CURRICULUM GUIDE

August 2022

www.coolercommunities.org

A Project of the Harold Grinspoon Charitable Foundation

SUMMARY

The Cooler Communities Project

The Cooler Communities Project provides opportunities for public discussion around climate change solutions. Through student engagement embedded in curriculum work and related community fairs, the project highlights actions that individuals, households, and communities can take to reduce carbon emissions, with particular emphasis on wise use of energy. The goals of the project are:

● To empower K-12 students and celebrate their contributions to climate change solutions.

● Offer incentives for teachers and students to study climate change solutions within existing curriculum requirements.

● Lower the carbon footprints of communities throughout Massachusetts.

A major feature is the participation of K-12 students in a community fair at which they showcase what they have learned through lessons - based in STEM, ELA, history, and the arts – and teach their community about the most effective ways to reduce carbon emissions. School districts that participate in Cooler Communities Fairs receive grants of up to $5000. Presented in collaboration with community partners, each Cooler Communities Fair features climate-friendly vendors, exhibits, workshops, speakers, and family friendly activities.

The Cooler Communities Curriculum Guide

The Cooler Communities Curriculum Guide provides ideas and information that can be used by Massachusetts K-12 educators to teach about climate change solutions that students, their families, and their community can implement. If desired, the ideas can be developed by teachers, individually or collaboratively, into projects for a Cooler Communities Fair. The contents of this guide include:

- descriptions of ideas for lessons and projects

- summaries of lesson plans

- links to detailed lesson plans and projects

- suggested lesson extensions that can result in cross curricular activities

- relevant Massachusetts Frameworks Standards

- links to resources

- possible projects and exhibits for Cooler Communities Fairs

- examples of projects presented at previous Cooler Communities Fairs

NOTE: This document contains bookmarks and hyperlinks. By clicking on an entry in the Table of Contents, you can go directly to that section of the document. Also, to shorten the length of the document and avoid repeating content, some lessons are bookmarked and links to those lessons are embedded in the titles of lessons elsewhere in the document. Those titles will not have content displayed below them. However, if you click on the title you will be taken to the lesson elsewhere in the document. For example, if a lesson titled "Climate Change Solutions" is appropriate for Grades 3-5, the title and description will be posted in the content for Grade 3. You can also find the title "Climate Change Solutions" in the content areas for Grades 4 and 5 without the description. You can click on the titles in those sections and you will be taken to the full description under the title in the Grade 3 section.

The Cooler Communities grant program is an initiative of the Harold Grinspoon Charitable Foundation in Western MA, with support from the Community Foundation of Western Massachusetts, UMass Clean Energy Extension and MassEnergize.

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SECTION I - PROJECTS BY GRADE

In Section I, lesson ideas are listed by grade from K to 12. They include the standards for various subjects that the lessons could be presented in. Some of the lesson ideas include links to specific lessons, materials, and assessments. All of the lesson ideas could lead to projects for a Cooler Communities Fair.

Elementary School

Grades K-2

Posters

Students create posters about the top solutions to reducing greenhouse gas emissions within their community: energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and/or reduce/refuse/reuse and recycle waste reduction. Posters could also focus on the local impacts of climate change, including its effects on health.
Subject(s): Science, Art, History and Social Science, ELA
Standard(s):
Science – ESS2-1, ESS2-2, ESS3-2, ESS3-3, PS3-1, PS3-2, ETS1-1, ETS1-2, ETS1-3
VisualArts –1,2,3,4,5,6,and10
History and Social Science
K and Grade 1: Topic 1. Civics and Topic 4. Economics
Grade 2: Topic 2. Geography and Topic 5. Economics
ELA – RI 1, 2, 3, 4, 6, 7, and 10; RF 1; W 1, 2, 4, 5, 6, 7 and 8; SL 1, 2, 3, 4, and 5; L 4 and 6

Grade 3

Cooking with the Sun: Comparing Yummy Solar Cooker Designs

Students learn about using renewable energy from the sun for heating and cooking as they build and compare the performance of four solar cooker designs. They explore the concepts of insulation, reflection, absorption, conduction and convection. They finish up by making quick-cooking food like marshmallow and chocolate s'mores! The lesson plan includes a list of materials needed, photos of solar cookers used around the world, vocabulary list, student worksheet, discussion questions, extension activities, modifications for older and younger students, and assessments for before, during, and after the activity.

This engineering curriculum aligns to Next Generation Science Standards (NGSS).
Science - 3-5-ETS1-2, 3-5-ETS1-2, and 4-PS3-4
Math - CCSS.Math.Content.4.MD.B and CCSS.Math.Content.5.G.A.2

Fueling Our Future: Exploring Sustainable Energy Use - Grades 3-5
This six lesson unit is provided by Western Washington University's CEDAR program. It begins by introducing students to foundational energy science. The lessons then shift to focus on personal energy use, energy sources and their impacts, and transportation fuels. The unit culminates with an energy conservation lesson that showcases young people from around the world implementing energy conservation strategies in their homes, schools, communities and beyond. This lesson can be used as a launching pad for a classroom action or service project. The pre and post assessment can be administered before and after this unit to measure student growth in content knowledge, personal attitudes, and personal behaviors about energy.
Each lesson contains:
• Additional resources
• Background information for educators
• Connections to the *Fundamental Concepts in Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education*
• Discussion questions
• Inquiry/critical thinking questions
• Key concepts • Lesson extensions
• Student objectives
• U.S. standards correlation
The unit along with the related teaching standards can be downloaded at https://cedar.wwu.edu/ee_ftf/5/.

Limericks

Students write two limericks, one about saving energy at home and one about saving energy at school. See also.
Subject(s): Science, History and Social Science, ELA
Standard(s):
Science – ESS3-1, ETS1-1, ETS1-2, ETS1-4
History and Social Science - Topic 1: Massachusetts cities and towns today and in history ELA – RL 4 and 6; RI 4, 6, and 10; W 3, 4, 5, 6, 7, 8, and 10; SL 5; L 1, 2, 3, 4, 5, and 6

Shrinking Our Footprint

Free registration at pblworks.org

Teaching materials and lesson plan are available for FREE

Students use measurement, data, and fraction concepts to develop, implement, and monitor an action plan for reducing their family's impact on the environment. Topics include electricity and car gas use. Students research general usage information (eg., mpg of the family car), conduct home inventories, graph results, set reduction goals, and identify strategies to achieve the goals.
Subjects: Math, Science, and ELA
NOTE: Standards are provided as 5th Grade Common Core Math and ELA and Next Generation Science Standards, but can be applied in Grades 3 to 6.
Math - 5.MD.B.2 and 5.MD.C.5
Science - 5-ESS3-1 Earth and Human Activity
ELA - W.5.2, W.5.9

Wind Turbine

Teachers can cover this topic a number of ways – wind as a source of energy, the structure of a turbine and how it can be used for energy production, the geographic and climate features that work best for wind energy, and an evaluation of the school, community, and/or region for wind energy production, and the pros and cons of wind turbines.

For information on lessons and resources, see KidWind.org and WindExchange.

Subject(s): Science, History and Social Science Standard(s):
Science ESS2-1, ESS2-2, PS2-1, ETS1-1, ETS1-2, ETS1-4
History and Social Science - Topic 1: Massachusetts cities and towns today and in history and Topic 2. The geography of Massachusetts

Grade 4

Billboard

Students design outdoor billboards that promote reducing greenhouse gas emissions within their community. Top solutions focus on energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and refuse/reduce/reuse/recycle waste reduction.
Billboards could also focus on the local impacts of climate change, including its effects on health. See also.
Subject(s): Science, Art, History and Social Science, ELA
Standard(s):
Science – ESS3-1, ESS3-2, PS3-2, PS3-3, PS3-4, ETS1-3, ETS1-5
Visual Arts Standards – 1, 2, 3, 4, 5, 6, and 10
History and Social Science – Topic 4. The expansion of the US over time and its regions today – The Northeast (4.T4a)
ELA – RI 1 to 10; W 1, 2, 4, 5, 6, 7, 9, and 10; SL 1 to 6, L 3, 4, 5, and 6

Cooking with the Sun: Comparing Yummy Solar Cooker Designs

Fueling Our Future: Exploring Sustainable Energy Use - Grades 3-5

Persuasive Writing Project

Teacher/Student selected science topics that promote reducing greenhouse gas emissions within their community. Top solutions focus on energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and reduce/reuse/recycle waste reduction.
Subject(s): Science, History and Social Science, ELA Standard(s):
Science – ESS3-1, ESS3-2, PS3-2, PS3-3, PS3-4, ETS1-3, ETS1-5
History and Social Science – Topic 4. The expansion of the United States over time and its regions today (4.T4a)

ELA – RI 1 to 10; W 1, 2, 4, 5, 6, 7, 8, 9, and 10; L 1 to 6

Shrinking Our Footprint

Solar Ovens (General Lesson Ideas)

Solar cookers can cook meat, vegetables, beans, rice, bread and fruit. They can bake, stew, steam, fry and braise using sunlight instead of gas or electricity. Students can learn the pros and cons of solar ovens, how they work, and where they would be suitable to use. Projects could include graphic depiction evaluating the pros and cons, diagrams or drawings of solar ovens, or plans for / construction of a model solar oven. Projects could also include an evaluation of where solar cookers could be used in their community, including their homes, community picnic areas, and campgrounds.
Subject(s): Science, Art, History and Social Science, ELA
Standard(s):
Science – ESS3-1, ESS3-2, PS3-2, PS3-3, PS3-4, ETS1-3, ETS1-5
Visual Arts Standards – 1, 2, 3, 4, 5, 6, and 10
History and Social Science - Topic 4. The expansion of the United States over time and its regions today (4.T4a)
ELA – RI 1 to 10; W 1, 2, 4, 5, 6, 7, 8, 9, and 10; L 1 to 6

Grade 5

Cooking with the Sun: Comparing Yummy Solar Cooker Designs

Fueling Our Future: Exploring Sustainable Energy Use - Grades 3-5

Newspapers in Education: Global Issues and Sustainable Solutions

This curriculum will spark student interest in global and environmental issues and sustainable solutions through 20 thought-provoking articles that first appeared in the Seattle Post-Intelligencer's Newspapers in Education series Skills for Everyday Living. This series of case studies and classroom activities can be used in full or in part to study specific topics. All articles include a student activity and "take action" idea.

https://cedar.wwu.edu/ee_ftf/8/

Shrinking Our Footprint

Super Hero Character

Students create an energy savings superhero on a poster and write a 150 word description of how the character promotes saving energy. See also.
Subject(s): Science, Art, ELA
Standard(s):
Science – ESS3-1, LS2-1, LS2-2, ETS3-1, ETS3-2 Visual Arts Standards – 1, 2, 3, 4, 5, 6, and 10 ELA – W 1 to 10

What Kind of Footprint? Carbon Footprint

Students determine their carbon footprints by answering questions about their everyday lifestyle choices and engineer plans to reduce their footprints. Students learn about their personal impacts on global climate change and how they can help the environment. The lesson plan includes a vocabulary list, YouTube video link, student worksheet, discussion questions, extension activities, modifications for older and younger students, and assessments for before, during, and after the activity.
This engineering curriculum aligns to Next Generation Science Standards (NGSS).
https://www.teachengineering.org/lessons/view/cub_footprint_lesson1
Science - 5-ESS3-1, MS-ESS3-5

Middle School

Grade 6

Climate Change: Connections and Solutions - Grades 6-8

The two week unit is provided by Western Washington University's CEDAR program. This curriculum is aligned with national science and social studies standards and may be used in other classes as well. Appropriate disciplines are suggested for each lesson. The 2-week unit begins with an introduction to climate change. During the first week, the

foundation is laid for understanding some of the forces behind climate change. Students learn basic scientific phenomena related to climate change, beginning with the carbon cycle and the greenhouse effect and concluding with an analysis of different fuel types. The second week widens and deepens students' understanding of climate change with an exploration of its connections to various social, economic, and environmental factors. By the end of this 2-week unit, students will understand and be able to communicate complex and interconnected issues related to climate change. Each week of the curriculum is a stand-alone unit and can be taught independently of the other week.

Energy Thinking

Fueling Our Future: Exploring Sustainable Energy Use Grades 6 to 8
The unit begins with lessons that introduce students to foundational energy concepts. The lessons then begin to focus more specifically on topics like energy access and transportation fuels. The unit culminates with an aviation-focused performance-based assessment that is integrated into the final three lessons.

This unit was designed to contribute to the educational mission of the Northwest Advanced Renewables Alliance to strengthen the overall scientific literacy of students with respect to biofuels. The pre and post assessment can be administered before and after this unit to measure knowledge and personal attitudes about energy consumption.
https://cedar.wwu.edu/ee_ftf/3/

Letter to Parents/Guardians/Family Members

In a letter of 500 words maximum, students challenge parents (family members/guardians) to change energy habits and become more energy efficient. Students can focus on informing their parents, family members, or guardians about the top solutions to reducing greenhouse gas emissions within their community: energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and reduce/reuse/recycle waste reduction. Students could also inform their parents, family members, or guardians about the local impacts of climate change, including its effects on health. See also.
Subject(s): Science, History and Social Science, ELA Standard(s):
Science – ETS1-1, ETS1-6, ETS2-1, ETS2-2
History and Social Science – Topic 1. Studying complex societies ELA – W 1 to 10

Newspapers in Education: Global Issues and Sustainable Solutions

Shrinking Our Footprint

What Kind of Footprint? Carbon Footprint

Grade 7

Climate Change: Connections and Solutions - Grades 6-8

Energy Thinking

What Kind of Footprint? Carbon Footprint

Energy Efficiency / Carbon Footprint

Students first learn about or review the relationship between carbon emissions and climate change. (See “What Kind of Footprint? Carbon Footprint,” above.) Students then learn about everyday activities that lead to carbon emissions – from using hot water, cooking, driving, heating and cooling homes, food production and consumption, agricultural practices, electricity usage, etc. Students also learn how to calculate the amount of carbon emitted by each everyday activity. Projects or displays for an exhibition could include:

- creating a method to use at home to evaluate individual and household carbon footprints
- sharing and comparing data of student and household carbon footprints
- committing to student and household changes in activities that generate carbon emissions
- calculating the change in individual student and household carbon footprints after modifying activities that generate carbon emissions

- calculating the change in the collective carbon footprint of the classroom's students and their households after modifying activities that generate carbon emissions
- sharing results of class assignments in a display at an exhibition
- creating an interactive exhibit whereby students could assist members of the public to evaluate their individual and household carbon footprints
- creating an energy efficient choices display

Subject(s): Science, ELA, Math Standard(s):
Science – ESS3-4, LS2-4, LS2-5, LS2-6, PS3-3, PS3-6, ETS1-2, ETS1-4, ETS3-3, ETS3-5 Math - 7.RP, 7.NS, 7.EE, 7.SP

[Fueling Our Future: Exploring Sustainable Energy Use Grades 6 to 8]

Life in a Changing Climate Program - 7th Grade

NOTE: There are costs associated with this program. A Cooler Communities grant can be used to offset the fees of Massachusetts-based nonprofit organizations.

Offered through Mass Audubon's Arcadia Wildlife Sanctuary, the program is available to teachers and schools in the Berkshires and Connecticut Valley region.

Class #1: Climate Science Basics
Students uncover some climate misconceptions and explore the carbon cycle's role in climate by becoming carbon at-oms both before and after the industrial revolution.

Class #2: Changing Wildlife
Students brainstorm changes to local wildlife populations and use historical bird species data to track changes in populations over time. Students will use the online Mass Audubon State of the Birds and Climate Change report to answer questions about range, distribution, breeding, and habit, and interpret graphs to predict why there has been either an increase or decrease in their species in Massachusetts.

Field Trip: Changing Habitats & Solutions
Students visit Arcadia's vernal pool, forest, field, farm, river, and meadow habitats to discover past, current, and future changes. They propose ways to protect habitats for the future, explore climate solutions, and participate in an optional outreach challenge.

For more information:
https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/arcadia/programs-classes-activities/schools-groups/schools/life-in-a-changing-climate

For a brochure that includes corresponding teaching standards:
https://www.massaudubon.org/content/download/17260/254853/file/Arcadia-Climate-Change-Program-brochure-2017.pdf

News Article

Students write an article about one or more of the top solutions to reducing greenhouse gas emissions within their community: energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and reduce/reuse/recycle waste reduction. Students could also explain the local impacts of climate change, including its effects on health. Articles could be published in a school newsletter or submitted for publication in a local or regional newspaper or magazine. See also.
Subject(s): Science, ELA
Standard(s):
Science – ESS3-4, LS2-4, LS2-5, LS2-6, PS3-3, PS3-6, ETS1-2 ELA – W 1 to 10

Newspapers in Education: Global Issues and Sustainable Solutions

Trash to Treasure!

Student teams use the engineering design process to create a useful product of their choice out of recyclable items and "trash." The class is given a "landfill" of reusable items, such as aluminum cans, cardboard, paper, juice boxes, chip bags, egg cartons, milk cartons, etc., and each group is allowed a limited amount of bonding materials, such as duct tape, hot glue and string. This activity addresses the importance of reuse and encourages students to look at ways they can reuse items they would otherwise throw away. The lesson plan includes a materials list, vocabulary list, student worksheet, extension activities, modifications for older and younger students, and assessments for before, during, and after the activity.
This engineering curriculum aligns to Next Generation Science Standards (NGSS).
Science: MS-ETS1-1
Math: CCSS.Math.Content.6.NS.B.3, CCSS.Math.Content.6.RP.A.3b, CCSS.Math.Content.6.SP.B.5

Vermicomposting and Gardening

Students can learn about reducing carbon and methane emissions through lessons and activities on vermicomposting and gardening. Two of the top solutions are sustainable landscaping and reduce/reuse/recycle waste reduction. Additional lessons could be added to tie in low carbon diets and reduced transportation as solutions for reducing individual, household, and community carbon emissions. Projects or displays for an exhibition could include:
- learning to separate waste for vermicomposting from other waste
- building a vermicomposting structure for home and/or school
- practicing vermicomposting at home and/or school
- estimating the amount of waste removed from the trash collection cycle by practicing vermicomposting at home and/or school
- dedicating the compost created by vermicomposting to a variety of uses including home, school, and community gardens
- creating or transforming fruit, vegetable, or flower gardens using sustainable agriculture and horticulture methods
- displaying results through descriptions, data measurements, graphs, photos, and any fruit, vegetables, and flowers grown in sustainable gardens

For lessons, directions, and materials needed for vermicomposting, see Agriculture in the Classroom, Worms and Vermicomposting Lesson Plan, and Vermicomposting: A Starter's Guide for Teachers
Subject(s): Science, Math
Standard(s):
Science – ESS3-4, LS1-4, LS2-1, LS2-2, LS2-3, LS2-4, LS2-5, LS2-6, ETS1-2, ETS1-4, ETS1-7 Math - 7.RP, 7.NS, 7.EE, 7.G

What Kind of Footprint? Carbon Footprint

Students determine their carbon footprints by answering questions about their everyday lifestyle choices and engineer plans to reduce their footprints. Students learn about their personal impacts on global climate change and how they can help the environment. The lesson plan includes a vocabulary list, YouTube video link, student worksheet, discussion questions, extension activities, modifications for older and younger students, and assessments for before, during, and after the activity.
This engineering curriculum aligns to Next Generation Science Standards (NGSS).
Science - 5-ESS3-1, MS-ESS3-5

Grade 8

[Climate Change: Connections and Solutions - Recommended for Grades 6-8]

[Energy Thinking]

[Fueling Our Future: Exploring Sustainable Energy Use Grades 6 to 8]

Life in a Changing Climate Program - 8th Grade

NOTE: There are costs associated with this program. A Cooler Communities grant can be used to offset the fees of Massachusetts-based nonprofit organizations.

Offered through Mass Audubon's Arcadia Wildlife Sanctuary, the program is available to teachers and schools in the Berkshires and Connecticut Valley region.
Class #1: Climate Science Basics
Students discover the scale of the atmosphere and explore the role of green-house gases as they participate in a simulation of increased heat-trapping gases in our atmosphere.

Class #2: Using Climate Data—Keeling Curves
Students learn about ppm and use real carbon dioxide data to make inferences about our future climate by calculating slope and comparing to climate scientists' predictions.

Field Trip: Climate Impacts & Solutions
Students focus on the benefits and costs of climate solutions by touring Arcadia's attempts to "lead by example" throughout the sanctuary. Students will identify solutions they are willing to try, calculate the amount of carbon they will save, and create a pledge for their class.

For more information:
https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/arcadia/programs-classes-activities/schools-groups/schools/life-in-a-changing-climate

For a brochure that includes corresponding teaching standards:

https://www.massaudubon.org/content/download/17260/254853/file/Arcadia-Climate-Change-Program-brochure-2017.pdf

Newspapers in Education: Global Issues and Sustainable Solutions

Public Service Announcement

Students prepare and record a 60 second PSA about one or more of the top solutions to reducing greenhouse gas emissions within their community: energy efficiency, home heating and cooling, transportation, renewable energy, low carbon diets, sustainable landscaping, and reduce/reuse/recycle waste reduction. Students could also explain the local impacts of climate change, including its effects on health. Articles could be published in a school newsletter or submitted for publication in a local or regional newspaper or magazine. See also.
Subject(s): Science, Art, History and Social Science, ELA
Standard(s):
Science – ESS3-5
Music Standards 1, 2, 3, 4, 7, and 10 Theatre Standards 1, 2, 3, 4, 5, 6, 7, and 10
History and Social Science - 8.T4, 8.T7
ELA - RI.8, W.8, SL.8, L.8

Grades 7-8

Solar Farm

Solar energy is a clean renewable energy source and therefore is one of the top solutions to reducing greenhouse gas emissions. Students can learn about solar energy in general and then specifically about large scale production through solar farms, including their various forms of ownership - public, private, cooperative, etc. lessons could include field trips to nearby solar farms. Students can learn the pros and cons of solar farms and where they would be suitable to use. Projects could include graphic depiction evaluating the pros and cons, diagrams or drawings of solar farms, or plans for a model solar farm. Projects could also include an evaluation of where solar farms could be located in their community and proposed local regulations for the siting of solar farms.
Subject(s): Science, History and Social Science Standard(s):
Science – PS4-1, PS4-2, ETS1-1, ETS1-2, ETS1-5, ETS1-6, ETS2-1, ETS2-2, ETS2-4, ETS2-5, ETS3-4, ESS1-1b, ESS2-5, ESS3-4, ESS3-5, LS2-4, LS2-5, PS3-1, PS3-3

History and Social Science -
Topic 4. Rights and responsibilities of citizens [8.T4]
Topic 6. The structure of Massachusetts state and local government [8.T6]

Residential Solar Panels

Solar energy is a clean renewable energy source and therefore is one of the top solutions to reducing greenhouse gas emissions. Students can learn about solar energy in general and then specifically about residential solar panels. Lessons could cover types of solar panels, the pros and cons of residential solar panels, and where they would be suitable to use. Projects could include calculating hours of sunlight on roof angles, charts evaluating the pros and cons, models of houses with panels, graphs showing cost savings or reduction of carbon emissions. Inviting a solar provider as a guest speaker could help students make real life connections.
Subject(s): Science
Standard(s):
Science – PS4-1, PS4-2, ETS1-1, ETS1-2, ETS1-5, ETS1-6, ETS2-1, ETS2-2, ETS2-4, ETS2-5, ETS3-4, ESS1-1b, ESS2-5, ESS3-4, ESS3-5, LS2-4, LS2-5, PS3-1, PS3-3

High School

Climate Change - Connections and Solutions Grades 9-12

The two week unit is provided by Western Washington University's CEDAR program. This curriculum is aligned with national science and social studies standards and may be used in other classes as well. Appropriate disciplines are suggested for each lesson. The 2-week unit begins with an introduction to climate change. During the first week, the foundation is laid for understanding some of the forces behind climate change. Students learn basic scientific phenomena related to climate change, beginning with the carbon cycle and the greenhouse effect and concluding with an analysis of different fuel types. The second week widens and deepens students' understanding of climate change and its connections to various social, economic, and environmental factors. By the end of this 2-week unit, students will understand and be able to communicate complex and interconnected issues related to climate change. Each week of the curriculum is a stand-alone unit that can be taught independently of the other week.The unit can be downloaded at https://cedar.wwu.edu/ee_ftf/7/.

Life in a Changing Climate Program - High School

NOTE: There are costs associated with this program. A Cooler Communities grant can be used to offset the fees of Massachusetts-based nonprofit organizations.

Offered through Mass Audubon's Arcadia Wildlife Sanctuary, the program is available to teachers and schools in the Berkshires and Connecticut Valley region.

Class #1: Climate Science
Students review the carbon cycle and greenhouse gas effect. They view scientific predictions and calculate their own carbon footprint.

Class #2: Tracking Climate Changes
Students use local maple sugaring data to hypothesize the impact climate change may have on an important and iconic species. They will then predict how changes will impact our economy, health, and infrastructure.

Field Trip: Forest Resilience and Solutions
On sanctuary or school grounds
Students learn about past, current, and future forest changes due to human activities. They use the forests of Arcadia or their school grounds to perform a forest resiliency study and propose management strategies and do a forest carbon sequestration calculation. They also explore climate solutions, participate in an optional outreach challenge, and discover which green career fits their personality.

For more information:
https://www.massaudubon.org/get-outdoors/wildlife-sanctuaries/arcadia/programs-classes-activities/schools-groups/schools/life-in-a-changing-climate

For a brochure that includes corresponding teaching standards:
https://www.massaudubon.org/content/download/17260/254853/file/Arcadia-Climate-Change-Program-brochure-2017.pdf

Fueling Our Future: Exploring Sustainable Energy Use Grades 9 to 12

This unit begins with lessons that introduce students to foundational energy concepts. The lessons then begin to focus more specifically on topics like energy access and

transportation fuels. The unit culminates with an aviation-focused performance-based assessment that is integrated into the final three lessons.

This unit was designed to contribute to the educational mission of the Northwest Advanced Renewables Alliance to strengthen the overall scientific literacy of students with respect to biofuels. The pre and post assessment can be administered before and after this unit to measure knowledge and personal attitudes about energy consumption. https://cedar.wwu.edu/ee_ftf/4/

Newspapers in Education: Global Issues and Sustainable Solutions

Heat Transfer and Solar Water Heaters

After this heat transfer lesson, students will be able to explain the three types of heat transfer and apply what they have learned about heat transfer and materials to real-world problems. The lesson plan includes teaching standards, vocabulary and short pre and post assessments. The lesson can also lead into a longer solar water heater activity in which student teams design and build solar water heating devices that mimic those used in residences to capture energy in the form of solar radiation and convert it to thermal energy. The activity plan includes teaching standards, a list of materials needed, student worksheets, specific directions for the teacher, vocabulary, and pre and post assessments.

Passive Solar Design and Zero-Energy Housing

This lesson introduces students to passive solar design and includes teaching standards, vocabulary, pre and post assessments and extension activities. The lesson then leads to a zero-energy housing activity during which students investigate passive solar building design with a focus solely on heating. They learn how insulation, window placement, thermal mass, surface colors, and site orientation play important roles in passive solar heating. They use this information to design and build their own model houses, and test them for thermal gains and losses during a simulated day and night. Teams compare designs and make suggestions for improvements. The activity plan includes teaching standards, a list of materials needed, student worksheets, specific directions for the teacher, vocabulary, and pre and post assessments.

Persuasive Image

Students create a short poem with imagery or cartoon strips on energy efficiency. See also.
Subject(s): Science, Art, ELA, History and Social Science Standard(s):
Science - HS: ESS.2.6, ESS.3.1, ESS.3.2, ESS.3.3, LS.2.1, LS.2.7, PHY.3.3, ETS.1.1, ETS.1.2, ETS.1.3, ETS.1.6, and ETS.4.1
Visual Arts Standards – 1, 2, 3, 4, 5, 6, and 10
ELA - R.PK-12.4, R.PK-12.7, W.PK-12.1, W.PK-12.3, W.PK-12.4, W.PK-12.5, W.PK-12.6, W.PK- 12.7, SL.PK-12.2, L.PK-12.3, L.PK-12.5, RL.4, W.3.b, W.5, W.7, L.5
History and Social Science - USII.T1(1), (2), (3), (4), (8), (9), (10), and (11); USII.T5 (2) and (5); WHII.T6 (5); GOV.T4; ECON.T1, T2, T4; PFL.T1(4), T2(6); NML.T1(5), T4, and T5

Solar Cookers

Solar cookers can cook meat, vegetables, beans, rice, bread and fruit. They can bake, stew, steam, fry and braise using sunlight instead of gas or electricity. Students learn how solar ovens work, the pros and cons of their usage, and where they would be suitable to use. Projects could include graphics evaluating the pros and cons, diagrams or drawings of solar ovens, or plans for / construction of a model solar oven. Projects could also include an evaluation of where solar cookers could be used in the community, including homes, picnic areas, and campgrounds.
Subject(s): Science, History and Social Science Standard(s):
Science - HS: ESS.3.2, ESS.3.3, PHY.3.3, ETS.1.1, ETS.1.2, ETS.1.3, ETS.1.6, ETS.2.3, and ETS.4.1
History and Social Science - USII.T1 (1) and (2), T5 (5)

SECTION II - PROJECTS BY TOPIC

Home Weatherization

Why it's important

The Energy Information Administration says that the U.S. residential sector accounts for 21 percent of all energy consumption and is responsible for 20 percent of our country's carbon emissions.[1] Improvements in energy efficiency reduce greenhouse gas emissions and support the push towards a decarbonized society.[2] Weatherization of homes reduces residential and power plant emissions of carbon dioxide by 2.65 metric ton/year per home. Over the life of the measures, it saves 53 metric tons of CO2 emissions per house.[3]

Audits

An energy audit is an assessment of your home that takes a look at current energy consumption and then identifies energy efficiency measures that you can conduct to make your home more efficient. An energy auditor can assess where your home is losing the most energy, and then proposes improvements to make to help save energy.[4]

<u>Student projects related to audits</u>

- Research how to sign up for free energy audits from MassSave, CAP agencies, CET, municipal utility, etc.
- Research how an audit is conducted and what gets evaluated
    - Auditor / contractor as guest speaker
- Take-home parent survey about audits
    - Whether and when home audit was done
    - Any upgrades done that were recommended by audit
- Create "marketing" materials to promote audits
    - Posters, PSAs, Letters to the Editor

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[1] https://www.c2es.org/content/home-energy-use/
[2] https://www.eesi.org/articles/view/federal-programs-reduce-emissions-by-improving-energy-efficiency
[3] https://www.eesi.org/files/wap_facts.pdf
[4] https://www.energysage.com/energy-efficiency/buyers-guide/home-energy-audit

Fair visitor pledge
I will request a free energy audit for my home.

Thermostats

Lowering your thermostat in the winter and raising it in the summer can cause a significant decrease in energy use, lowering your power bill while fighting global warming.[5]
(Brief history and explanation of how thermostats work.[6])

Student projects related to thermostats

- Research electronic and SMART thermostats
    - Compare and contrast / pros and cons of each
- Create take-home questionnaire about thermostat usage at home
- Estimate cost savings of regulating temperature
    - Lowering usage at night and when no one is home
- Create “marketing” materials to promote electronic / SMART thermostats
    - Posters, PSAs

Fair visitor pledge

- *I will have a programmable thermostat installed in my home.*
- *I will lower my heat setting 1 to 2 degrees in the winter.*
- *I will lower my heat setting to 60 degrees at night.*
- *I will lower my heat setting to 55 degrees when no one is home.*
- *I will raise my air conditioning 1 to 2 degrees in the summer.*

Air Leak Sealing

Air leakage around doors, windows, vents and electrical outlets can account for up to 25 per cent of your total heating costs. In fact, air sealing is one of the most cost-effective, quick, and important things you can do to make your home more energy-efficient. Caulking and weather-stripping windows, doors, dryer vents, and other areas where air is escaping are examples of air sealing.[7]

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[5] https://homeguides.sfgate.com/lowering-heating-cooling-global-warming-78706.html
[6] https://outrider.org/climate-change/articles/smart-thermostats-climate-solution-saves-energy-and-money
[7] https://www.ohmconnect.com/blog/blog-post/how-to-reduce-your-home-carbon-footprint-and-stop-money-from-flying-out-the-window

Student projects related to air leak sealing

- Students search for air leaks at home
- Research DIY air sealing
- Create air sealing kit for display project
- Poster or 3D display of house identifying where air leaks occur and how to fix them

Fair visitor pledge

- *I will find and seal air leaks in my home.*

Insulation

By reducing the need for natural gas, propane, fuel oil, and electricity to heat and cool buildings, insulation benefits the environment in the form of reduced emissions of pollutants such as carbon dioxide, sulfur oxide and nitrogen oxide, among others. Installing insulation in 4 million homes (just 4% of all North American housing stock) is equivalent to the carbon dioxide removed from the atmosphere by planting 667 million acres of trees—10 times the area of Colorado.[8]

Student projects on insulation

- Create take-home survey about household insulation
- Research financial benefits and estimated carbon reduction of insulation
- Compare / contrast types of insulation, including recycled content of insulation
- Research / identify impediments to insulation
    - Cost
    - Asbestos, vermiculite, knob and tube electrical wiring
- Research / identify available incentives for insulation
    - Grants, no interest loans
- Create 3D display of home with insulation
- Create “marketing” materials to promote
    - Posters, PSAs, Letters to the Editor

Fair visitor pledge

- *I will have my home insulated.*
- *I will ask my landlord to have my home insulated.*

[8] https://insulationinstitute.org/im-a-homeowner/about-insulation/environmental-considerations

Transportation

Why it's important

Transportation is now the largest source of carbon emissions in the United States. In many U.S. cities and towns, the personal automobile is the single greatest polluter because emissions from millions of vehicles on the road add up. Modern transportation relies heavily on petroleum, and passenger cars and light-duty trucks (i.e. sport vehicles, pickup trucks and minivans) contribute half of the carbon dioxide emissions from the U.S. transportation sector.[9] As of 2018, 28% of US greenhouse gas emissions came from transportation. Of that, 59% was emitted by cars.[10]

Eco-Driving

Optimal driving techniques can also help you cut emissions and save money in a gasoline-powered car. Hard acceleration and braking can waste fuel and lower your mileage by 33 percent on the highway and 5 percent around town, according to the Department of Energy (DOE). DOE studies show that for every 5 miles per hour you drive over 60 miles per hour, fuel economy is lowered by 7 percent, so go easy on the brakes and gas pedal. You can also lower impacts by reducing time spent idling as well using overdrive and cruise control. And because a properly-maintained vehicle can improve your gas mileage and fuel economy by 4 percent, remember to have your vehicle tuned up, tires inflated, and oil and air filter cleaned out regularly.[11]

<u>Student projects related to eco-driving</u>

- Take-home parent survey about eco-driving
- Create "marketing" materials to promote audits
    - Posters, PSAs, Letters to the Editor

<u>Fair visitor pledge</u>

I will learn the techniques of "eco-driving" and apply them when I drive.

[9] https://www.c2es.org/content/reducing-your-transportation-footprint/
[10] https://www.epa.gov/greenvehicles/fast-facts-transportation-greenhouse-gas-emissions
[11] https://www.c2es.org/content/reducing-your-transportation-footprint/

Trip planning

Combining errands into one trip saves you time and money. Your fuel economy is worse when your engine is cold than when it is warmed up. So, several short trips taken from a cold start can use twice as much fuel as a longer, multipurpose trip covering the same distance. Trip planning can reduce the amount of time you drive with a cold engine. It can also reduce the distance you travel. [12]

Student projects related to trip planning

- Identify the locations and number of local trips taken by household members in a week
- Prepare a plan for household members to combine trips

Fair visitor pledge

I will plan and combine trips when I am doing errands.

Electric Vehicles

Plug-in electric vehicles (also known as electric cars or EVs) can help keep your town and your world clean. In general, EVs produce fewer emissions that contribute to climate change and smog than conventional vehicles. [13]

Student projects related to EVs

- Research the benefits of owning or leasing an EV.
- Research financial incentives available for purchasing or leasing an EV.
- Create a project displaying the benefits of EVs.
- Create a project displaying the financial incentives for purchasing or leasing an EV.
- Promote the establishment of public charging stations in town.

Fair visitor pledge

When I am in the market for a vehicle, I will acquire an EV.

Walking and Biking

Swapping the car for walking, cycling and e-biking even just one day a week makes a significant impact on personal carbon emissions in cities. 'Active transport' -- cycling, e-biking or walking -- can help tackle the climate crisis. Meeting greenhouse gas

[12] https://www.fueleconomy.gov/feg/planning.shtml
[13] https://www.energy.gov/eere/electricvehicles/reducing-pollution-electric-vehicles

emissions reduction targets requires a significant move away from motorised transport. Shifting to active transport could save as much as a quarter of personal carbon dioxide (CO2) emissions from transport.[14]

Student projects related to walking and biking

- Research the benefits of walking or biking instead of driving for short trips.
- Create a project displaying the benefits of walking and biking.
- Promote the establishment of safe walking and biking lanes along major destination routes.
- Promote the establishment of a public bike share program.

Fair visitor pledge

I will walk or bike instead of driving a car for short trips.

Renewable Energy

Why it's important

Using clean, renewable energy is one of the most important actions you can take to reduce your impact on the environment. Electricity production is our #1 source of greenhouse gases, more than all of our driving and flying combined, and clean energy also reduces harmful smog, toxic buildups in our air and water, and the impacts caused by coal mining and gas extraction. Renewable energy provides reliable power supplies and fuel diversification, which enhance energy security, lower risk of fuel spills, and reduce the need for imported fuels. Renewable energy also helps conserve the nation's natural resources. [15]

Buying renewable energy through utilities

Most electricity customers have the option to purchase renewable electricity directly from their power supplier, and everyone has the option of purchasing renewable energy certificates. Such power is sometimes referred to as "green power" or "clean power."

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[14] https://www.sciencedaily.com/releases/2021/02/210208104624.htm

[15] https://buycleanenergy.org/why#:~:text=Renewable%20energy%20provides%20reliable%20power,conserve%20the%20nation's%20natural%20resources.

Options in your area may include green pricing, competitive electricity markets, or green certificates. [16]

[16] https://www.energy.gov/energysaver/buying-and-making-electricity/buying-clean-electricity

Student projects related to buying renewable energy through utilities

- Research the benefits of buying renewable energy.
- Create a project displaying the benefits of renewable energy.
- Create a display explaining how to buy renewable energy.
- Research and debate the issue of whether biomass energy is clean and “green.”
- Create marketing strategies for buying renewable energy.
    - Posters, letters to the editor, PSAs

Fair visitor pledge

I will purchase electricity generated by solar or wind power.

Community solar

A community solar project is a solar power plant whose electricity is shared by more than one property.

The primary purpose of community solar is to allow members of a community the opportunity to share the benefits of solar power even if they cannot or prefer not to install solar panels on their property. Project participants benefit from the electricity generated by the community solar farm, which costs less than the price they would ordinarily pay to their utility. [17]

Student projects related to community solar

- Research the benefits of community solar
- Research how to join a community solar project
- Create a project displaying the benefits of community solar
- Create a display explaining how to join a community solar project
- Create marketing strategies community solar
    - Posters, letters to the editor, PSAs

Fair visitor pledge

I will join a community solar project.

[17] https://www.energysage.com/solar/community-solar/community-solar-power-explained/

Residential solar

Solar power is usable energy generated from the sun in the form of electric or thermal energy. Solar energy is captured in a variety of ways, the most common of which is with photovoltaic solar panels that convert the sun's rays into usable electricity. Aside from using photovoltaics to generate electricity, solar energy is commonly used in thermal applications to heat indoor spaces or fluids. Residential property owners can install solar hot water systems.

Student projects related to residential solar

- Research the benefits of solar panels and hot water systems
- Create a project displaying the benefits of solar panels and hot water systems

Fair visitor pledge

I will install solar panels and/or a solar hot water system on my property.

SECTION III - RESOURCES AND IDEAS

Apps

https://actnow.aworld.org/

Available in the Apple App Store and Google Play, the “AWorld In Support of ACTNOW” app helps the user participate in the United Nations ACTNOW Campaign. The free app includes daily tips to help live a sustainable lifestyle, storytelling and educational stories organized in episodes,, community challenges, and fun and engaging sustainable habits you can activate to track your improvements. It has an Impact Tracker with metrics for actions in the areas of carbon footprint, water, energy, and waste.

Civics

Massachusetts 2035 Ban on Sale of New Gas-Powered Cars

Massachusetts recently passed a ban, similar to one in California, that will ban the sale of new gas-powered cars. This presents an excellent and timely opportunity to explore this topic with students. Possible lesson ideas include:

- Researching and evaluating how it will be implemented
- Identifying its impacts and who will be impacted
- Researching, discussing, and writing about the pros and cons
- Studying the California law and it implementation for lessons learned that could be applied in Massachusetts

https://www.caranddriver.com/news/a35104768/massachusetts-ban-new-gas-cars-2035/?utm_campaign=GEN%20Communications&utm_medium=email&_hsmi=105568626&_hsenc=p2ANqtz-_z-T23qL8FE5RgHqt7dh7q9dNa-_sS1ujde2UXk59223GrI1OlD6GlCB73OcY_1mQ2JjqpP3WraHb50dYOCV9XqfCaksARD0eHpHusSOmnNKt3JNk&utm_content=105568626&utm_source=hs_email

ShareMyLesson.com

The free on demand webinar *Using Books to Energize Civic Engagement* provides educators with insight on how to use books and resources found on the First Book Marketplace and Storyline Online to support civic engagement within their classrooms and communities. Resources include a list of inexpensive books available on First Book Marketplace. An example is City Green about creating a community garden and comes with a family activity sheet in Spanish as well as English. Another is Can We Help?

which provides examples of students volunteering, including a community farm, where families plant, grow, and harvest produce for soup kitchens and charities. Both books could go well with lessons about sustainable landscaping, plant biology, etc. And The Earth Book contains “ideas on how we can all work together to make the Earth feel good—from planting a tree and using both sides of the paper, to saving energy and reusing old things in new ways.” The book includes an interior gatefold with a poster with tips/reminders on how kids can "go green" everyday.

Student Council Resolutions

“Schools For Climate Action” is a non-partisan, grassroots, youth-adult campaign that helps students pass student council resolutions that advocate for action to combat the climate crisis in order to protect current and future generations. It also provides step-by-step suggestions for students to present their cause to school boards and request that boards similar resolutions. Resources include model student council and school board resolutions. https://schoolsforclimateaction.weebly.com/

Warning Stickers

Cambridge MA is requiring stickers on fuel pumps to warn drivers of the resulting dangers posed by the climate crisis. Similar to warnings on cigarette packets, the intent is to influence people’s thinking about the product they are purchasing. According to Jamie Brooks of the label campaign group Think Beyond the Pump, “Labels are designed to create a feeling like someone has broken a rule or violated a law. This feeling, along with increased social pressure, like smoking labels, can translate to a collapse in trust for the current system, thereby increasing the public appetite for alternatives.”
https://grist.org/climate/a-massachusetts-city-will-post-climate-change-warning-stickers-at-gas-stations/?utm_source=Energy%20News%20Network%20daily%20email%20digests&utm_campaign=709d0adc67-EMAIL_CAMPAIGN_2020_05_11_11_42_COPY_01&utm_medium=email&utm_term=0_724b1f01f5-709d0adc67-89263099

Classroom Videos

Great step by step resource for making classroom videos that capture student learning in general. You could use it to document the process and results of a lesson on a climate change solution.
https://modelsofexcellence.eleducation.org/exhibits/documenting-projects-toolkit

Composting

chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fsecureservercdn.net%2F198.71.233.83%2Fz59.a75.myftpupload.com%2Fwp-content%2Fuploads%2F2021%2F10%2FCSC-Student-Workbook-Fillable.pdf&clen=1742398&chunk=true

In conjunction with their Sustainability Challenge, Chipotle and Earthforce provide a Student Workbook

Cross Curricular Student Documentary

After learning about energy in Physics. and energy policy in Social Studies, high school students in Greenfield MA formed small teams to focus on one of several energy-related issues, with each team designing a presentation on their issue of choice. They shared their presentations to one another and then, as a whole group, selected the one they thought would make the best documentary.
https://modelsofexcellence.eleducation.org/projects/blades-change

EcoRise

NOTE: There are costs associated with some EcoRise materials and programs.

In 2008, EcoRise began serving one school in Austin, TX and over the past 12 years has grown to a nationally recognized organization serving more than 4,700 teachers, 2,000 schools, and 268,000 students in all 50 states. It continues to offer new ways for students to take action in their communities.

Ecorise has two major programs. The Green Building Academy is primarily implemented at vocational schools. The Green Building Academy provides Mass-approved professional development workshops, NGSS-aligned curriculum, and can lead to the LEED Green Associate, and internationally-recognized professional credential. The K-12 Sustainable Intelligence Program has several components: free lesson plans, low cost curriculum, low cost teacher workshops, and continuing professional development to implement the curriculum, grants for Eco-Audits, and Student Showcases. https://www.ecorise.org/our-work/sustainable-intelligence/

While teachers and/or schools can access the free lesson plans and low cost curriculum on their own, incorporating the rest of the components makes the Sustainable

Intelligence Program more effective. In an Eco-Audit, students assess the energy efficiency or eco-related needs of the school. They evaluate the results and propose a project that would improve upon the school's results. EcoRise will provide a grant of up to $500 for the students to implement the proposed project.

The free lessons also include Personal Eco-Audits. These six engaging lessons provide students with the tools they need to measure their own resource consumption and understand how their behaviors compare to those of households across the world. The Sustainable Intelligence Curriculum is available for a low cost fee. Both sets of lessons are available at https://www.ecorise.org/our-work/curriculum/?orderby=date.

Teachers in Boston may be able to access the program for free. Others may be eligible for a scholarship.
https://www.ecorise.org/our-work/sustainable-intelligence/#sponsored-regions

Educational Videos

The Hampden Hampshire Conservation has a collection of educational resources on topics such as climate change, soils, and vermiculture.
http://hampdenhampshireconservation.org/videos/

Energize Schools

The Energize Schools Program's curriculum resources are project-based and aligned with NGSS and common core standards. Resources are designed for 9th-12th grade students, but can be adapted for 6th-8th grade students. They are free but must be requested[18]. https://www.energizeschools.org/curriculum.html Units include:

Introduction to Energy Auditing

Students learn how to conduct a school or personal energy audit. Students will complete a series of activities, including a plug-load audit and investigation of

[18] *Please do not share Energy School's curriculum directly with others. Sharing of curriculum is restricted to SEI to enable accurate grant tracking.*

opportunities for energy conservation and efficiency. Practical applications in math and science to understand the economic and environmental benefits of energy use reduction will also be covered.

Energy

Energy Kids

Fun site for teaching and learning about energy.
https://www.eia.gov/kids/what-is-energy/ Includes pages about saving energy, games and activities

EnergyTeachers.org

Based in Cambridge MA, EnergyTeachers.org (ETO) offers help to educators at all levels, formal and informal, interested in teaching about energy production and use. Services include a web site, face-to-face meetings, newsletters, a lending library, reviews of lesson plans, and other tailored services.
Constantly measuring what other entities are doing to develop energy education, ETO finds empty niches and creates innovative projects in energy education relating to arts, technology, writing, information science, and engineering. ETO also works with numerous other organizations and government agencies, seeking every opportunity to incorporate appropriate topics into lessons. Relevant information from other organizations is presented on its website, from workshops to news to lesson ideas.
http://energyteachers.org/home.html

KidWind.org

KidWind focuses on teaching the world about renewable energy and has helped thousands of educators bring wind and solar power to life in the classroom, guided by its award winning curriculum and its unique tools and kits. Materials available on its website include elementary, middle school, and high school curriculum, lab activities, and online and simulation challenges. https://www.kidwind.org/

NEED.org

The National Energy Education Development (NEED) Project includes a curriculum portfolio of 100+ teacher and student guides designed to engage and teach teachers

and students about energy. NEED also offers teacher professional development and training for educators and school district energy personnel as well. The educator tab on its website has great resources to get started. NEED can partner with school districts to help deliver energy lessons for teachers and students.

One resource is the 2019-2020 “Schools Going Solar”, a 56 page unit plan that can lead to the installation of solar panels at a school. There are lessons within it, however, that do not require such an extensive commitment. Some of the lessons rely on materials and kits; however, NEED can provide assistance in acquiring kits.

STEM Rising

The U.S. Department of Energy’s “STEM Rising” program shares resources and events from the National Labs, National Nuclear Security Administration, and program offices and provides a monthly newsletter as well as social media. The resources are for workforce preparation and there might be of interest to guidance counselors as well as teachers and students. For more information, email AnneMarie.Horowitz@hq.doe.gov, Director of STEM Rising.

For students and teachers: https://www.energy.gov/kindergarten-high-school
At the time of writing, the link has 174 virtual and in person programs around the country for K-12 students. Some of them are focused on a particular scientific topic, geographic area near a national lab, or target student group such as girls or people of color. Eg., Girls of Energy contains links to videos of female scientists who discuss their background and their work as well as related teaching materials. We narrowed the search to “renewable energy” and found 9 programs. Excellent resource!

For teachers: https://www.energy.gov/teachers
Link for digital content and virtual learning for classroom use, experiential learning, teacher workshops and research opportunities, and grants.

WINDExchange

WINDExchange is a platform that shares the best available science and fact-based wind energy information to enable U.S. communities to:

- Make wind development decisions using the suite of WINDExchange resources and tools
- Understand siting, permitting, and installation processes
- Weigh the costs and benefits of wind energy

- Collaborate or partner with many organizations, including non-governmental organizations, academia, and national laboratories.

WINDExchange is supported by the Wind Energy Technologies Office at the U.S. Department of Energy. Facilitated by the National Renewable Energy Laboratory, WINDExchange aims to enable well-informed decisions about the appropriate development of wind energy. WindExchange focuses on the dissemination of quality and unbiased information to the public, communities, businesses, organizations, and state and local governments about wind technology as a viable renewable energy option across our nation.
This page provides a list of wind energy curricula and teaching materials for elementary, middle school, and high school students that can bring wind energy into the classroom, even for students at schools without a wind turbine installation.

Energy Audits of Schools by Students

Students at The Renaissance School in Springfield MA wrote the Greenprint report as part of a learning expedition called Powering the 21st Century. The report summarizes student findings from energy audits at schools around the city and recommends a variety of initiatives that the city of Springfield should take in order to lower its carbon footprint and reduce energy costs.
https://modelsofexcellence.eleducation.org/projects/greenprint

Energy Efficiency Programs in K-12 Schools: A Guide to Developing and Implementing Greenhouse Gas Reduction Programs According to Project Green School, “This guide from the Minnesota Renewable Energy Society is extremely well researched and contains all you need to know to install renewable energy at your school. Highly Recommended!” https://projectgreenschools.org/energy/

Cleanet.org has a team of educators and scientists who review and organize the free teaching resources on climate and energy for K-12 and through college. Below are a few lessons on energy audits for middle and high school students that have been reviewed.

- Video: Energy 101: Home Energy Assessment 3 min
  http://energy.gov/energysaver/articles/professional-home-energy-audits
  - Middle and high school
  - reviewed by Committed to Climate and Energy Education
    - https://cleanet.org/resources/44625.html

    - Notes by reviewers:
        - Great introduction to energy audit/project-based learning by students/student teams for schools, houses, and communities.
        - Good resource that can supplement implementing this video:

- Activity: "Energy Walkabout" - 2 class periods
  https://energy.gov/eere/education/downloads/energy-walkabout
    - In this activity learners work in pairs or small groups to evaluate energy use in their school and make recommendations for improved efficiency. Students create and use an energy audit tool to collect data and present recommendations to their class. Further communication at the school and district level is encouraged.
    - Middle and high school
    - Camera required
    - reviewed by Committed to Climate and Energy Education
        - https://cleanet.org/resources/42684.html
    - Notes by reviewers:
        - Have students complete energy audit sheets for each classroom they go to during one day and then compile the list of classrooms analyzed. This will cut down on the number of rooms that have to be covered during a single science class period.
        - The two extension activities provided will enrich the learning across the curriculum (language arts/multimedia).

- Activity: "The Big Energy Gamble" - 2 to 3 class periods
  http://www.pbs.org/wgbh/nova/teachers/activities/3519_energy.html
    - In this activity, students conduct an energy audit to determine how much carbon dioxide their family is releasing into the atmosphere and then make recommendations for minimizing their family's carbon footprint. Middle and high school
    - reviewed by Committed to Climate and Energy Education
        - https://cleanet.org/resources/41864.html
    - Notes by reviewers:
        - Since consumption is based on formulas with units of power and energy, the educator may have to help students with their calculations.
        - The educator is asked to set up a blog for student research purposes. Technical help to set that up in advance may be necessary.

        - The **extension activity for a school audit** is very highly recommended, including a guided discussion on what energy use means for the school would be really helpful.
        - To avoid issues of equity, use a sample bill (rather than students' using their own homes).

- Video: Dreaming in Green - Young Voices for the Planet https://www.youtube.com/watch?v=oPwDk9WhETo 6 min
    - In this video from Young Voices for the Planet, four middle-school girls (The Green Team) talk about their efforts to work with their peers to reduce the carbon footprint of their school and how they made the school more energy efficient.
    - Middle and high school
    - reviewed by Committed to Climate and Energy Education
        - https://cleanet.org/resources/42861.html
    - Notes by reviewers:
        - Video can be used as a hook before teaching about energy efficiency, carbon footprints, or before an energy audit assignment is given to the students.
        - This is an example of an action project that involves mathematics, science, and technology.

- Video: Energy 101: Daylighting http://www.energy.gov/eere/videos/energy-101-daylighting 3 min
    - This video introduces the concept of daylighting - the use of windows or skylights for natural lighting and temperature regulation - and how it is a building strategy that can save operating costs for homeowners and businesses.
    - Middle and high school
    - reviewed by Committed to Climate and Energy Education
        - https://cleanet.org/resources/42751.html
    - Notes by reviewers:
        - An interesting example about reducing the energy demands of buildings.
        - Examines a small but important use of solar energy in buildings for energy efficiency.
        - The introductory video is not a comprehensive instructional tool.
        - Comments from expert scientist: This resource provides a clear explanation of the principles with high production values.

Eversource Competitions and Resources

Eversource In-School Energy Efficiency Programs

Students and educators in Massachusetts can take advantage of our engaging, no-cost energy efficiency education programs. Students can learn how to save energy, promote good energy-use habits and prepare for the future.

- The Home Energy Challenge WooSox Edition – program for students in grades K-8 in an Eversource community in Massachusetts. This fun and easy project invites students to explore the transformation of radiant energy (light) to chemical energy and thermal energy (heat).
- The Eversource Challenge - student contest offers students K-12 the chance to showcase their knowledge and ideas about energy efficiency and sustainable living.It invites students to showcase their energy knowledge through various grade level written or visual challenges. Finalists from each grade will be honored with a special awards presentation. Registration for the 2022-23 challenge opens in January 2023.
    - Prizes of up to $400 in Amazon gift cards are awarded to winners in each grade level.
- In-School Programs
    - Energy Quest Online is a game that transforms students in grades 6–8 into home-energy investigators. Students can test their knowledge about electricity, water, and gas usage in their homes, while learning about new energy-efficient technologies and developing positive energy behaviors.
    - Watts-Ville Online is a game for grades K–3 that teaches students about energy efficiency and the importance of saving energy. Through Watts-Ville, students play with real-world examples to understand how they use energy every day, and some simple steps to use less.
    - The Energized Guyz is an interactive e-learning package that offers classrooms a convenient, online-accessible option for experiencing energy efficiency education through live theatre. The 35-minute livestream event presents a virtual lesson on energy efficiency for students in grades 3-5. A live host will introduce entertaining skits featuring a variety of characters and scenes that help classes discuss energy use. Students and teachers will also have access to a Q&A with the host, plus an exclusive e-learning package that includes games, quizzes, e-books and lesson plans for the classroom.

Food

Food Span

Food Span is a free, downloadable high school curriculum that highlights critical issues in the food system and empowers students to be food citizens. It is aligned to national education standards in science, social studies, health, and family and consumer sciences. This curriculum stimulates debate about crucial food system topics related to human health, the environment, equity, and animal welfare. The Johns Hopkins Center for a Livable Future developed FoodSpan as a natural outgrowth of the work it does to help build a healthier, more equitable, and more resilient food system.

Graphs

Online tool for teaching, learning, and creating graphs.
https://nces.ed.gov/nceskids/createagraph/Default.aspx

Housing

Tiny tiny Houses Now

NOTE: There are costs associated with the TtHN program. A Cooler Communities grant can be used to offset the fees of Massachusetts-based nonprofit organizations.

Tiny tiny Houses Now (TtHN) is an innovative STEAM educational program for middle school students (Grades 5-9th) which adheres to the learning standards of the Massachusetts Curriculum Frameworks. The curricula promotes math and design skills for students of all abilities, fosters creative thinking & civic engagement and social issues concerning sustainable housing. Including both hands-on classroom and non-classroom activities, the curricula can be licensed for use by a single class or multiple classes across different schools. https://educationnow2.org/tthn

Public Health

Impacts on Human Health in the U.S.

A 31 page lesson module with graphic organizers, answer keys, assessment options, and suggested modifications for different student learning styles. The module follows the 5E instructional model (engagement, exploration, explanation, elaboration, and evaluation) “to promote student discovery and learning about the complex interactions between climate change, the environment and human health. ... Students also consider the benefits of climate mitigation on human health and are thus introduced to the concept of co-benefits. Students are invited to identify and evaluate adaptation strategies that are protective of human health. To provide a solutions focus to the module, a culminating activity is offered that enables students to engage with local, state or regional data and the US Climate Resilience Toolkit to evaluate climate adaptation and mitigation strategies and, if desired, plan a resilience building project to address a climate change related human health impact relevant to their local community.”
National Institute of Environmental Health Science
https://www.niehs.nih.gov/health/assets/docs_a_e/a_student_exploration_of_the_impacts_of_climat
e_change_on_human_health_in_the_united_states_lesson_plan_508.pdf
https://www.niehs.nih.gov/health/scied/teachers/cchh/index.cfm
The site includes downloadable lesson plans, PowerPoint presentations
Subject(s): Science, ELA
Standard(s):
Science - HS: ESS2-2, ESS3-1, ESS3-4, ETS1-1, ETS1-2, ETS1-3, ETS1-4
History and Social Science - HS: USII.T1, USII.T5(5), WHII.T6, GOV.T1, T2, and T4; ECON.T1, T3(8), T4; NML.T1(1), (3), and (5); T2(2), T3, T4, T5
Next Generation Science Standardshttps://www.niehs.nih.gov/health/assets/docs_a_e/climate_change_and_human_health_ngss _alignment_508.pdf

Impacts on Human Health & Vector-borne Disease

A 22 page lesson module with graphic organizers, answer keys, assessment options, and suggested modifications for different student learning styles. The module follows the 5E instructional model (engagement, exploration, explanation, elaboration, and evaluation) “to promote student discovery and learning about the complex interactions between climate change, the environment vector-borne disease and human health. Using content from international reports, students are prompted to explore the impacts

of changing climate and ecologic conditions on vector borne diseases relevant to human health with an emphasis on vulnerable populations. Students will then apply systems thinking to create a visual model that depicts the relationship between climate change, vectors and human health. To provide a solution focus to the module, a culminating activity is offered that enables students to engage with local, regional, or national data to evaluate climate adaptation and mitigation strategies. Additionally, and, if desired, students may contribute to the GLOBE Observer Mosquito Habitat Mapper (GO MHM) program. GO MHM is a mobile app developed for citizen and student scientists that enables users to locate, identify and count mosquito larvae and eliminate breeding sites in their communities."
National Institute of Environmental Health Science
https://www.niehs.nih.gov/health/assets/docs_a_e/cchh_vectorborne_lesson_plan_508.pdf https://www.niehs.nih.gov/health/scied/teachers/cchh/index.cfm The site includes downloadable lesson plans, PowerPoint presentations, and Next Generation Science Standards.
Subject(s): Science, ELA
Standard(s):
Science - HS: ESS2-2, ESS3-1, ESS3-4, ETS1-1, ETS1-2, ETS1-3, ETS1-4
History and Social Science - HS: USII.T1, USII.T5(5), WHII.T6, GOV.T1, T2, and T4; ECON.T1, T3(8), T4; NML.T1(1), (3), and (5); T2(2), T3, T4, T5Next Generation Science
Standardshttps://www.niehs.nih.gov/health/assets/docs_a_e/climate_change_and_human_health_ngss _alignment_508.pdf

Student-Created Guide to Energy Efficiency

7th and 8th grade students at Capital City Public Charter School created a guide to energy efficiency as the capstone project to a seven-month expedition on Green Building. During this expedition students worked under the guidance of an interdisciplinary team of teachers (science, humanities, math and art) to learn about smart energy use. Through partnerships with the Alliance to Save Energy and the U.S. Green Building Council, as well as input from a green building expert, Capital City's students explored the problem of overconsumption alternatives.
https://modelsofexcellence.eleducation.org/projects/do-green-thing

Waste Management

Keep America Beautiful

Keep America Beautiful and the Ad Council are partnering on the award-winning “I Want To Be Recycled” public service advertising (PSA) and awareness campaign. The campaign includes an online recycling game that is fun, challenging, and educational.https://berecycled.org/game/

Keep Massachusetts Beautiful

The nonprofit organization “Keep Massachusetts Beautiful" provides a free workshop “Talking Trash and Recycling” for groups of 20 or more. The interactive presentation teaches about what really happens to trash and recyclables here in Massachusetts. Learn about the Massachusetts Department of Environmental Protection's innovative new Recycle Smart MA program.
Attendees will also learn to reduce the amount of trash they generate, improve their recycling habits, make small changes to lead a more sustainable lifestyle, and help the state of Massachusetts achieve its solid waste reduction goals. This program is funded by a grant from MassDEP.
https://keepmassbeautiful.org/what-we-do/environmental-education/talking-trash-recycling.html

Take the PUP Pledge

The “Pick Up Poop” pledge campaign is a clever and simple way to bring attention to the dangers of dog waste, particularly as a potential pollutant to water resources. While the sponsoring organization, Think Blue Connecticut River, focuses on the impacts generated in the Pioneer Valley area of Massachusetts, the concepts and the importance of the pledges can be applied statewide. The website and the pledge is easy enough for kids to understand and simple enough for busy adults to commit to. It’s a perfect way to engage dog owning families.
https://thinkblueconnecticutriver.org/pet-waste-management/

SECTION IV - INTERDISCIPLINARY APPROACH

While not required or essential, participation in a Cooler Communities Expo provides schools and districts a unique opportunity to implement DESE's vision of powerful instruction that supports interdisciplinary learning experiences in which students as well as their families are invested.

Most, if not all, of the suggestions in this Cooler Communities Curriculum Guide have interdisciplinary connections. Many of them would make excellent cross curricular topics. For instance, students could learn about energy efficiency during a science class and in art class make posters about what they learned. The science and art teachers could cooperate to create the lessons and the poster requirements and rubrics. A finished poster could be used as an assessment tool for both science and art. Other examples include combining science, ELA, and history and social science for lessons culminating in a civics project whereby students engage with local officials and media. Designing and building models also weaves math, technology, and engineering into the lessons.

The Massachusetts Department of Elementary and Secondary Education ("DESE") recognizes the importance of an interdisciplinary approach to teaching and learning. In its Academic Vision, DESE states:

Students read meaningful texts across content areas, work on complex real-world problems, participate in the arts, and share their ideas through speaking and writing using evidence, all in an effort to understand the world, their personal identities and their roles in the world.

Instruction is most powerful when educators have strong content knowledge and access to high-quality instructional materials and professional learning that promote inclusive practice accessible to all students, including English learners and students with disabilities; support authentic, engaging, and interdisciplinary student learning experiences; and invest families and students in their learning.

To support standards-based learning, we believe that every student should engage: - with grade-appropriate text every day

- with meaningful real-world problems every day

- in scientific conversations using data every week[1]

Furthermore, DESE encourages the integration of technology and engineering into science classes. In its Quick Reference Guide: Integrating Technology & Engineering with High School Science, DESE states:

The goal of STE education is to develop scientifically and technologically literate citizens who can solve complex, multidisciplinary problems and apply analytical reasoning and innovative thinking to real world applications needed for civic participation, college preparation and career readiness. ... Districts choose whether to teach students the Technology/Engineering standards within a unique course or through integration with other science courses. This flexibility reflects the nature of STE as complex and interdisciplinary. Scientists and engineers typically do not work in isolation; rather they create networks of professionals within and across disciplines. Students' understanding of science, technology, and engineering as interdisciplinary and interconnected is enhanced in the 2016 STE Framework by the integration of these standards from Pre-K to grade 8. ... Integration can make a curriculum relevant and engaging to students, motivate deeper understanding, and build student identity as civic participants .[2]

[1] http://www.doe.mass.edu/highstandards/

[2] http://www.doe.mass.edu/stem/ste/integration.pdf

SECTION V - EXAMPLES OF CC FAIRS

Information and images from all communities participating in Cooler Communities events can be found at https://coolercommunities.org/about-us/our-communities/.