

ENERGY

IN THE CLASSROOM

Correlation of NEED Materials
to the
Learning Standards
of the
State of Michigan
for
Science
K-12

NEED

25th
Anniversary
2005

Putting Energy into Education

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or to receive the materials and training needed to
conduct an innovative energy unit in your classroom
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*The National Energy Education Development (NEED) Project is a 501(c)(3) nonprofit education association dedicated to providing professional development and objective, comprehensive, innovative materials for teachers to use to teach students about energy.
Materials are available for students in grades K–12.*

Primary Correlations Grades K-4

Strand I. Constructing New Scientific Knowledge

Standard I.1 Constructing New Scientific Knowledge

All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings using appropriate technology; and reconstruct previously learned knowledge.

Strand II. Reflecting on Scientific Knowledge

Standard II.1 Reflecting on Scientific Knowledge

All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science.

Strand III. Using Scientific Knowledge in Life Science

Standard III.5 Ecosystems

All students will explain how parts of an ecosystem are related and how they interact; explain how energy is distributed to living things in an ecosystem; investigate and explain how communities of living things change over a period of time; describe how materials cycle through an ecosystem and get reused in the environment; and analyze how humans and the environment interact.

Strand IV. Using Scientific Knowledge in Physical Science

Standard IV.1 Matter and Energy

All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter.

Standard IV.2 Changes in Matter

All students will investigate, describe and analyze ways in which matter changes; describe how living things and human technology change matter and transform energy; explain how visible changes in matter are related to atoms and molecules; and how changes in matter are related to changes in energy.

Standard IV.3 Motion of Objects

All students will describe how things around us move and explain why things move as they do; demonstrate and explain how we control the motions of objects; and relate motion to energy and energy conversions.

Standard IV.4 Waves and Vibrations

All students will describe sounds and sound waves; explain shadows, color, and other light phenomena; measure and describe vibrations and waves; and explain how waves and vibrations transfer energy.

NEED Materials

Energy Fair
Primary Science of Energy
Exploring Magnets
The Sun and Its Energy
Energy from the Sun
Primary/Elementary Infobooks
Building Buddies

Primary/Elementary Infobooks
Primary Energy Stories and More
The Sun and Its Energy
Energy from the Sun
Energy Around the World (4)
Building Buddies

Primary/Elementary Infobooks
Primary Energy Stories and More
Energy in the Balance
Building Buddies
Today in Energy
Trash Flip Book
Trash Talk

Primary Science of Energy
Exploring Magnets
The Sun and Its Energy
Energy from the Sun
ElectroWorks (4)
Building Buddies

Primary Science of Energy
Building Buddies
EnergyWorks (4)
ElectroWorks(4)

Primary Science of Energy
Exploring Magnets
EnergyWorks (4)

Primary Science of Energy
EnergyWorks (4)

Primary Correlations Grades K-4

Strand V. Using Scientific Knowledge in Earth Science

Standard V.1 The Geosphere

All students will describe the earth's surface; describe and explain how the earth's features change over time; and analyze effects of technology on the earth's surface and resources.

Standard V.2 The Hydrosphere

All students will demonstrate where water is found on earth; describe the characteristics of water and how water moves; and analyze the interaction of human activities with the hydrosphere.

Standard V.3 The Atmosphere and Weather

All students will investigate and describe what makes up weather and how it changes from day to day, from season to season and over long periods of time; explain what causes different kinds of weather; and analyze the relationships between human activities and the atmosphere.

NEED Materials

Primary/Elementary Infobooks
Building Buddies
Primary Energy Stories and More

Primary/Elementary Infobooks
Building Buddies
Primary Energy Stories and More

Primary/Elementary Infobooks
Building Buddies
Primary Energy Stories and More
The Sun and Its Energy
Energy from the Sun

Intermediate Correlations Grades 5–8

Strand I. Constructing New Scientific Knowledge

Standard I.1 Constructing New Scientific Knowledge

All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings using appropriate technology; and reconstruct previously learned knowledge.

Strand II. Reflecting on Scientific Knowledge

Standard II.1 Reflecting on Scientific Knowledge

All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science.

Strand III. Using Scientific Knowledge in Life Science

Standard III.5 Ecosystems

All students will explain how parts of an ecosystem are related and how they interact; explain how energy is distributed to living things in an ecosystem; investigate and explain how communities of living things change over a period of time; describe how materials cycle through an ecosystem and get reused in the environment; and analyze how humans and the environment interact.

Strand IV. Using Scientific Knowledge in Physical Science

Standard IV.1 Matter and Energy

All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter.

Standard IV.2 Changes in Matter

All students will investigate, describe and analyze ways in which matter changes; describe how living things and human technology change matter and transform energy; explain how visible changes in matter are related to atoms and molecules; and how changes in matter are related to changes in energy.

Standard IV.3 Motion of Objects

All students will describe how things around us move and explain why things move as they do; demonstrate and explain how we control the motions of objects; and relate motion to energy and energy conversions.

Standard IV.4 Waves and Vibrations

All students will describe sounds and sound waves; explain shadows, color, and other light phenomena; measure and describe vibrations and waves; and explain how waves and vibrations transfer energy.

NEED Materials

Energy Fair
ElectroWorks
EnergyWorks (5-6)
ThermoDynamics (7-8)
Exploring Solar Energy

Intermediate Energy Infobook
Yesterday in Energy
Energy Around the World
What Car Will You Drive?

Intermediate Energy Infobook
Energy in the Balance
Great Energy Debate Game
Trash Talk
Museum of Solid Waste and Energy
Monitoring & Mentoring (5-6)
Learning & Conserving (7-8)

EnergyWorks (5-6)
ThermoDynamics (7-8)
ElectroWorks
Science of Energy

EnergyWorks (5-6)
ThermoDynamics (7-8)
Exploring Solar Energy
ElectroWorks
Science of Energy

EnergyWorks (5-6)
ThermoDynamics (7-8)
Science of Energy

EnergyWorks (5-6)

Intermediate Correlations Grades 5–8

NEED Materials

Strand V. Using Scientific Knowledge in Earth Science

Standard V.1 The Geosphere

All students will describe the earth's surface; describe and explain how the earth's features change over time; and analyze effects of technology on the earth's surface and resources.

Standard V.2 The Hydrosphere

All students will demonstrate where water is found on earth; describe the characteristics of water and how water moves; and analyze the interaction of human activities with the hydrosphere.

Standard V.3 The Atmosphere and Weather

All students will investigate and describe what makes up weather and how it changes from day to day, from season to season and over long periods of time; explain what causes different kinds of weather; and analyze the relationships between human activities and the atmosphere.

**Intermediate Energy Infobook
Monitoring & Mentoring (5-6)
Learning & Conserving (7-8)
Great Energy Debate Game
Marine Energy (7-8)
Exploring Solar Energy
Ocean Energy**

Secondary Correlations Grades 9–12

NEED Materials

Strand I. Constructing New Scientific Knowledge

Standard I.1 Constructing New Scientific Knowledge

All students will ask questions that help them learn about the world; design and conduct investigations using appropriate methodology and technology; learn from books and other sources of information; communicate their findings using appropriate technology; and reconstruct previously learned knowledge.

Secondary Energy Infobook
ThermoDynamics
Learning & Conserving
Mission Possible
Alternative Transportation Fuels
Photovoltaics

Strand II. Reflecting on Scientific Knowledge

Standard II.1 Reflecting on Scientific Knowledge

All students will analyze claims for their scientific merit and explain how scientists decide what constitutes scientific knowledge; how science is related to other ways of knowing; how science and technology affect our society; and how people of diverse cultures have contributed to and influenced developments in science.

Secondary Energy Infobook
Mission Possible
Energy Around the World
Alternative Transportation Fuels
Photovoltaics

Strand III. Using Scientific Knowledge in Life Science

Standard III.5 Ecosystems

All students will explain how parts of an ecosystem are related and how they interact; explain how energy is distributed to living things in an ecosystem; investigate and explain how communities of living things change over a period of time; describe how materials cycle through an ecosystem and get reused in the environment; and analyze how humans and the environment interact.

Secondary Energy Infobook
Great Energy Debate Game
Learning & Conserving
Mission Possible
Alternative Transportation Fuels
Photovoltaics

Strand IV. Using Scientific Knowledge in Physical Science

Standard IV.1 Matter and Energy

All students will measure and describe the things around us; explain what the world around us is made of; identify and describe forms of energy; and explain how electricity and magnetism interact with matter.

Science of Energy
ThermoDynamics
Learning & Conserving
Photovoltaics

Standard IV.2 Changes in Matter

All students will investigate, describe and analyze ways in which matter changes; describe how living things and human technology change matter and transform energy; explain how visible changes in matter are related to atoms and molecules; and how changes in matter are related to changes in energy.

Science of Energy
ThermoDynamics
Learning & Conserving
Photovoltaics

Standard IV.3 Motion of Objects

All students will describe how things around us move and explain why things move as they do; demonstrate and explain how we control the motions of objects; and relate motion to energy and energy conversions.

Science of Energy

Standard IV.4 Waves and Vibrations

All students will describe sounds and sound waves; explain shadows, color, and other light phenomena; measure and describe vibrations and waves; and explain how waves and vibrations transfer energy.

Science of Energy

Secondary Correlations Grades 9–12

NEED Materials

Strand V. Using Scientific Knowledge in Earth Science

Standard V.1 The Geosphere

All students will describe the earth's surface; describe and explain how the earth's features change over time; and analyze effects of technology on the earth's surface and resources.

Standard V.2 The Hydrosphere

All students will demonstrate where water is found on earth; describe the characteristics of water and how water moves; and analyze the interaction of human activities with the hydrosphere.

Standard V.3 The Atmosphere and Weather

All students will investigate and describe what makes up weather and how it changes from day to day, from season to season and over long periods of time; explain what causes different kinds of weather; and analyze the relationships between human activities and the atmosphere.

**Secondary Energy Infobook
Great Energy Debate Game
Mission Possible**

**Secondary Energy Infobook
Marine Energy**

**Secondary Energy Infobook
Learning & Conserving**

NEED PROJECT MATERIALS

The NEED Project is a nonprofit organization dedicated to educating students, teachers, and the community about energy. Below is a description of NEED materials available to teachers listed in alphabetical order:

Biodiesel (Grades 4-12)—Students explore biodiesel as a transportation fuel with backgrounders on three reading levels and suggested activities.

Blueprint for Success (Grades K-12)—This booklet is designed to help teachers develop an effective energy education program for their grade level and special needs using NEED materials. Pre- and post surveys at four reading levels and an energy unit exam are also included.

Building Buddies (Grades 1-3)—This primary program introduces students to basic concepts of energy use and conservation, beginning with activities focused on home energy use and extending to school energy use and conservation measures. Students monitor weather conditions, record indoor and outdoor temperatures, and evaluate their energy use behaviors daily. Individual students and classrooms are recognized for energy-saving habits and being good Building Buddies. Teacher and student guides are included. The Building Buddies Kit includes an indoor/outdoor thermometer, immersion thermometer, flicker checker, and Building Buddies pouches, buttons, stickers, and certificates.

Current Energy Affair (Grades 7-12)—Students act as TV correspondents to report on electric power generation. They explore how electricity is generated and transported, what energy sources are used to make it, the history of electricity, efficiency and conservation, and the future of electricity generation.

ElectroWorks (Grades 4-7)—This hands-on unit introduces students to the mysteries of electricity with five centers—static electricity, batteries, magnets, electromagnetism, and circuits. This unit includes a Teacher Guide and Student Guide with a backgrounder, worksheets, and experiments. An ElectroWorks Kit with the materials needed to conduct the experiments and a class set of Student Guides is also available.

Energy Analysis (Grades 7-12)—Students research and analysis information in graphic formats to discern energy trends.

Energy Around The World (Grades 5-12)—Students work in groups to research and make presentations on energy use in one of 60 countries around the world.

Energy Carnivals (Grades K-12)—NEED's popular carnival games are an excellent way to get students and adults thinking about energy. The Energy Carnival for Grades 4-12 contains complete instructions for ten carnival games including Energy Pictionary, The Wheel of Energy, Top Five, Energy Knockdown, and Energy Taboo. An excellent activity for elementary or middle school energy fair or Earth Day celebration. The Primary Energy Carnival contains nine games appropriate for students in Grades K-3, including games such as Energy Bingo, Energy Math, Memory, Match Game, and Energy Pursuit.

Energy Conservation Contract (Grades 4-12)—Students ask their families and neighbors to sign contracts in which they agree to save energy at home and on the road. Teacher and student guides are included.

Energy Enigma (Grades 7-12)—Students put on their detective hats to uncover the mysteries of the energy sources.

Energy Fair (Grades 2-6)—This unit is a guide to teaching the experimental design model with an emphasis on energy. Classroom projects, suggested energy fair projects, and a student guide are included.

Energy Flows (Grades 5-12)—This hands-on activity explains forms of energy and energy transformations.

Energy From The Sun (Grades 3-4)—This elementary solar energy kit teaches the basics of solar energy and photovoltaics with hands-on explorations.

Energy House (Grades 4-12)—In this activity, students insulate a cardboard-box house with a variety of insulating materials that they purchase with energy bucks, learning about energy conservation and savings. Teacher and student guides are included.

Energy Infobooks (Grades K-12)—NEED's energy infobooks are available in primary (grades K-2), elementary (3-4), intermediate (grades 5-8), and secondary (grades 7-12) versions. The booklets provide information on the sources of energy, electricity, consumption, as well as general energy information. The booklets are revised each year to provide the most complete, up-to-date information. Class sets of infobooks can be ordered.

Energy Infobook Activities (Grades K–12)—NEED’s energy infobook activities are companion workbooks to the infobooks and are available in primary (grades K-2), elementary (3-4), intermediate (grades 5-8), and secondary (grades 7-12) versions.

Energy In The Balance (Grades 4–6)—This unit introduces students to the advantages and disadvantages of the major energy sources through a series of critical thinking, charting, and graphing activities.

Energy Jeopardy (Grades 4-12)—Students enjoy learning about energy using this game show format.

Energy Math Challenge (Grades 3–12)—These activities strengthen students’ math skills while increasing their knowledge of energy. Students work individually and in teams to solve energy math problems. Elementary, intermediate and secondary skill levels are included.

Energy On Public Lands (Grades 5-8)—Students learn and teach others about how energy on public lands is managed with background information and hands-on activities.

Energy On Stage (Grades 4–12)—NEED’s own versions of cartoon characters, classic TV characters, blockbuster movies, and children’s stories—all with an energy story to tell.

Energy Source Expo (Grades 3-12)—Students work in groups to develop exhibits and make presentations on the major energy sources as they develop an expo to teach others. Teacher and student instructions and background resources are included.

EnergyWorks—(Grades 4–8) This is a hands-on unit that introduces students to the things energy does—heat, light, motion, sound, growth, and powering technology. This unit includes a Teacher Guide and Student Guide with backgrounders, worksheets, and hands-on experiments. Separate heat, light, motion, and sound units are available. An EnergyWorks Kit with the materials needed to conduct the experiments and a class set of Student Guides is also available.

Ethanol (Grades 4-12)—Students explore ethanol as a transportation fuel with backgrounders on three reading levels and suggested activities.

Exploring Energy (Grades 4–6)—This booklet contains short articles and hands-on explorations on a variety on energy-related topics, such as composting, solar cooking, heat, refrigeration, microwaves, how cars work, and the greenhouse effect.

Exploring Magnets (Grades 1–4)—The Exploring Magnets unit teaches the fundamentals of magnetism using a hands-on kit.

Exploring Solar Energy (Grades 5–8)—The intermediate solar energy kit teaches students the applications of solar energy and photovoltaics using hands-on materials.

Future is Today (Grades 7–12)—Students learn about conventional and alternative fuels with comprehensive background information and suggested activities.

Games & Icebreakers (Grades K–12)—Fun and educational activities and games, including Bumper Stumpers, Energy Bingo, Electric Connections, Energy Chants, and America’s Most Wanted Energy Wasters.

Global Trading Game (Grades 4–12)—This activity, developed by the Ohio Energy Project, allows students to become economic advisors, geologists and miners as they work in teams to learn about their assigned country’s resources and needs, then trade with other countries.

Great Energy Debate Game (Grades 5–12)—Students work cooperatively to devise strategies for the Great Energy Debate Game. Students represent different energy sources and develop arguments on the merits of their energy source over the others. A good critical thinking game.

Great Energy Rock Performances (Grades 3–12)—Recommended for grades 3-12. Student rock bands sing about their energy sources in this rousing contest. You’ll learn more from these energy rock stars as they tell their stories to interviewers out to get the latest energy scoop. Teacher and student instructions included, along with sample songs and interviews.

H2 Educate (Grades 6-12)—This intermediate/secondary unit introduces students to hydrogen as an important energy carrier for the future, both as a fuel for distributed generation and as a transportation fuel. A hands-on kit explores electrolysis, atomic structure, and hydrogen fuel cells, and includes a hydrogen fuel cell car.

Learning & Conserving (Grades 7–12)—Secondary students learn about energy consumption and conservation by reading utility meters and utility bills, comparing EnergyGuide labels, and exploring electric nameplates. Students conduct comprehensive surveys of the school building and school energy consumption—gathering, recording and analyzing data, and monitoring energy usage. Students develop a comprehensive energy management plan for the school that includes suggestions for retrofits, systems management and conservation practices. The Learning and Conserving Kit includes indoor/outdoor thermometer/ immersion thermometer, hygrometer, light meter, and measuring tape.

Marine Energy (Grades 7–12)—Students construct a topographical map of the United States, including the outer continental shelf and the Exclusive Economic Zone, that shows the major land and underwater formations. Students also conduct a community hearing on the development of energy resources and/or minerals in these areas.

Mission Possible: Energy Trade-offs (Grades 7–12)—This is an activity in which students are challenged to develop an energy plan for a fictitious, growing country. Students consider the advantages and disadvantages of the energy sources available in the country so that they can increase electricity production while maintaining environmental quality.

Monitoring & Mentoring (Grades 4–6)—The elementary program introduces students to methods of measuring energy usage, determining costs, and quantifying environmental effects through a series of activities that include reading electric and natural gas meters, EnergyGuide labels, and electric nameplates. Students conduct surveys of the school building and school energy consumption—gathering, recording and analyzing data, and monitoring energy usage. Students are encouraged to buddy with primary students to learn by teaching others. The Monitoring & Mentoring Kit includes indoor/outdoor thermometer, immersion thermometer, hygrometer, and light meter.

Museum of Solid Waste and Energy (Grades 6–12)—Students create museum stations on eight solid waste and energy topics, such as reusing, recycling paper, metals, and plastics, reducing, and landfilling.

Mystery World Tour (Grades 4–8)—This activity allows students to create 12 murals depicting energy sources and terms, while learning about different countries.

Ocean Energy (Grades 6–8)—Intermediate students learn about all of the energy sources available in, under and over the ocean, with background information and hands-on activities.

Photovoltaics (Grades 8-12)—This secondary solar energy kit provides comprehensive information on solar energy and photovoltaics with hands-on explorations.

Primary Energy Stories & More (Grades K–4)—This booklet contains a series of stories and hands-on activities for primary teachers to use to introduce basic energy concepts and the major energy sources.

Primary Science of Energy (Grades 1–4)—The Primary Science of Energy, for students in Grades K-4, teaches the fundamentals of motion, heat, sound and light through a series of hands-on activities that introduce simple measurement tools such as thermometers, balances, rulers, beakers, and graduated cylinders. Primary students learn to observe, measure, record results, compare and contrast, categorize, make predictions, analyze and graph results, and draw conclusions.

Projects & Activities (Grades K–12) This booklet includes workplan and suggestions for energy outreach activities to other classes, schools, families, and communities, as well as the **Youth Awards Guide** and application form.

Science of Energy—Elementary & Secondary (Grades 4–12)—The Elementary Science of Energy, for students in Grades 4-8, teaches about the forms of energy and how one form is converted into other forms. It is designed to take five class sessions of 45 minutes. The kit includes teacher demonstrations and six experiment stations with complete student instructions and worksheets that incorporate the scientific method. The Secondary Science of Energy (Grades 8-12) teaches the same concepts with more detailed scientific explanations.

Sun and Its Energy (Grades K–2)—This primary solar energy kit teaches the fundamentals of solar energy and photovoltaics with hands-on explorations.

Talking Trash (Grades 4–6)—Students create exhibits of eight trash topics, including reusing, recycling paper, metals, and plastics, reducing, and landfilling.

This Mine Of Mine (Grades 2-6)—Students explore the formation, geology, recovery, and uses of coal, as well as the reclamation of mine sites, by building a plot of land, mining the coal, and reclaiming the land.

Today In Energy (Grades K-4)—Students are introduced to the concepts of energy choice, trade-offs, and costs using math and critical thinking skills to get them through the day with a limited supply of energy bucks.

Transparent Energy (Grades 5–12)—In this activity, students prepare and make presentations on the ten energy sources using transparencies. Included are teacher and student instructions, a sample energy presentation on energy consumption, sample presentation scripts, and transparency masters for the energy sources.

Transportation Fuels Debate Game (Grades 5-12)—Students evaluate the advantages and disadvantages of conventional and alternative transportation fuels.

Transportation Fuels Expo (Grades 5-12)—Students work in groups to develop exhibits and make presentations on conventional and alternative transportation fuels in a debate game format.

Transportation Fuels Rock Performances (Grades 4-12)—Students rock bands write songs and sing about alternative fuels in this entertaining activity. Teacher and student instructions are included, along with sample songs and interviews.

Trash FlipBook (Grades K–2)—Primary students are introduced to trash, recycling, and landfills using a flipbook with simple words and bold graphics, with comprehensive teacher information and suggested hands-on activities.

ThermoDynamics (Grades 7–12)—A guide to hands-on experiments that explore concepts of thermodynamics, including molecular structure, conduction, convection, radiation, specific heat, heat of fusion, and heat of vaporization.

This Mine of Mine (Grades 2–6)—Students build a plot of land with coal deposits in it; mine the coal using tools, then reclaim the land and investigate the uses of coal to produce energy.

Today in Energy (Grades K–4)—This primary activity introduces students to the concepts of choice, trade-offs and economics. Students use math and critical thinking skills to get them through the day with a limited supply of money.

U.S. Energy Geography (Grades 4-12)—This resource includes maps of all ten major energy sources, energy production, energy consumption, and more. The maps can be used as transparency masters.

What Car Will You Drive? (Grades 5–6)—Students are introduced to conventional and alternative fuels with background information and suggested activities.

Yesterday In Energy (Grades 4–12)—The booklet informs students about how life has changed in the United States in the last 100 years, especially in terms of energy sources and usage. Students work in small groups to prepare a museum exhibit and short presentation of one facet of the life of yesterday and today, such as transportation, heating, lighting, and jobs.