mystery in which they investigate the conductivity of various materials. Explorations lead to a beginning understanding of uses and safety concerns associated with conductors and insulators.	• While electrical circuits can be connected in different ways, all circuits have three essential parts: a source, a pathway, and a receiver. • A complete path to and from the source (loop) is needed for the electric current to flow. • Current electricity can exist in and move through a conductor. A conductor is a material that allows an electric current to pass through it. • An insulator does not allow an electric current to pass through it.	• Recognize that all materials are not able to provide a pathway for the flow of electricity. • Examine the differences in electrical conductivity of a variety of common materials. • Use knowledge of conductors and insulators to explain why and how certain materials are used simple electrical devices (i.e. light bulbs, extension cords, desk lamps, etc.).	• Electricity in circuits can produce light, heat, sound and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass. NSES B(K-4) • Materials vary in how they respond to electrical currents, magnetic forces, and visible light or other electromagnetic waves. BSL 4D/M9(6-8) • Offer reasons for their findings and consider reasons suggested by others. BSL 12A (3-5) • Scientists develop explanations using observations (evidence) and what they already know about the world (scientific knowledge). Good explanations are based on evidence from investigations. NSES A (K-4) • Keeping records of their investigations and observations and not change the records later. BSL 12A (3-5)

Lesson Matrix

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Lesson 5: Signs of Safety *(1-2 sessions)* After taking a closer look at the materials making up the components of familiar light emitting devices, students extend their understanding of conductors and insulators by identifying potential electrical hazards, discussing what makes them hazardous, and suggesting what can be done to prevent such hazards.	• A complete path to and from the source (loop) is needed for the electric current to flow. • Current electricity can exist in and move through a conductor. A conductor is a material that allows an electric current to pass through it. • An insulator does not allow electric current to pass through it easily. • Electrical energy can be used safely in our homes, businesses, and schools, but it is not without risks. By understanding how electric current travels, people can minimize their chances of being seriously injured or killed from electrical hazards.	• Recognize the applications of conductors and insulators in everyday devices and situations. • Identify electrical hazards in homes, businesses, and schools. • Suggest ways to prevent serious injury and death from electrical hazards.	• Electricity in circuits can produce light, heat, sound and magnetic effects. Electrical circuits require a complete loop through which an electrical current can pass. NSES B(K-4) • Materials vary in how they respond to electrical currents, magnetic forces, and visible light or other electromagnetic waves. BSL 4D/M9(6-8) • The potential for accidents and the existence of hazards imposes the need for personal injury prevention. Safe living involves the recognition of risk in personal decision. NSES F (5-8)
Lesson 6: **People Have the Power!** ***Electricity Generation*** *(1-2 sessions)* Where does electricity that is used to light our homes, schools, and businesses come from? In this lesson, students investigate how electricity is generated on a wide scale basis. The major components of electric production: the turbine, the generator, and energy source are introduced in this lesson.	• Electricity can be generated using a variety of energy sources. • Presently, the majority of electricity generated uses some of the same methods that have been used for over 100 years. • Electricity generation most commonly involves a turbine and generator. • Some energy sources are renewable and some are nonrenewable.	• Explore how electricity is generated. • Investigate several energy sources used in the generation of electricity. • Consider why different energy sources are used in the generation of electricity. • Be introduced to the idea that some energy sources are renewable and some energy sources are nonrenewable.	• The sun is the main source of energy for people and they use it in various ways. The energy in fossil fuels such as natural gas and coal comes from the sun indirectly, because the fuels come from plants that grew long ago. BSL 8C(3-5) b • Electrical energy can be produced from a variety of energy sources... Moreover, electricity is used to distribute energy quickly and conveniently to distant locations. BSL 8C (6-8) d

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Lesson Matrix

PowerSleuth
Maine Energy Education Curriculum

Overview	Key Ideas	Lesson Goals Students will:	Connection to Learning Goals from • *Benchmarks for Science Literacy (BSL)*, • *National Science Education Standards (NSES)*, • and *Maine Learning Results (MLR)*
Lesson 7: **Around and Around They Go** ***Turbines*** *(2-4 sessions)* Turbines are a common component in most forms of electricity production. During this lesson, students explore turbines by designing and building blades for a simple wind turbine.	• Wind, water, and steam can be used to make things happen. In the context of generating electricity, wind energy can spin a turbine. • Technological design involves using scientific principles to solve problems. • Predicting, observing, designing, testing, analyzing, and redesigning are all part of technological design.	• Describe how wind, water, or steam can be used to make things happen. • Identify different uses of windmills and wind turbines. • Observe and describe how different blade materials and shapes harness wind. • Analyze turbine designs for strengths and weaknesses and implement some of their improvement ideas.	• Propose a solution to a design problem that recognizes constraints including cost, materials, time, space, or safety. MLR B2 (3-5) b • Evaluate their own design results, as well as those of others, using established criteria. MLR B2 (3-5) e • Modify designs based on results of evaluations. MLR B2 (3-5) f • Present the design problem, process, and design or solution using oral, written, and/or pictorial means of communication. MLR B2 (3-5) g • Give examples of changes in the environment caused by natural or man-made influences. MLR C3 (3-5) b • Explain that natural resources are limited, and that reusing, recycling, and reducing materials and using renewable resources is important. MLR C3 (3-5) c • Predict the effect of a given force on the motion of an object. MLR D4 (3-5) a
Lesson 8: : Light Bulbs and Energy Efficiency *(2 sessions)* Students begin to develop an understanding of energy efficiency and the importance of energy conservation by comparing different light bulbs. By comparing the amount of energy, heat, bulb life, and light output each bulb delivers, students learn that some bulbs provide the same light output using less electrical energy. The lesson culminates with a discussion about the broader impact of using energy wisely.	• Not all of the energy that a device uses gets used in the way people intend. As energy moves from place to place, it always produces heat which is often an undesired effect. • Things that are energy-efficient use less energy to do the same task. Energy-efficient devices minimize or redirect unintended energy effects. • Using energy responsibly is something everyone can and should do.	• Develop an understanding of energy-efficiency and the importance of energy conservation. • Discover that some devices do the same job but use less energy to do so. • Recognize that there are many factors to consider when deciding how to use energy responsibly.	• Some people try to reduce the amount of fuels they use in order to conserve resources, reduce pollution, or to save money. BSL 8C/E4 (3-5) • Explain that natural resources are limited, and that reusing, recycling, and reducing materials and using renewable resources is important. MLR C3 (3-5) c • Give examples of changes in the environment caused by natural or man-made influences. C3 (3-5) b • Explain how scientific and technological information can help people make safe and healthy decisions. C3 (3-5) a

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Lesson 9: Bright Schools ***Energy Knowledge in Action!*** *(2-4 sessions)* In this culminating lesson, students examine electric lighting used in their school and determine if there are methods that can reduce the amount of energy being used for the schools' lighting.	• By modifying habits, people can reduce the amount of energy being used for lighting. • By taking action, students can incorporate these simple habits to save energy at school. • These actions are cumulative, important, and have an effect on our environment.	• Conduct a survey to determine how energy is used for lighting in school. • Make recommendations for reducing the amount of energy being used for lighting in school. • Recognize that everyone can contribute to using energy more responsibly by including simple habits like turning off a light when it is not needed.	• Some people try to reduce the amount of fuels they use in order to conserve resources, reduce pollution, or to save money. BSL 8C/E4 (3-5) • Explain that natural resources are limited, and that reusing, recycling, and reducing materials and using renewable resources is important. MLR C3 (3-5) c