Fueling Our Future: Exploring Sustainable Energy Use

Middle and High School Interdisciplinary Energy Curricula

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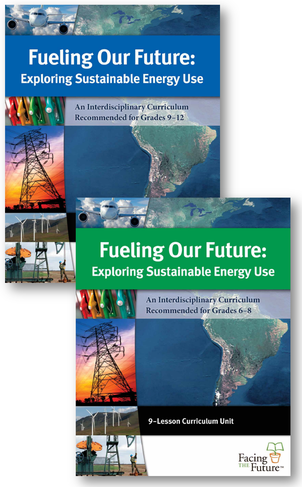
Facing the Future™
Critical thinking. Global perspective. Informed action.

Introduction

Facing the Future (FTF), an independent program of Western Washington University, is dedicated to educating and motivating today's students to be responsible stewards of tomorrow's world. FTF creates tools for educators that equip and motivate students to develop critical thinking skills, build global awareness and engage in positive solutions for a sustainable future. Using global sustainability as a context and framework, FTF promotes effective teaching and learning through well-tested curriculum models and strategies. Our curriculum is used in all 50 US states and over 140 countries by teachers and students in grades K-12, in undergraduate and graduate classes, and across multiple subject areas.

FTF has recently designed and published *Fueling Our Future: Exploring Sustainable Energy Use* in partnership with the Northwest Advanced Renewables Alliance (NARA) which includes scientists, sustainability experts, educators, and industry leaders. This project, funded by the United States Department of Agriculture-National Institute of Food and Agriculture (USDA-NIFA), explores the possibilities of creating jet biofuel from forest residuals in the Pacific Northwest in order to provide an alternative to petroleum-based jet fuel and petroleum-based products. Because this project is a rich example of a contemporary, real-world energy issue, it was used as a model for many of the lessons in this unit. Elementary lessons vertically aligned to this curricula are currently in development.

Through the creation of this curriculum and the implementation of professional development workshops focused on energy, FTF is helping to advance the NARA Education GreenSTEM K-12 Initiative's goals of improving bioenergy literacy in teachers and K-12 students. These lessons and workshops attempt to provide students and teachers with the science content required to understand today's conversations about energy and the opportunity to critically think about the sustainability of different energy options.



Methods and Outcomes

Global sustainability was used as a guiding framework to select content, create context for lessons, and to choose appropriate pedagogical methods for two 9-lesson interdisciplinary energy units - one for middle and one for high school. Drafts of outlines and lessons were reviewed and piloted by teachers and the team at University of Idaho's McCall Outdoor Science School (MOSS). Content experts, including several NARA members, were also recruited to review lessons. Bioenergy photographs taken by Justin Hougham for the NARA project were also used in the design of this curriculum.

Once lessons were finalized, *Fueling Our Future* was published in print, PDF, and SMART Board formats to meet the diverse needs of teachers. Content from this unit was integrated into online and in-person professional development resources and presented to teachers at conferences held by the National Science Teachers Association, University of Idaho's McCall Outdoor Science School, and Oregon State University's SMILE (Science & Math Investigative Learning Experience) program - a member of Advanced Hardwood Biofuels Northwest. Additionally, FTF Peer Educators have presented lessons at the Midwest Renewable Energy Association Energy Fair.

Within almost 1 year of publication, 254 units and 134 free lessons have been distributed to educators, reaching over 11,600 students. [FTF conservatively estimates that 50 percent of teachers receiving a resource will use it in their classrooms with 60 students.] After using this resource in the classroom, one teacher reported:

"I love that this was so well integrated and there was such a variety of ways students learned about topics. The activities with visuals, extensions, and links to extensions and additional information were very helpful. Also, the PBA was excellent, my students really got into it especially because so many of them have family members that work for Boeing….Fantastic curriculum, I would love [to] use more like this: locally relevant, integrated, differentiated!"

The Importance of Energy Education

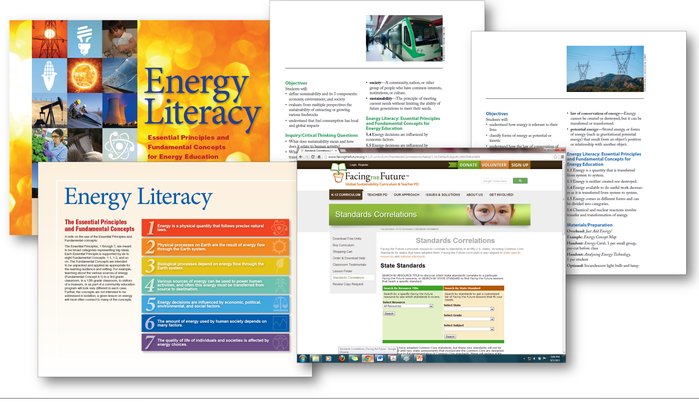
Energy fuels our lives. It sustains our bodies, powers our industries, lights our cities, charges our cell phones, and moves our cars. It is also interconnected with a range of global issues from climate change to economic development and resource scarcity. The personal and collective nature of energy presents a unique opportunity for students to engage in this unit of study by drawing on their personal experiences with energy to connect with energy issues around the world.

Human energy use is a rich topic that spans many disciplines. *Fueling Our Future* provides the opportunity for students to engage in an authentically interdisciplinary study of sustainable energy use. In this unit, students review basic energy science, calculate their daily electricity use, identify the pros and cons of renewable and nonrenewable sources of energy, and analyze global statistics on energy use around the world. Using Facing the Future's global sustainability framework, students explore the social, economic, and environmental impacts of petroleum-based fuels and various biofuels.

Taking a close look at human energy use is a key part of working toward sustainable societies, economies, and environments. By presenting students with multiple perspectives on important energy issues and allowing them to grapple with real-world issues such as the development of sustainable aviation biofuels, students are able to formulate their own perspectives on energy issues and to develop the skills needed to positively respond.

Standards Correlations

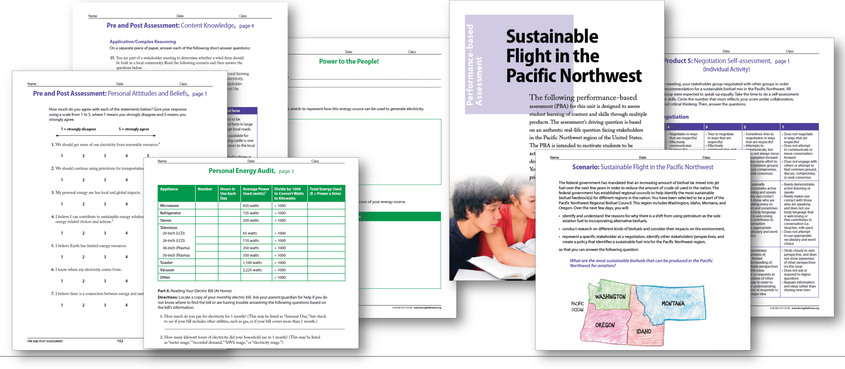
Fueling Our Future correlates to standards in all 50 US states. Each lesson has also been aligned to the principles and concepts presented in *Energy Literacy: Essential Principles and Fundamental Concepts for Energy Education*. This framework was developed through a peer-review network of 13 federal agencies that comprise the US Global Change Research Partner agencies and 20 recognized educational partners including the American Association for the Advancement of Science. For more information on this document, visit: http://energy.gov/eere/education/education-homepage.



Robust Assessments

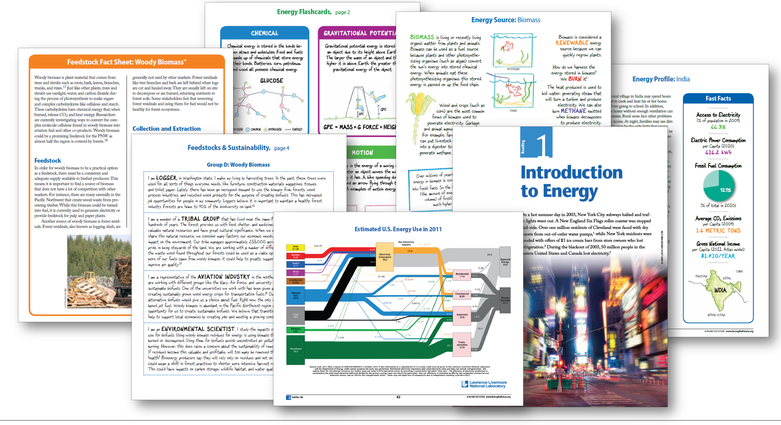
Fueling Our Future incorporates multiple opportunities for teachers to assess student understanding. Formative assessments such as student sketches, class discussions, and short presentations provide teachers with informal opportunities to assess student prior knowledge about complex energy concepts.

Summative assessments for the unit include a pre and post assessment designed to measure student analysis of complex energy issues, understanding of content knowledge, and personal attitudes toward energy consumption. The unit culminates with a performance-based assessment (PBA) designed to engage students in tackling a real-world energy issue facing society today—developing alternatives to fossil fuels. This is a timely energy issue that has no easy answer, requires collaboration among many different stakeholders, and provides a great learning experience for students.



Global Statistics, Graphics, and Informational Text

Students are asked to analyze information via global statistics, graphs, stakeholder profiles, and feedstock fact sheets. This gives students multiple opportunities to acquire and integrate information from a variety of sources. In addition to the lessons, *Fueling Our Future* student readings. The readings include vocabulary, questions that check for understanding, career profiles, case studies, and youth profiles that showcase youth around the world who have made positive impacts in their communities.



NARA
Northwest Advanced Renewables Alliance

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