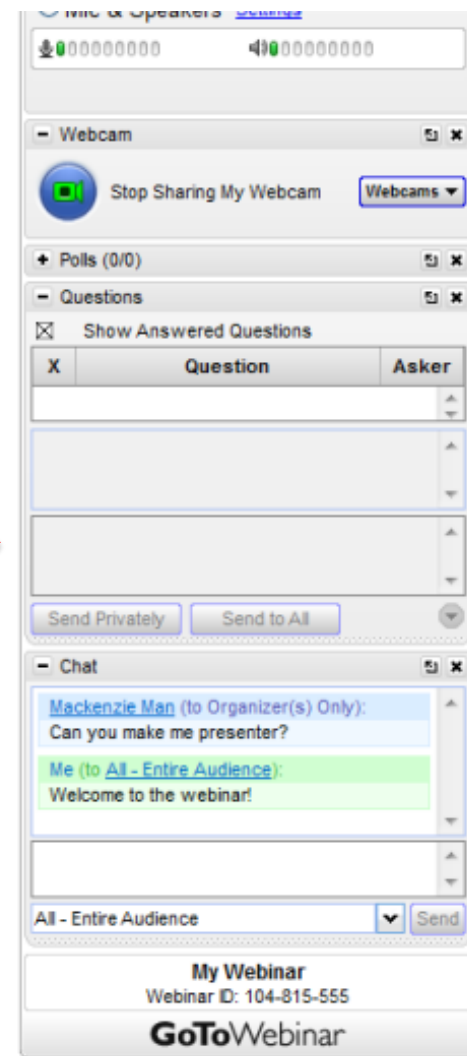


Welcome to the Engaging Students in Energy Webinar!

- We Will Begin Shortly
- Please mute your line
- Submit Questions Via the ask questions tool
- Recording of the webinar and copy of the slides will be available after the webinar
- www.eere.energy.gov/education/



Welcome to the Webinar!

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Engaging Students in Energy

Friday, December 13th 2013 3-5PM

Department of Energy

Office of Energy Efficiency & Renewable Energy
EERE Education & Workforce Development
EERE Strategic Programs
EERE Small Business and Innovation Research
Office of Economic Impact and Diversity
Office of Science
Office of Nuclear Energy

Introductory remarks- Dot Harris, Director of Office of Economic Impact and Diversity

- **Session 1- DOE Energy Efficiency & Renewable Energy(EERE) Education & Workforce subgroup**
 - Energy Literacy Initiative
 - Energy 101 Project
- **Session 2- EERE programs-Engaging Underrepresented Groups in Energy**
 - Student Competitions and the National Clean Energy Student Business Plan Competition
 - Small Business and Innovation Research (SBIR) program
- **Session 3-DOE Office of Economic Development and Diversity, Office of Science and Office of Nuclear Energy**
 - Minorities in Energy Initiative
 - Visiting Faculty Program
 - Mickey Leland Program

At the end of each session we will try to answer common submitted questions

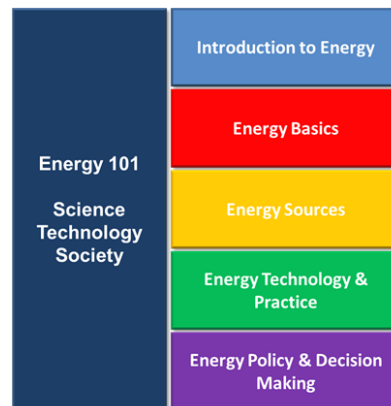
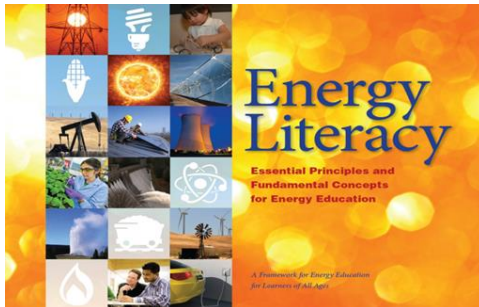


- Confirmed by the U.S. Senate on March 29, 2012. Ms. Harris brings nearly 30 years of management and leadership experience to this position, having served at some of the world's largest firms and leading a successful energy, IT, and healthcare consulting firm.
- Director Harris and staff participated in over 125 public events across the country in 2012 and 2013. The majority of these events focused on promoting public participation in DOE economic development, STEM education, and research & development programs.
- Through publications and outreach, Director Harris has reached over 43 million viewers on the topic of diversity and engagement in the STEM workforce.

DOE - Energy Efficiency & Renewable Energy (EERE) Energy Education & Workforce

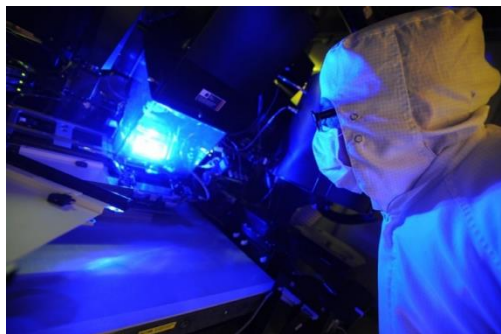
Energy Literacy Initiative

Energy 101 Project



Why are Energy Literacy and Energy Education important topics to the Department of Energy?

Tweet [#EnergyLiteracy](#) [#Energy101](#)



Sustain a World-Leading Technical Workforce



www.pinterest.com/energy/

#Energyliteracy #Energy101

The DOE Strategic Plan & Energy Literacy and Energy Education

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



U.S. DEPARTMENT OF
ENERGY

STRATEGIC PLAN

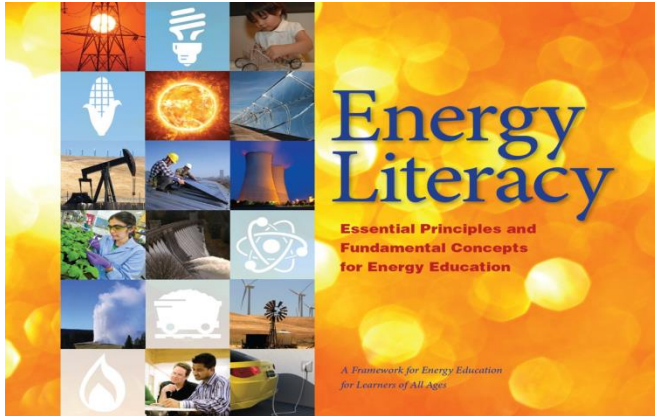
MAY 2011



“The Department will actively participate in the development and implementation of a coordinated national “energy education” or “energy literacy” effort.”

[DOE Strategic Plan, May 2011]

<http://energy.gov/downloads/2011-strategic-plan>

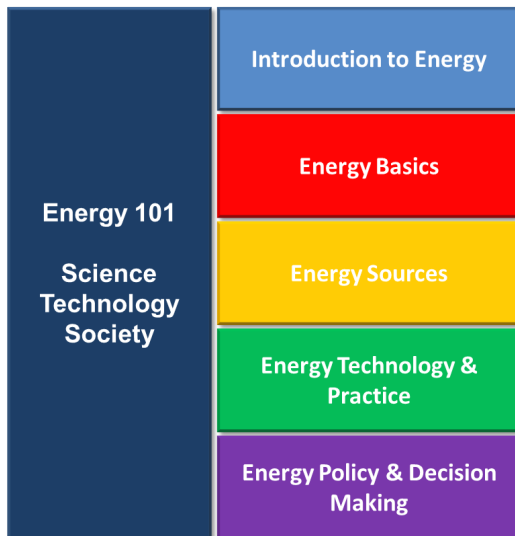


- **Energy Literacy Initiative & the Energy Literacy Document**

- Josh Sneideman

- Albert Einstein Distinguished Educator Fellow

- EERE- Education & Workforce Development



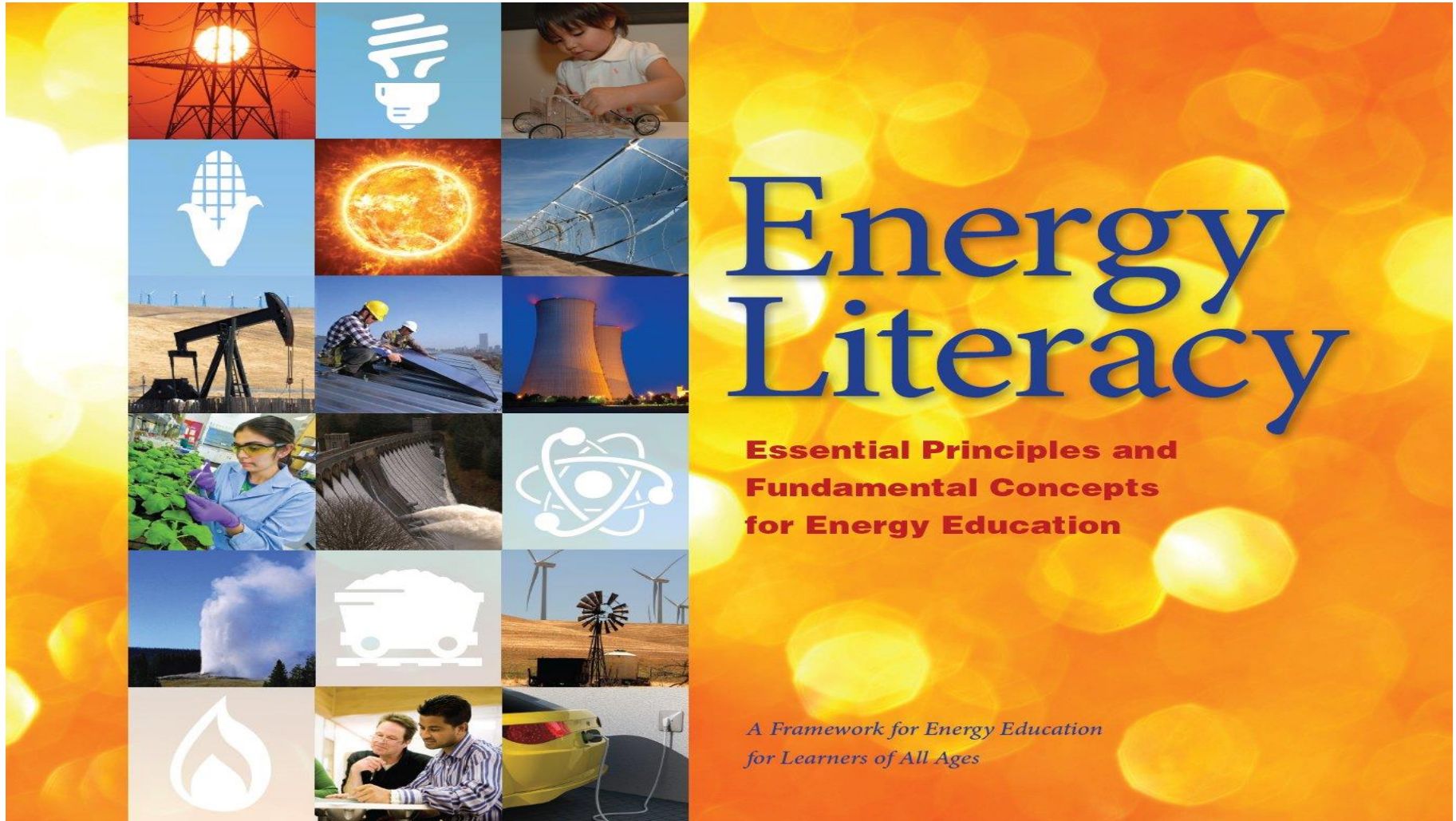
- **Energy 101 project & the Energy 101 Framework**

- Matt Garcia

- Oak Ridge Institute of Science Education Science & Technology Policy Fellow

- EERE-Education & Workforce Development

A Framework for Energy Education for Learners of All Ages



Energy Literacy: 7 Essential Principles

1

Energy is a physical quantity that follows precise natural laws.



2

Physical processes on Earth are the result of energy flow through the Earth system.



3

Biological processes depend on energy flow through the Earth system.



4

Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.



5

Energy decisions are influenced by economic, political, environmental, and social factors.



6

The amount of energy used by human society depends on many factors.



7

The quality of life of individuals and societies is affected by energy choices.



- A better understanding of energy can:
 - Lead to more informed decision
 - Improve the security of the nation
 - Promote economic development
 - Lead to sustainable energy use
 - Reduce environmental risks and negative impacts
 - Help individual and organizations save money

Una persona con conocimientos en energía

- puede rastrear los flujos de energía y pensar en términos de sistemas de energía
- sabe la cantidad de energía que él/ella utiliza, para qué, y de dónde proviene
- puede evaluar la credibilidad de la información sobre energía
- puede comunicar acerca de la energía y el uso de energía de manera significativa
- es capaz de tomar decisiones con información y conocimiento de energía y su uso basadas en la comprensión del impacto y consecuencias
- continúa aprendiendo acerca de la energía a lo largo de su vida

Today's U.S. Energy System

Sustainable Energy System

TRANSFORMATION

- Produces 25% of the world's carbon emissions;
- Dependent on foreign sources; subject to price volatility;
- Increasingly vulnerable energy delivery systems; and
- 2/3 of source energy is wasted.

- Carbon neutral;
- Diverse, homegrown supply options;
- Sustainable use of natural resources;
- Creates American jobs;
- Accessible, affordable and secure;
- 20% more efficient by 2020.

Energy is one of the NGSS seven crosscutting concepts that **bridge disciplinary boundaries, uniting core ideas** throughout the fields of science engineering. The purpose is to help students **deepen their understanding** of the disciplinary core ideas and **develop a coherent and scientifically based view of the world.** (NGSS, 2013, p79)



NEXT STEPS



Read

- ✓ Download energy literacy framework
www.eere.energy.gov/education/energy_literacy.html



Do

- ✓ apply the principles in your class or curriculum
- ✓ Share this resource with fellow educators
- ✓ #EnergyLiteracy #Energy101

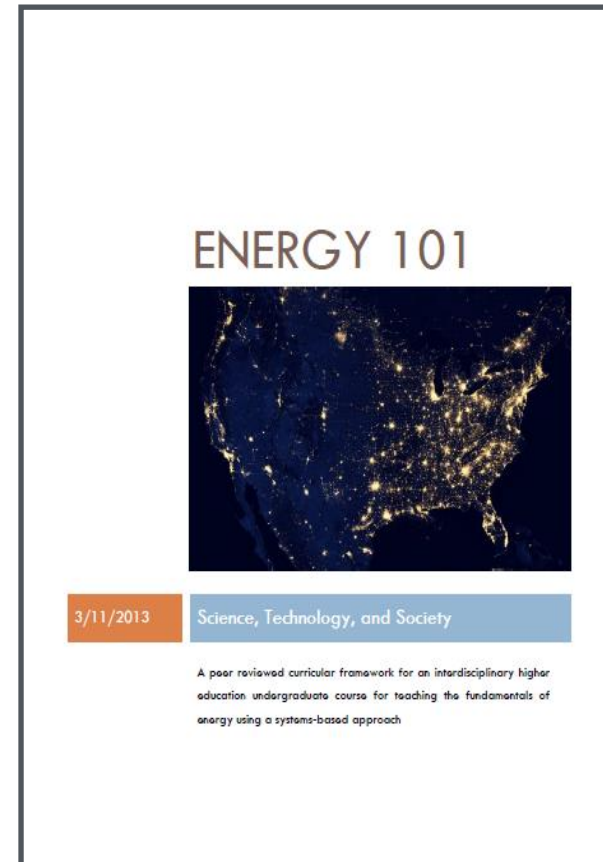
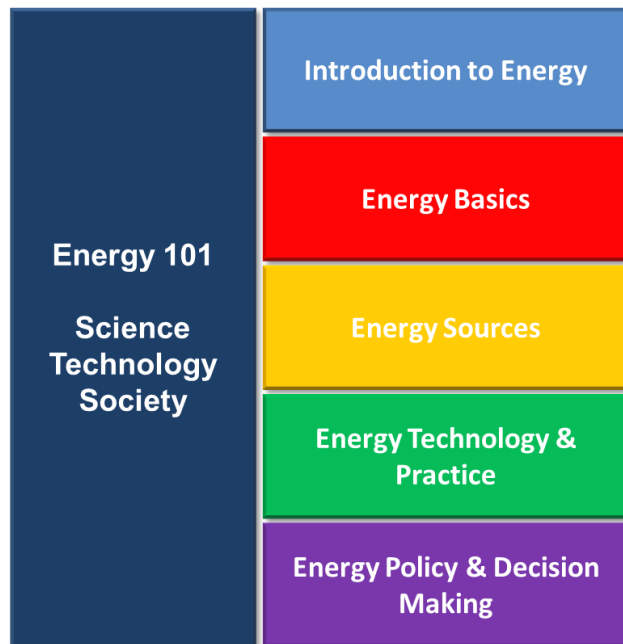


Connect

- ✓ Email me at energyliteracy@ee.doe.gov if you would like join the DOE in planning the next steps for Energy Literacy education.



What is the Energy 101 project?



eere.energy.gov/education/energy_101.html

#Energy101

What is the Energy 101 Project?

ENERGY 101



3/11/2013

Science, Technology, and Society

A peer reviewed curricular framework for an interdisciplinary higher education undergraduate course for teaching the fundamentals of energy using a systems-based approach

A recognition of undergraduate energy education efforts in the Nation's colleges and universities.

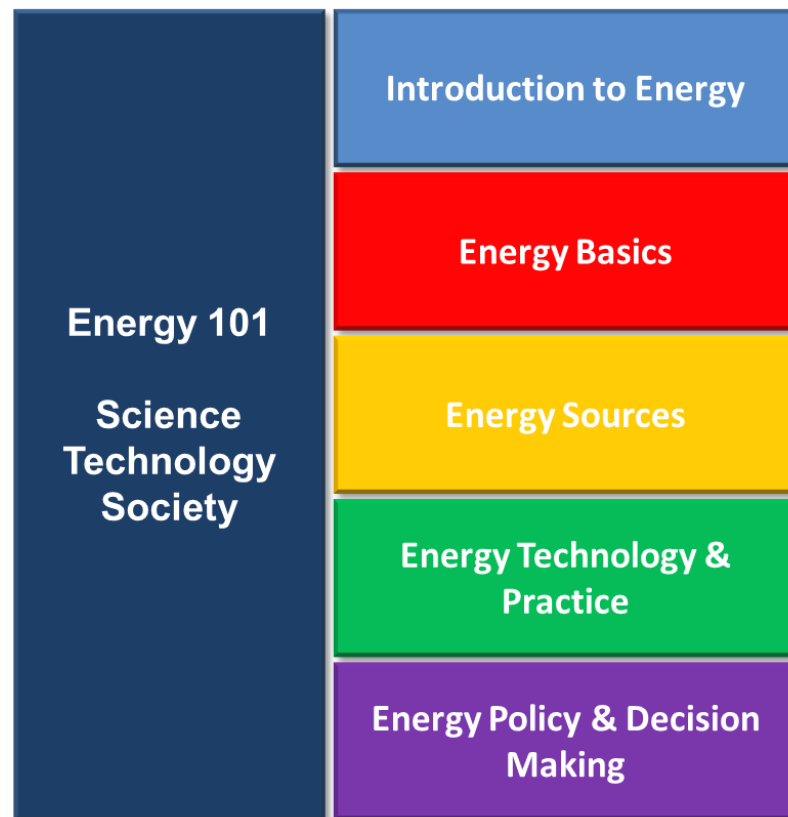
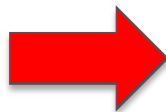
- Effort to further Support and amplify those efforts
 - Encouraging the creation of energy fundamentals courses
 - Foster a coordinated national discussion on energy education at the post-secondary level

Overall Goal

- **Increasing the pathways available to students towards training, degrees and careers in energy and related fields (STEM)**

eere.energy.gov/education/energy_101.html

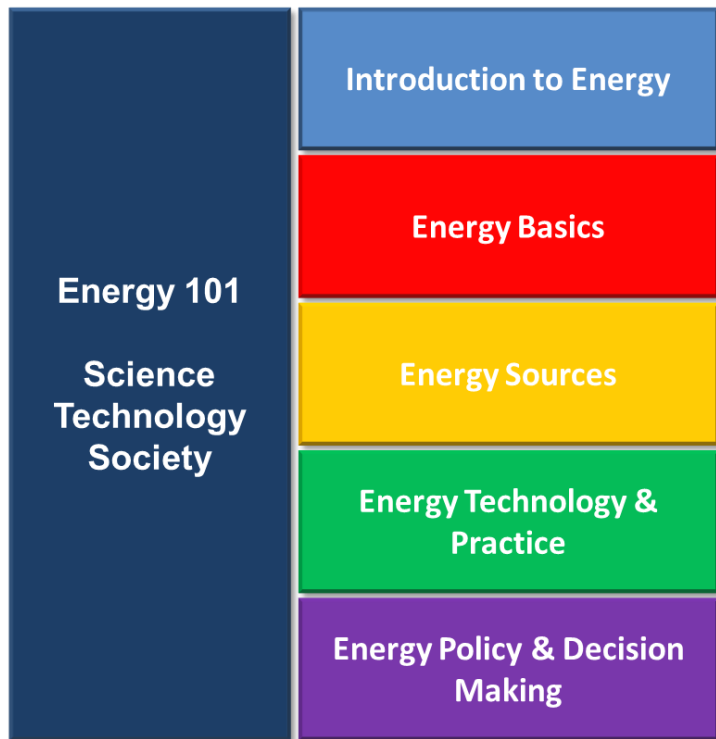
A product of the Energy 101 project: The Energy 101 Course Framework



Packages the peer reviewed Energy Literacy Principles into a semester long introductory course framework

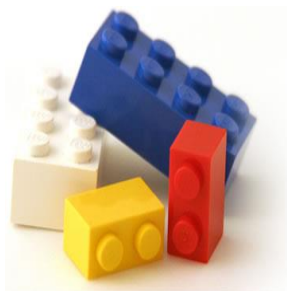
Course framework consisting of 5 Units of fundamentals and concepts in Energy

What is The Energy 101 Framework?



- While not itself a course or curriculum, the framework presents a universal set of building blocks to help course creation
- Provides a core course lattice which can be modified and customized to meet the unique student, institutional and regional energy landscapes

**Building
Blocks**



**Energy Fundamentals
Course**

#Energy101

The 5 Units of the Energy 101 Course Framework- 36 core concepts

U1. Introduction to Energy

1. Energy is a physical quality that follows precise natural laws (Core 1.1)
2. Physical processes on Earth are the result of energy flow through the Earth system. (Core 2.6)
3. Biological processes depend on energy flow through the Earth system. (Core 3.6)

U2. Energy Basics

1. Energy is a physical quantity that follows precise natural laws (Cores 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8)

U3. Energy Sources

2. Physical processes on Earth are the result of energy flow through the Earth system. (Core 2.2)
4. Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination. (Core 4.1, 4.3, 4.5, 4.7)
6. The amount of energy used by human society depends on many factors. (Core 6.1)
7. The quality of life of individuals and societies is affected by energy choices. (Core 7.3)

Units

U4. Energy Technology & Practice

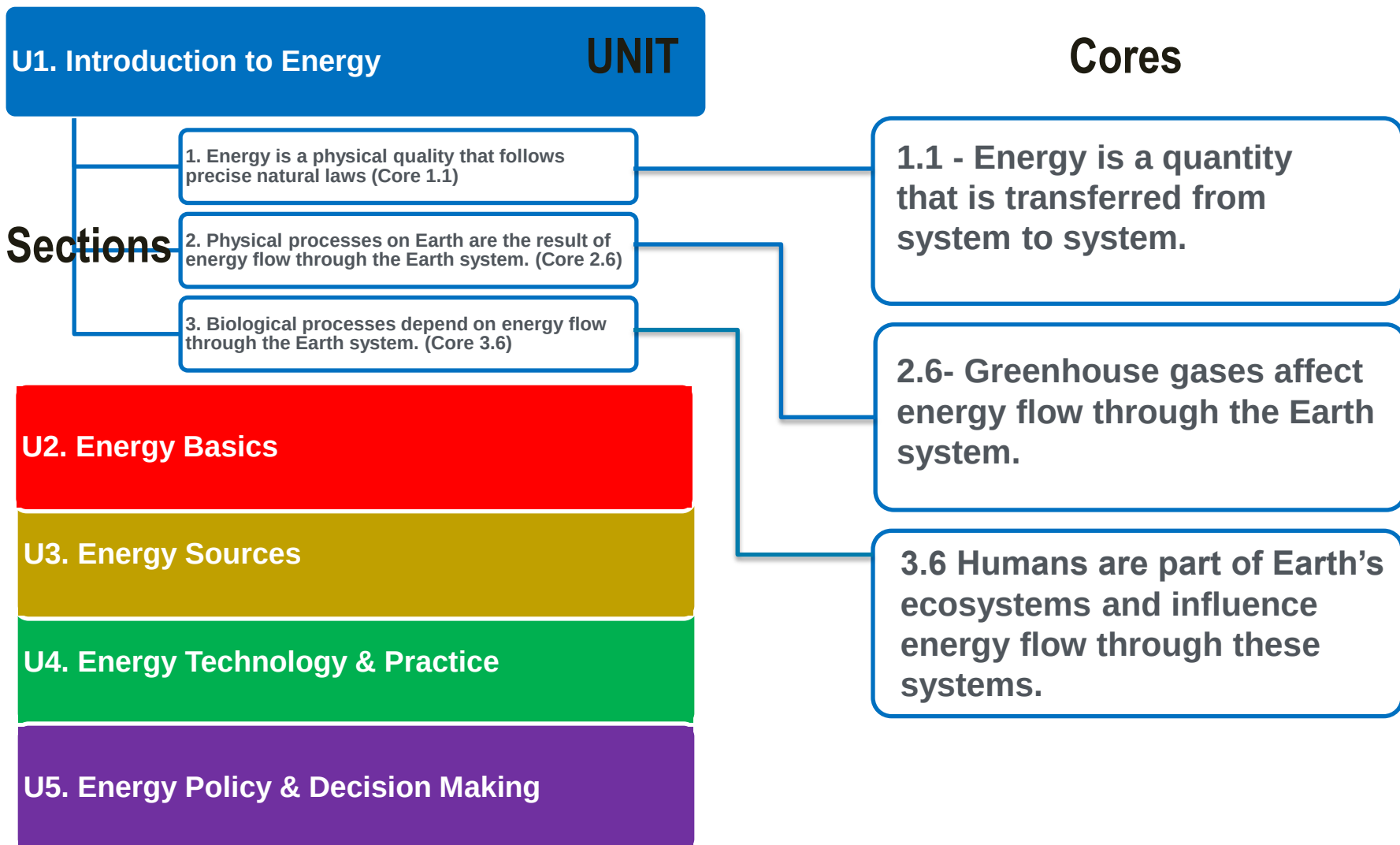
4. Various sources of energy can be used to power human activities, often this energy must be transferred from source to destination. (Cores 4.2, 4.3, 4.4, 4.5, 4.6, 4.7)

U5. Energy Policy & Decision Making

5. Energy decisions are influenced by economic, political, environmental, and social factors. (Cores 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7)
6. The amount of energy used by human society depends on many factors. (Cores 6.3, 6.4, 6.5, 6.6, 6.8)
7. The amount of energy used by human society depends on many factors. (Core 7.1)

Sections (Cores)

- 5 Units
- 1-3 sections
- 36 supporting core concepts





Home > Class Is Now in Session: Energy 101

Class Is Now in Session: Energy 101

August 19, 2013 - 11:48am



Students from the University of Maryland's Designing a Sustainable World course, a class based on the Energy Department's Energy 101 Course Framework, present their end-of-year design projects. | Photo courtesy of the University of Maryland.

Nadia Barboza
Intern, Office of Energy Efficiency and Renewable Energy

This week, Energy.gov is heading back to school. We'll be featuring stories on the role students and schools play in driving America's energy economy – from installing solar in the classroom to advancing innovations as interns at the National Labs. Stay up to date on our back-to-school week series by checking in with us everyday on [Energy.gov](#), [Twitter](#), [Facebook](#) and [Google+](#).

ABOUT THE ENERGY 101

Right now, millions of college students across the country are preparing for the start of a new semester – juggling the dual burden of their class schedules and environmental

Spring 2013, Pilot course at University of Maryland was offered

- Resulted in a general Education Course Credit
- More than 90 percent of the students who took the pilot indicated it helped them think about the complex issues or problems surrounding energy

February 2013, Harford Community College in Bel Air, Maryland, received approval to teach a course based on the Framework, *Introduction to Energy & Sustainability* (SCI 109)

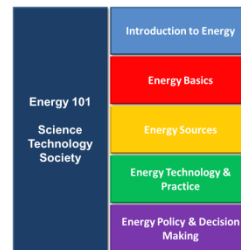
- General Science Course
- Transferrable to All State Higher Education Institutions in Maryland

In May of 2013, Cecil Community College received approval for *Introduction to Energy & Sustainability*

- 4 hour credit courses: ENV 150

<http://energy.gov/articles/class-now-session-energy-101>

- University of Maryland pilot “Energy 101” course deployment and framework development- Idalis Villanueva, Ph.D. Assistant Professor, Utah State University
- University of Maryland -Preparation for Energy and Power Careers (PEPC) - Leigh Abts, Ph.D. (Research Associate Professor, University of Maryland, College Park)
- RET “Energy 101” project at Cecil College- Professor Gail Wyant- Engineering & Geosciences



ENERGY 101 FRAMEWORK DEVELOPMENT

DOE Engaging Students in Energy Webinar

December 13, 2013



Idalis Villanueva, Ph.D. (Assistant Professor, Utah State University)

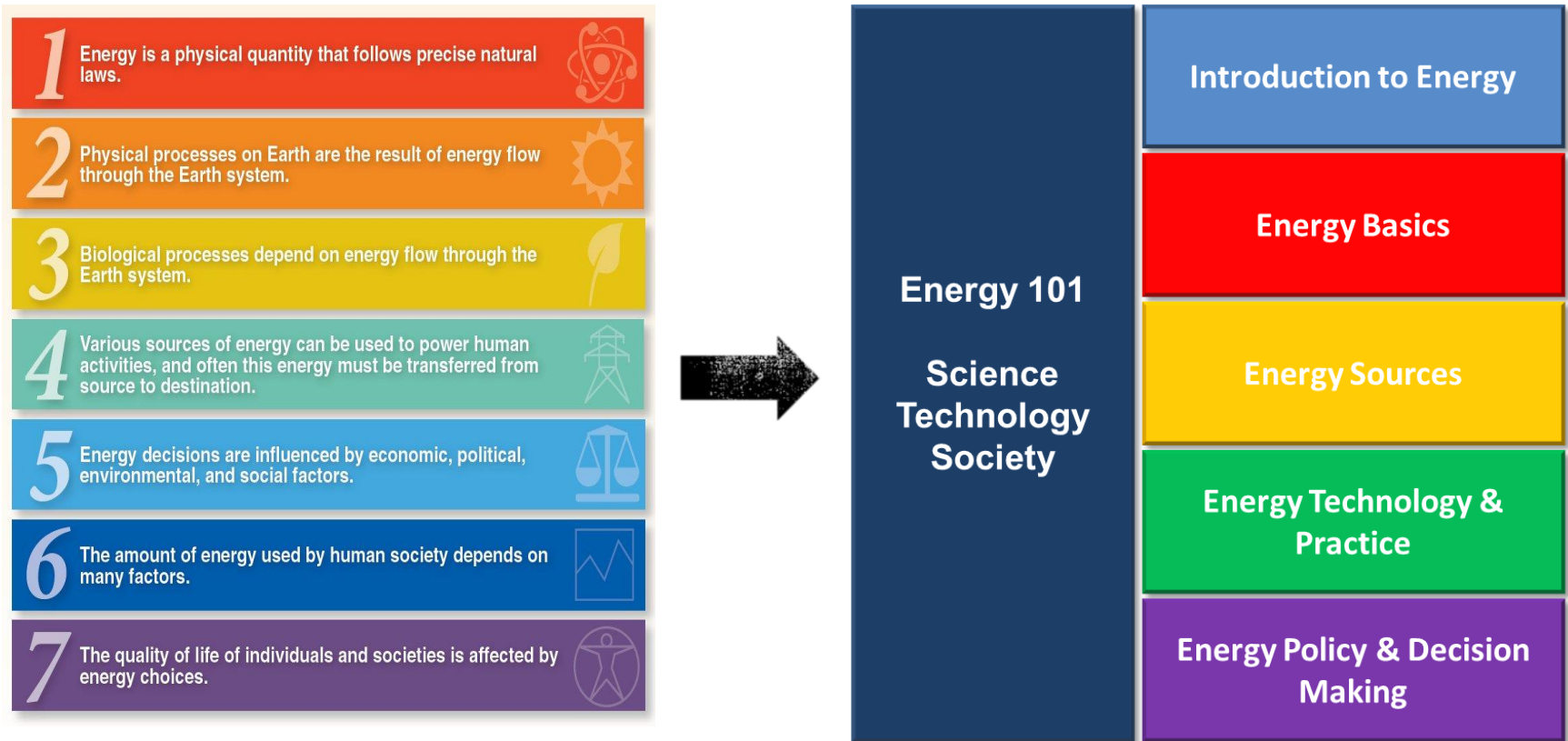
Leigh Abts, Ph.D. (Research Associate Professor, University of Maryland, College Park)

HYBRID DESIGN MODEL: CREATING A BASELINE INSTRUCTIONAL MODEL

- The hybrid design model was created for a project that aimed to disseminate energy literacy across the nation
 - Wide range of disciplines, age groups, institutions, and walks of life
 - Collaborative effort from the Department of Energy, EESI, APLU, and the University of Maryland at College Park
 - First step was to develop a baseline national model for an Energy 101 course



THE COURSE FRAMEWORK



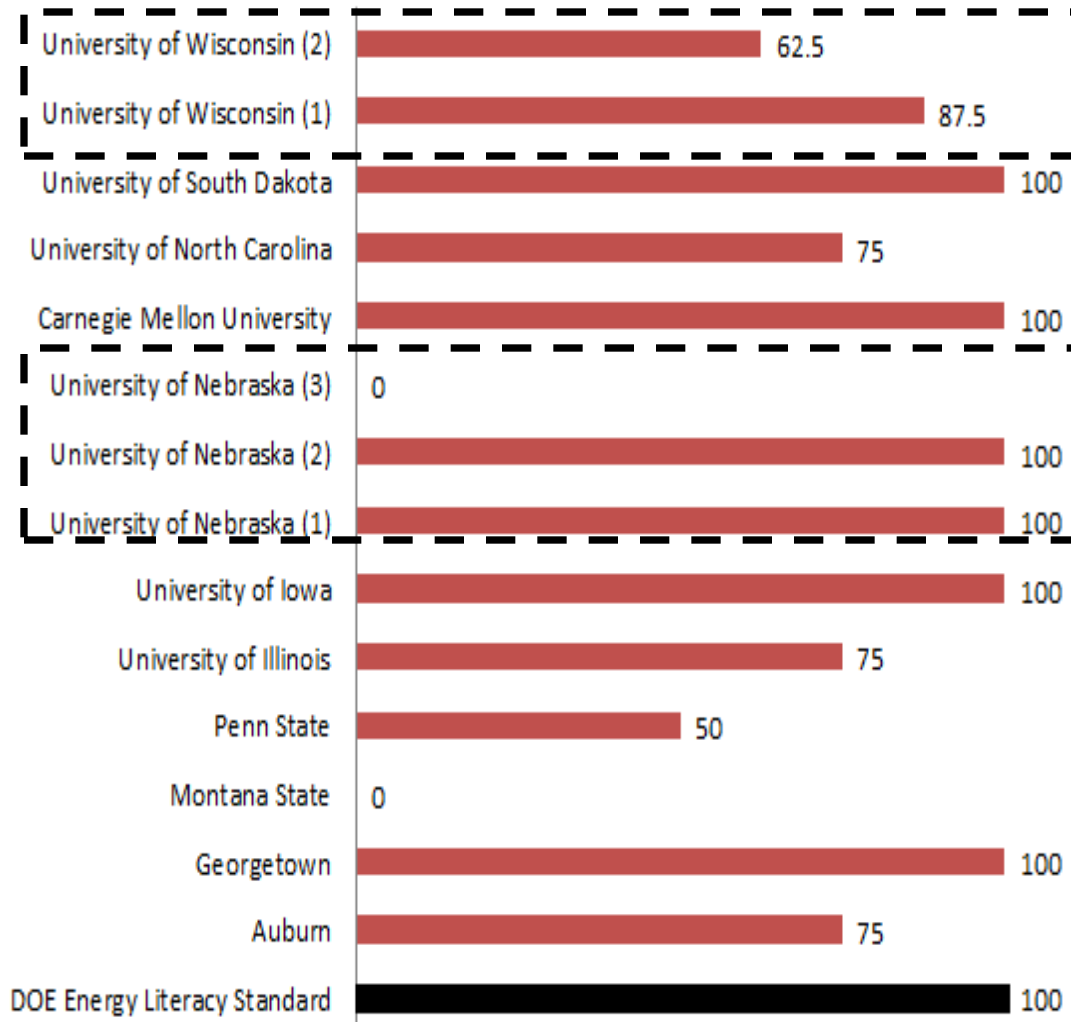
Packages the peer reviewed Energy Literacy Principles into a semester long introductory course framework

Energy 101 Framework



HYBRID DESIGN MODEL: CREATING A BASELINE INSTRUCTIONAL MODEL

% alignment to Energy Literacy Standard



DESIGN-BASED MODELS

Understanding by Design

1. Identify Desired Results
2. Determine Acceptable Evidence
3. Plan Learning Experiences and Instruction



Universal Design Learning

1. Equitable Use
2. Flexibility in Use
3. Simple and Intuitive
4. Perceptible Information
5. Tolerance for Error
6. Low Physical Effort
7. Size and space for approach and use



Evidence Centered Design

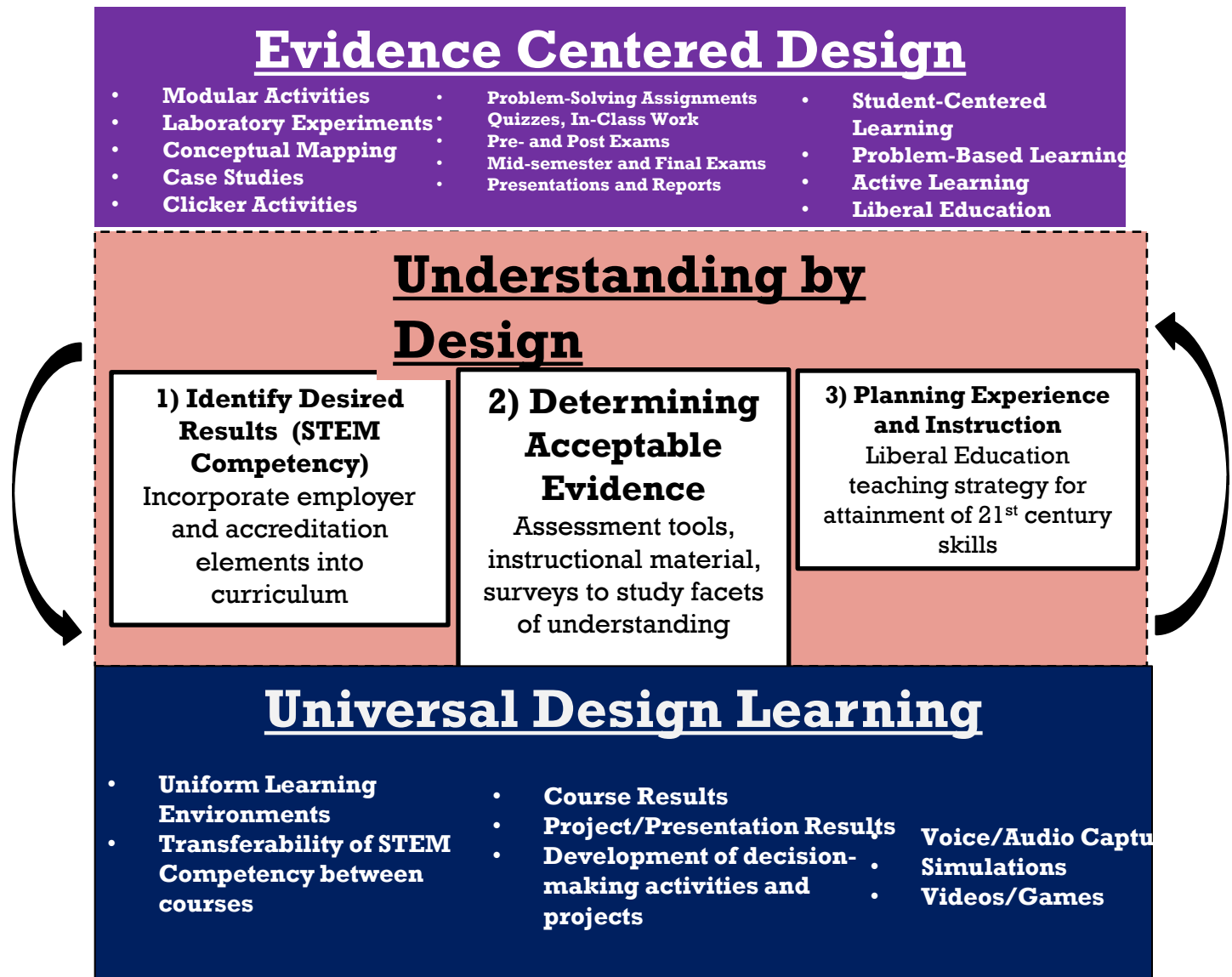
1. Competency Model
2. Evidence Model
3. Task or Action Model



Sources: Wiggins G., and McTighe J. 2005. *Understanding by design*. 2nd Ed., Association for Supervision & Curriculum Development, Alexandria: VA. *Understanding by Design* works on the premise that desired results are identified by determining acceptable evidence (i.e., assessment tools) to customize your planning experience and instruction; Mislevy RJ., Almond RG., and Lukas, JF. 2003. *A Brief Introduction to Evidence-centered Design*. Research Report, RR-03-16, Educational Testing Service: Princeton, 1 – 37. Evidence centered design identifies the learning tools, activities, and tools that will be assessed; Rose DH. and Meyer A. 2002. *Teaching Every Student in the Digital Age: Universal Design for Learning*, with Nicole Strangman and Gabrielle Rappolt. Alexandria, VA: Association of Supervision & Curriculum Development. *Universal Design Learning* considers the principles and practices from students with physical and learning disabilities to identify particular needs of a community and student body.



GRAPHICAL REPRESENTATION OF 'ENGINEERED' HYBRID DESIGN MODEL





I-Series Course

“The I-Series is the signature program of General Education at the University of Maryland. I-Series courses are lively and contemporary. They speak to important issues that spark the **imagination**, demand **intellect**, and **inspire innovation**.”

THE CHRONICLE
of Higher Education
Tuesday, December 18, 2012
Subscribe Today

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At U. of Maryland, an Effort to Make Introductory Courses Extraordinary



Joey Pulone for The Chronicle

Undergraduates at the U. of Maryland at College Park present their research via a poster session as part of a new-style introductory course on "Materials of Civilization." The course teaches "a bunch of science and physics," its instructor says. "But it's not dry Physics 101."

By Dan Berrett

College Park, Md.

Required introductory courses are as important as they are unloved.

They are a key part of the general-education curriculum, which makes up as much as one-third of the typical baccalaureate student's education, and they are the subject of seemingly never-ending



Hybrid Design Model:

Creating a Baseline Instructional Model

- **BIOE 289A: Designing a Sustainable World** was developed, proposed, and approved for the I-Series course in UMD College Park
- First run in Spring 2013 semester (~100% alignment to Energy Literacy Standards)
- Future course will take place in Spring 2014

Week	Dates	Topic/Description	Material	Due
1	January 24 (Lecture 1)	What is Energy? A definition on energy, the formal laws governing energy, how its transformed, and an introduction on units	Handouts and video tutorials	N/A
2	January 29- (Lecture 2); January 31- (Lecture 3)	An Energy Medley A description of varying energy forms: chemical and biochemical, physical (mechanical kinetic and gravitational potential), thermal, electrical, and nuclear	Handouts and video tutorials	N/A
3	February 5- (Lecture 4); February 7- (Lecture 5)	<i>Workshop: Designing a Sustainable Plan</i>		
4	February 12- (Lecture 6); February 14 - (Lecture 7)	And it began with a source... An introduction to different energy sources including petroleum, natural gas, coal, propane, fossil fuels, water, wind, and light	Handouts/ video or simulation	Elements A and B (Feb. 14)
5	February 19- (Lecture 8); February 21- (Lecture 9)	Sustainable Alternatives An overview of the differences between renewable and non-renewable sources; advantages and disadvantages of new technologies will be highlighted	Handouts	N/A
6	February 26- (Lecture 10); February 28- (Lecture 11)	Let's conserve energy efficiently An introduction to techniques and materials used to conserve energy	Online tutorials	Elements C and D (Feb. 28)



Hybrid Design Model: Creating a Baseline Instructional Model



Identify a Problem. Go after a solution.
Document your work. Connect with Opportunities.



The Innovation Portal enables

...students to create, maintain and share digital portfolios. The portfolios can be used to meet a class requirement or they can be used to submit the portfolio to a scholarship or open contest. The contest owners - or anyone else invited by the student - can evaluate a student's portfolio.

Register Now! or

Sign In!

***Rubric developed by Dr. Leigh Abts
and collaborators in Project Lead the
Way***

In process for submission to Journal of Engineering

Portfolio Elements

Portfolio Home

A Presentation and justification
of the problem

Resources

EDPPSR

B Documentation and analysis of
prior solution attempts

Resources

EDPPSR

C Presentation and justification
of solution design
requirements

Resources

EDPPSR

D Design concept generation,
analysis, and selection

Resources

EDPPSR

E Application of STEM principles
and practices

Resources

EDPPSR

F Consideration of design
viability

Resources

EDPPSR

G Construction of a testable
prototype

Resources

EDPPSR

H Prototype testing and data
collection plan

Steps to the Design Process



Hybrid Design Model: Creating a Baseline Instructional Model

Sample Lesson Plan (Lecture 4)

- **Essential Questions:**

- EQ1: How does design process differ from the scientific method?
- EQ2: Why research is an important process embedded in design?
- EQ3: What are the steps of the design process?
- EQ4: How designs be systematically be developed to solve a problem.

- **Energy Literacy Standards:**

- 5.1: Decisions concerning the use of energy resources are made at many levels.
- 5.3: Energy decisions can be made using a systems-based approach.
- 5.4: Energy decisions are influenced by economic factors.
- 5.5: Energy decisions are influenced by political factors.
- 5.6 Energy decisions are influenced by environmental factors.
- 5.7 Energy decisions are influenced by social factors.

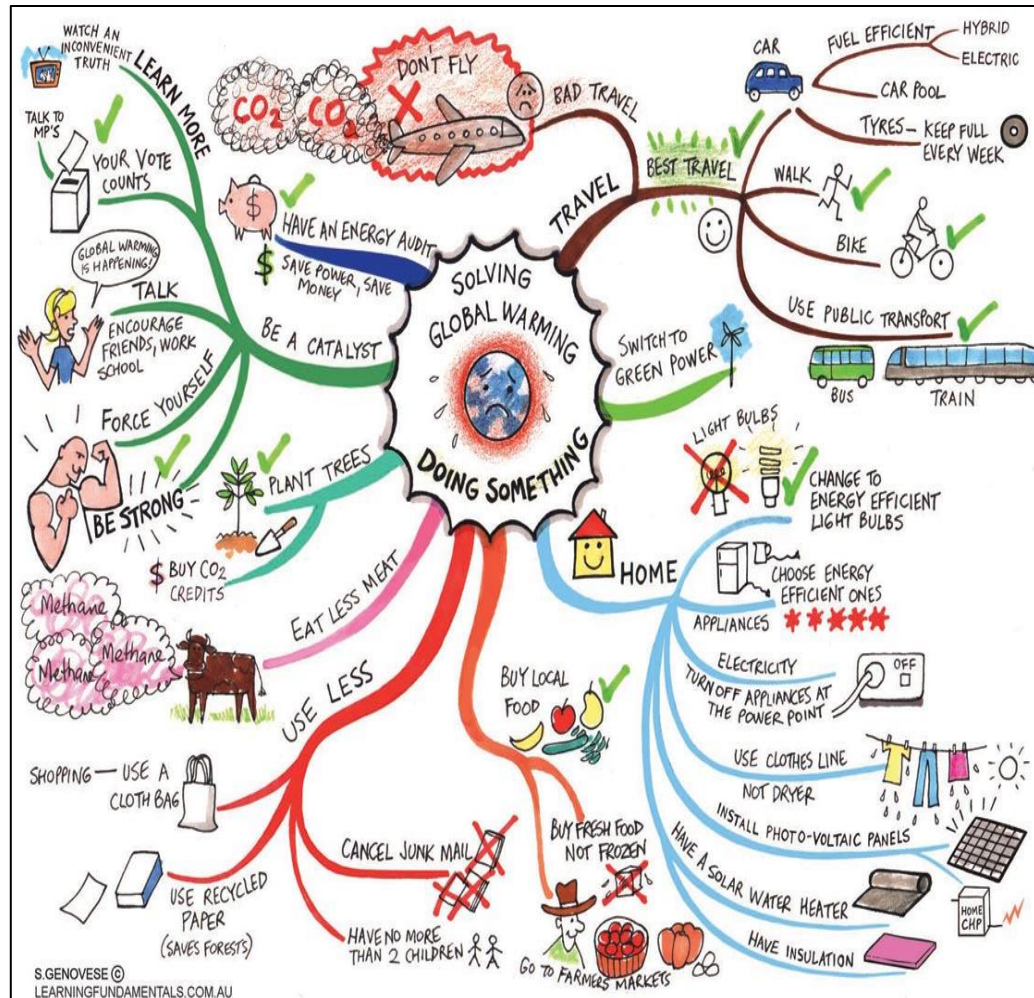
*BIOE 289A material was co-developed by Dr. Villanueva and Dr. Abts
In process for submission to Journal of Engineering Education*



Hybrid Design Model:

Creating a Baseline Instructional Model

Sample Lesson Plan (Lecture 4)



BIOE 289A material was co-developed by Dr. Villanueva and Dr. Abts

Abstract accepted for the 2014 American Educational Research Association Conference



APPLYING 'DESIGN THINKING' INTO A SUSTAINABLE PLAN

Sample Lesson Plan

(Lecture 4)

STEP 4 and STEP 5

Alternative Solutions/ Implementing

Choices: Try out your plan and tells us what worked and did not work and changes you would make. Implement the changes that worked in your plan.

STEP 3

Performance Criteria: For your idea, what factors can make your plan successful in targeting your goal.

STEP 6

Evaluate Outcomes: Tell us if your changes fixed the problem. Where the problems you were looking for in Step 2 addressed? If not, what would you do differently?

Example: For global emissions in cars, you want your design to be below the EPA emissions standards

STEP 2

Information:

Ask yourself? What area within my problem do I want to focus on? What are reliable sources of information? What information can tell me more about my topic?

DESIGN THINKING STEPS:

Step 1: Identify and define problems.

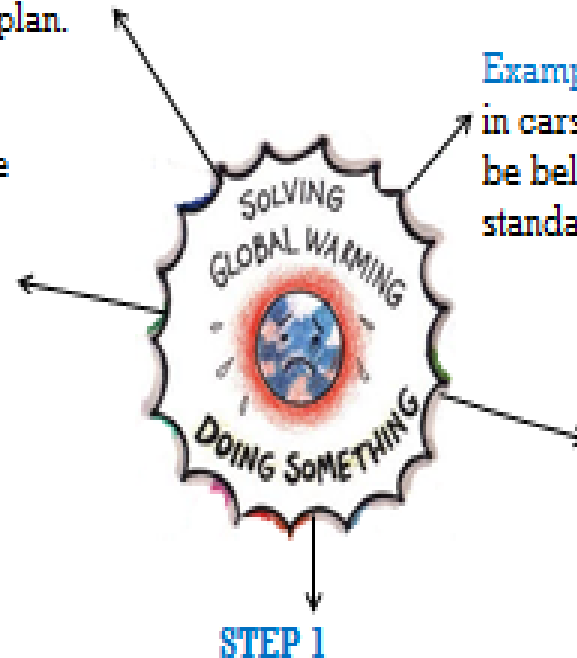
Step 2: Gather and analyze information.

Step 3: Determine performance criteria for successful solutions.

Step 4: Generate alternative solutions and build prototypes.

Step 5: Implement choices.

Step 6: Evaluate outcomes.



STEP 1

Problem: Global Warming

Definition: Average increase in atmospheric temperature, which can contribute to changes in global climate patterns

Example: For global warming, I could be interested in CO2 changes in the US over the past 20 years due to car emissions

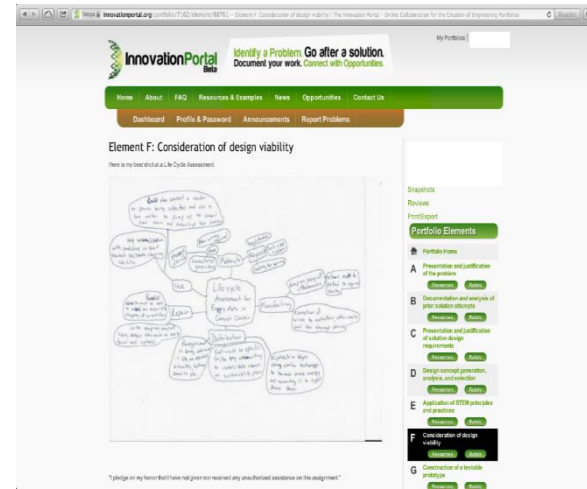


Sample Lesson Plan (Lecture 4)



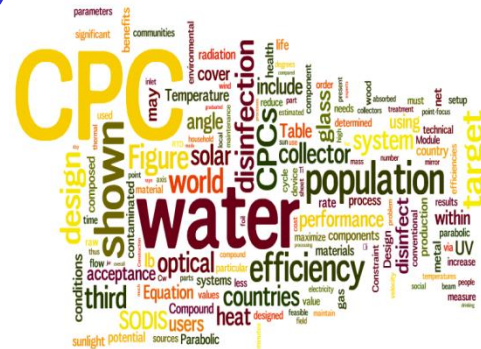
ECD assessments via Innovation Portal, quizzes, and in-classroom activities are currently being analyzed

Mind maps



By Mr. Paul Wampler, SO LTSC

Word Cloze

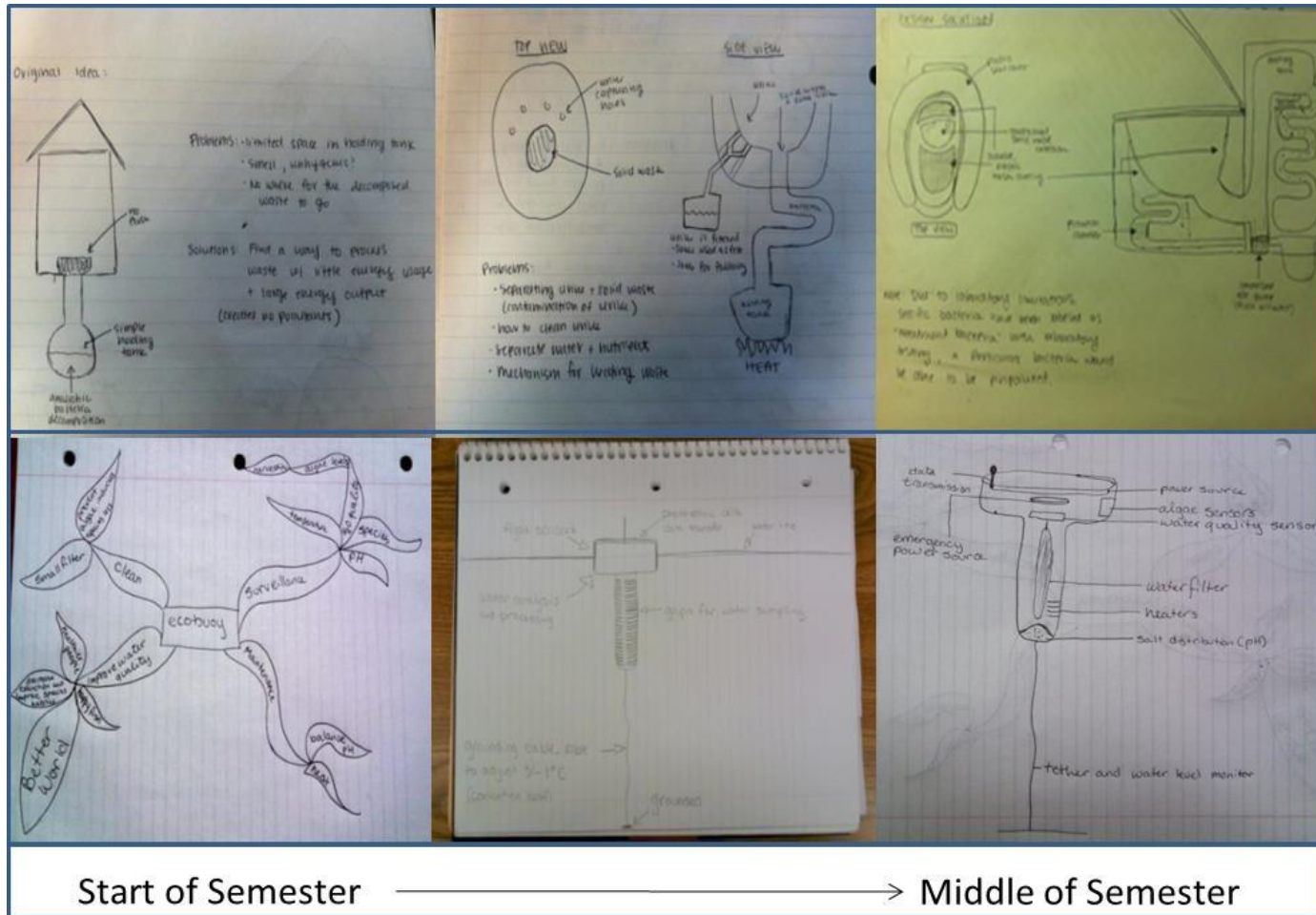


Mr. James Thomas, SR Civil Engineering



EXAMPLE PROJECTS

Courtesy of Ms. Natalie Tham – FR LTSC



Top: ‘Sustainable’ toilet by

Bottom: Sustainable water contamination buoy

Start of Semester —————> Middle of Semester

Courtesy of Ms. Rachel Grafman, FR Civil Engineering



COURSE RESULTS

Results from 27 students that took BIOE 289A: Designing a Sustainable World

Select Questions from Survey	Strongly Agree/Agree	Neutral	Strongly Disagree/Disagree
1) The course helped me to think about complex problems/issues	93%	0%	7%
2) Throughout the course the teaching and the materials kept me engaged	68%	7%	25%
3) The course dealt with problems that were relevant to me	86%	7%	7%
4) The course helped me to see and understand the political/social/economic and/or ethical aspects of the issue/problem that was the focus of the course	89%	7%	4%



SELECT STUDENT COMMENTS ABOUT COURSE:

- *I'm a biochemistry major, so design is not my strong point. I never thought I could create a[n engineering] design...as specific as I did. By the time I finished I thought, whoa, I've accomplished a lot...it's definitely changed my thoughts."*
- *"It's a good course because energy is the most important element in current society and sustainability is the most basic demand for our development."*



CURRENT DIRECTIONS FOR ENERGY 101:

PEPC: Preparation for Energy and Power Careers (PEPC)

Designing Quantitative Solutions for Energy

- **Leigh R. Abts**
- Research Associate Professor
- A. James Clark School of Engineering & College of Education
University of Maryland, College Park
- December 13, 2013



OVERVIEW

The course is supported by the Department of Defense, Office of Advanced Distributed Learning (ADL), through the “Next Generation Environment for Next Generation Learners” program and based on foundational research funded by the Department of Energy and the National Science Foundation



OVERVIEW

OBJECTIVE: Establish the foundation and process for nationally recognized and transferrable credit (micro-credentialing)

DELIVERABLES: A UMD 4-credit on-line, asynchronous, blending engineering mathematics concepts with the DOE Energy Literacy Principles and Design Thinking.

OPERATIONAL IMPACT: Support active duty and veteran transitions to civilian energy workforce through training and education

WORKFORCE DEVELOPMENT: Aligned to the Center for Workforce Development (CEWD) Troop to Energy Jobs initiative



KEY ONLINE COURSE COMPONENTS

- **6 Units (Straight Lines, Quadratics, Sinusoids, Logarithms, Derivatives, and Integrals)**
 - 6 Foundational Mathematics Video Lectures
 - 18 Mathematics Video Lectures
- **12 Application Videos – Real World Energy Problem Examples**
- **4 Virtual Laboratories**
- **7 Design Videos**
 - Innovation Portal (e-portfolio)
 - Design Project utilizing an e-portfolio
 - Design project mentoring
- **Alignment to CEWD Troops to Energy Jobs**
- **Integrated Evaluation and Assessment Plan**



INTEGRATION OF THESE FOUNDATIONAL BUILDING BLOCKS

Objectives:

- To master basic math **PROBLEM SOLVING** concepts
- To develop an understanding of their **APPLICATIONS IN ENERGY**
- Apply the **DESIGN PROCESS** to find a solution to a real world, energy problem

Part 1: Mastering basic math **PROBLEM SOLVING** concepts

- Linear lines
- Quadratic equations
- Sinusoids
- Logarithms
- Derivatives
- Integrals

Part 2: Understanding mathematical **APPLICATIONS** in **ENERGY** and **VIRTUAL LABORATORIES**

1. Applications (e.g. Heat Transfer in Nuclear Power Plant Condenser, Heat Conduction through a Wall)
2. Laboratories (Ohms Law, Transformers and Alternating Current, Applications of Exponentials in Energy, and Systems Thinking Laboratory)

Part 3: Independently solve **ENERGY** problems applying **MATH PROBLEM** concepts through **DESIGN THINKING** (Design Project)

RECRUITMENT

- Target Goal: 30 Active Duty transitioning service members or Veterans
- Over 250 invitations to apply
- To date, 35 applications received
- UMD Mathematics entrance examination
- Acceptance into the program



SPECIAL THANKS TO THE CONTRIBUTORS

- The students!
- James Turner, Senior Counsel and Director of Energy Programs, Association of Public and Land Grant Universities
- Ellen Larson Vaughan, Policy Director, High Performance Green Buildings, Environmental and Energy Study Institute
- Indira Nair, Professor and Vice Provost Emeritus, Carnegie Mellon
- Matthew Garcia, AAAS Science & Technology Policy Fellow, Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy
- DaNel Hogan, Albert Einstein Distinguished Educator Fellow, Energy Efficiency & Renewable Energy, U.S. Department of Energy
- Mark Schroll, *Senior Director of Strategic Partnerships*, Project Lead the Way
- Rosemary Reshetar, Executive Director at The College Board
- Margaret McLaughlin (Associate Dean for Research and Graduate Education, UMD College Park)
- Tami Imbierowicz, Harford Community College
- Gail Wyant, Cecil Community College
- Department of Defense
- Keith Herold, Ph.D. Associate Professor, UMD College Park



THANK YOU!

- Idalis Villanueva, Ph.D.
(idalis.Villanueva@usu.edu)
- Leigh Abts, Ph.D. (labts@umd.edu)



RET Energy 101 Project

NSF Grant



By Gail Wyant

Mentors: Dr. Leigh Abts

Dr. Idalis Villanueva





RET Energy Project

Energy 101 Goals



Surveyed courses with energy content at Cecil College to check for alignment with energy literacy standard and found 10 to 20% of these standards are covered.

Created a 4 credit Energy Literacy course with lab that meets general science distribution requirements and is an emerging issues course.

Implemented textbooks for use with the course.

Designed labs and hands on activities to integrate into the course. It will be offered in traditional and hybrid formats



The Course Framework

1

Energy is a physical quantity that follows precise natural laws.



2

Physical processes on Earth are the result of energy flow through the Earth system.



3

Biological processes depend on energy flow through the Earth system.



4

Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination.



5

Energy decisions are influenced by economic, political, environmental, and social factors.



6

The amount of energy used by human society depends on many factors.



7

The quality of life of individuals and societies is affected by energy choices.



RET Curriculum Elements

Course Syllabus

Date Approved:	May 8, 2013
Prepared By:	Gail Wyant
Course Title:	Introduction to Energy and Sustainability (SL, I)
Course Number:	ENV 150, PSC 150
Total Lecture Hours:	45
Total Lab Hours:	30
Total Course Contact Hours:	75
Credit Hours:	4
Pre-requisites:	EGL 093 and MAT 092 or appropriate skills assessment
Co-requisite:	None

Course Description:

Introduction to Energy and Sustainability with Lab (SL, I) will prepare students to investigate energy, its generation, use, and conservation strategies. The dependence of physical and biological processes on energy flow in the Earth's system will be studied. The role of renewable and nonrenewable energy sources to power human activities will be explored. The influence of the economic, political, environmental, and social factors on energy decisions will be examined. Field trip experiences may be required.



Curriculum Elements (3 outlines of 13)

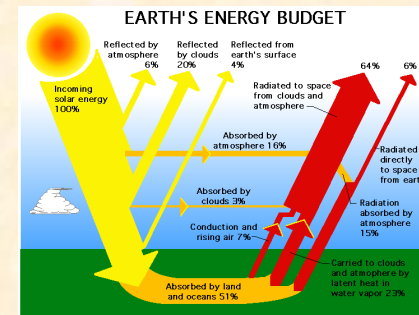
I Energy and natural laws

- A. Energy history
- B. Energy and work
- C. Energy's different forms
- D. Energy conservation
- E. Energy loss
- F. Thermal energy
- G. Energy units
- H. Power and energy transfer rate



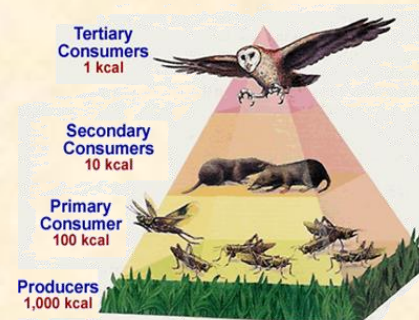
II. Energy flow through the Earth system

- A. Earth changes and energy flow
- B. Major sources of Earth's energy
- C. Weather, climate and the Sun
- D. Water's role in energy transfer and storage
- E. Energy and the flow of carbon
- F. Greenhouse gas energy affects
- G. Changes in Earth's energy



III. Biological processes and energy

- A. The Sun as a major energy source
- B. Organisms, food and energy
- C. Energy transfer and organisms
- D. Energy flows and food webs
- E. Ecosystems and energy
- F. Human's modifications and energy balance of Earth's ecosystems





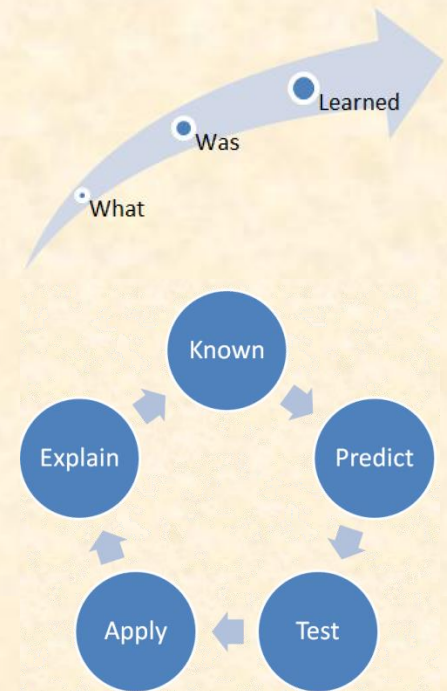
Curriculum Elements



The learning approach chosen was experiential for the classroom to be followed up with homework and projects for reinforcement. Pre and post assessments for units will be used.

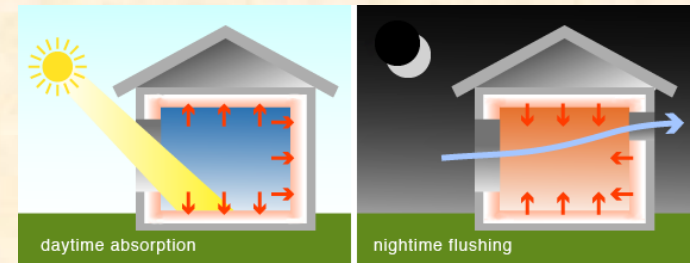
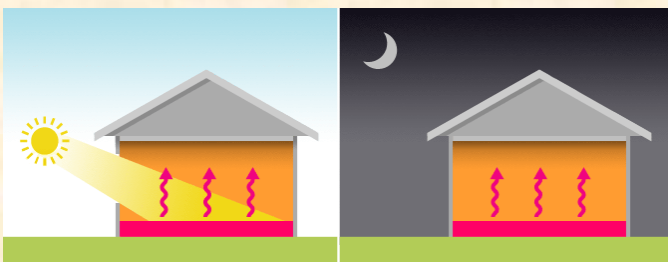
In my teaching experience, I have found success with the experiential learning cycle method. Retention is better.

- Students are asked what they know
- Students make a prediction
- Students test the prediction
- Students apply the new knowledge
- Students explain what was learned

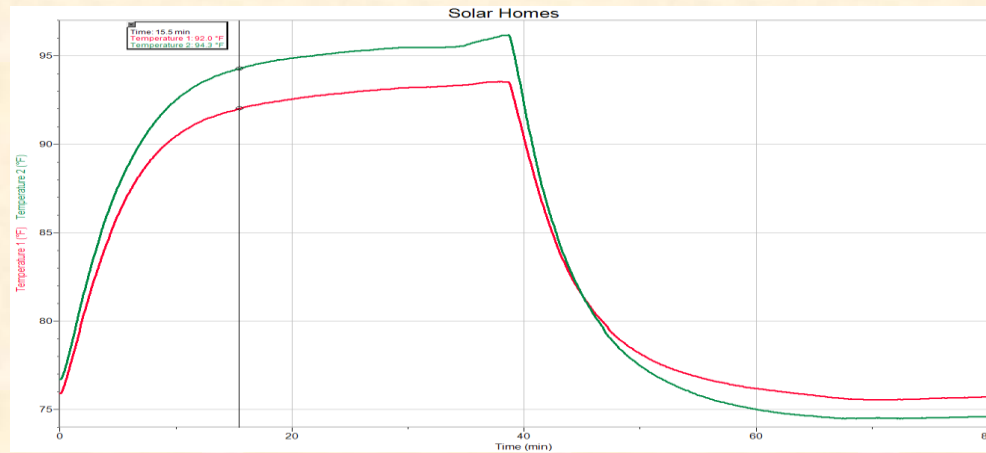
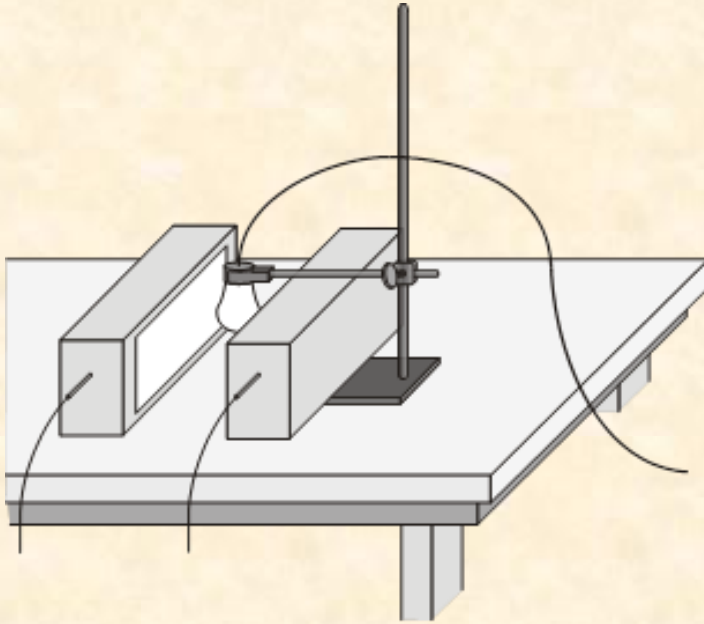


Solar Energy House Design Project

- Examine the effectiveness of thermal mass
- Determine the relationship between thermal mass and the ability of a solar home to retain heat
- Design and build a model solar home
- Test different thermal mass for the design
- Test different window materials
- Test different insulation materials



Solar Energy House Design



- Energy Education Webinar & Energy Literacy Webinars Spring of 2013
- Energy 101 Website
eere.energy.gov/education/energy_101.html
- Energy Education & Workforce Development website
eere.energy.gov/education/

We want to know about your efforts, please reach out and tell us about them: Energy101@ee.doe.gov and Energyliteracy@ee.doe.gov

Session 1 Questions and Answers

Session 2- EERE programs-Engaging Underrepresented Groups in Energy

Student Competitions and the National Clean Energy Student Business Plan Competition

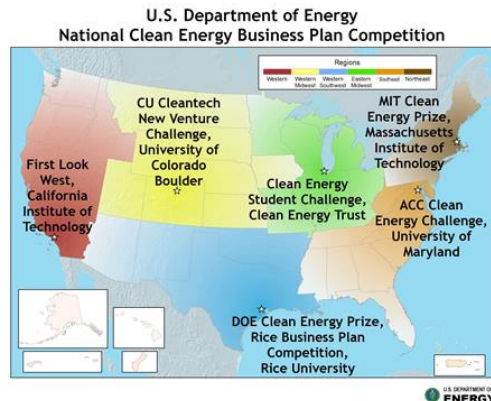
Small Business and Innovation Research (SBIR) program

Session 2: EERE: Student Competitions



Jennifer Garson

National Clean Energy Student Business Plan Competition & Student Competitions



Why We Compete

- Inspire entrepreneurs and technology developers
- Create opportunities for engaging in entrepreneurship
- Spur innovation across the country by creating prize incentives
- Closely tie researchers, industry, and government through public-private competitions

National Clean Energy Business Plan Competition – National Competition

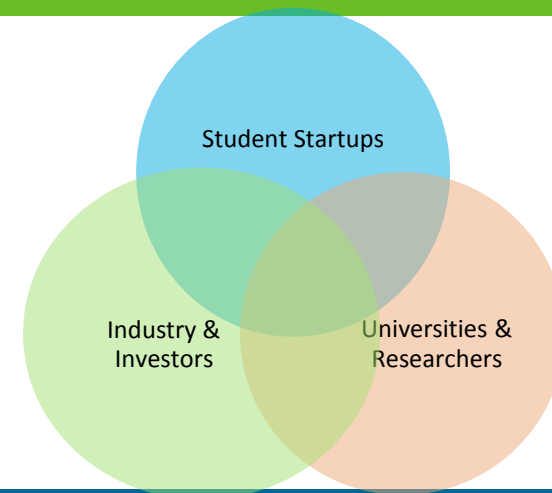


The National Clean Energy Business Plan Competition is a student-led competition comprised of six regional competitions, culminating in a National Competition in June.

- Western Southwest Region (deadline: February 21, 2014) – [Rice Business Plan Competition run by Rice University](#)
- Southeastern Region (deadline: February 14, 2014) – [ACC Clean Energy Challenge run by University of Maryland](#)
- Eastern Midwest Region (deadline: varies by state, check [here](#) for more information) – [Clean Energy Trust Clean Energy Challenge run by Clean Energy Trust](#)
- Western Midwest Region (deadline: February 24, 2014) – [CU Cleantech New Ventures Challenge run by University of Colorado-Boulder](#)
- Northeast Region (deadline: February 28, 2014) – [MIT Clean Energy Prize run by Massachusetts Institute of Technology](#)
- Western Region (deadline: March 4, 2014) – [First Look West run by California Institute of Technology](#)

About the NCEBPC

- ◇ **600 teams** involved in 2012-2013 NCEBPC
 - More than **55 startups** incorporated
 - **55 patents and disclosures** have been filed
 - **89+ jobs** created
 - More than **\$19M** in follow-on funding
- ◇ **Over \$700k in prizes** across the country for participants



How to Get Involved

- Teams must apply to any of **the regional competitions** across the U.S.
- Competed technology must apply to **EERE technology areas**
- Teams must be comprised of **50% students**
- The **2014 National Competition** will take place in June 2014

For more information, visit the National
Business Plan Competition at:

<http://techportal.eere.energy.gov/commercialization/natlbizplan.html>



The Collegiate Wind Competition is a forum for undergraduate college students of multiple disciplines to investigate innovative wind energy concepts; gain experience designing, building, and testing a wind turbine to perform according to a customized market data-derived business plan; and increase their knowledge of wind industry barriers. The National Renewable Energy Laboratory is facilitating the inaugural competition, which will take place in spring 2014.



DOE Collegiate Wind Competition Website

The official website of the competition wind.energy.gov/windcompetition/



The U.S. Department of Energy Solar Decathlon is an award-winning program that challenges collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive. The winner of the competition is the team that best blends affordability, consumer appeal, and design excellence with optimal energy production and maximum efficiency.

Impact

Since 2002, the Solar Decathlon has:

- Involved 112 collegiate teams
- Affected the lives of nearly 17,000 collegiate participants
- Expanded to currently include 65 participating teams and nearly 10,000 students in three competitions around the world: Solar Decathlon Europe 2012, Solar Decathlon China 2013, and the U.S. Department of Energy Solar Decathlon 2013





Interested in applying?

Solar Decathlon 2015 Collegiate Teams

The U.S. Department of Energy has released a funding opportunity announcement (FOA) to support the participation of up to 20 college and university teams in Solar Decathlon 2015. See [DE-FOA-0000959: U.S. Department of Energy Solar Decathlon 2015](#) for complete information.

Please note the following important dates for the Solar Decathlon 2015 teams FOA:

Issue date: Nov. 1, 2013

Submission deadline: Dec. 20, 2013, at 5 p.m. EST

Expected notification date: Feb. 14, 2014

Expected timeframe for award negotiations: Feb. 14–April 14, 2014.

Learn [how to apply](#) or see DE-FOA-0000959 in the [Funding Opportunity Exchange](#).



EcoCAR 2: Plugging In to the Future, is a three-year collegiate engineering competition and the only program of its kind.

The competition's mission is a vital one: offer an unparalleled hands-on, real-world experience to educate the next generation of automotive engineers. The competition challenges 15 universities across North America over the course of three years to reduce the environmental impact of a Chevrolet Malibu without compromising performance, safety and consumer acceptability.

<http://www.ecocar2.org/>

Technical Goals

In comparison to production gasoline vehicles, construct and demonstrate vehicles and powertrains that:

- **Reduce fuel consumption**
- **Reduce well-to-wheel greenhouse gas emissions**
- **Reduce criteria tailpipe emissions**
- **Maintain consumer acceptability in the areas of performance, utility, and safety**

AMERICAN ENERGY DATA CHALLENGE

Over the next year, the U.S. Department of Energy will conduct four contests, which will award over **\$100,000** in total prizes for the best ideas, apps, and visualizations that use energy data to help address some of America's biggest challenges.

CONTEST #1 IS OPEN NOW!

THE ENERGY IDEAS CONTEST

This challenge will focus on generating new ideas for using energy data to create high-value products, applications, services and research. We will award [\\$10,000 in prizes](#) for the best idea for using an existing Department of Energy dataset, the best idea for a "wish list dataset" that would be extremely valuable if it existed, and the best "killer idea" for a new energy-related application or service.

SUBMIT AN IDEA IN ONE OF THREE CAMPAIGNS:

Best Idea for An Existing Dataset Prize Pot: \$4,000

Best Idea for a "Wish List" Dataset Prize Pot: \$2,000

Best "Killer Idea" for an Energy-focused Application or Service: Prize Pot: \$4,000



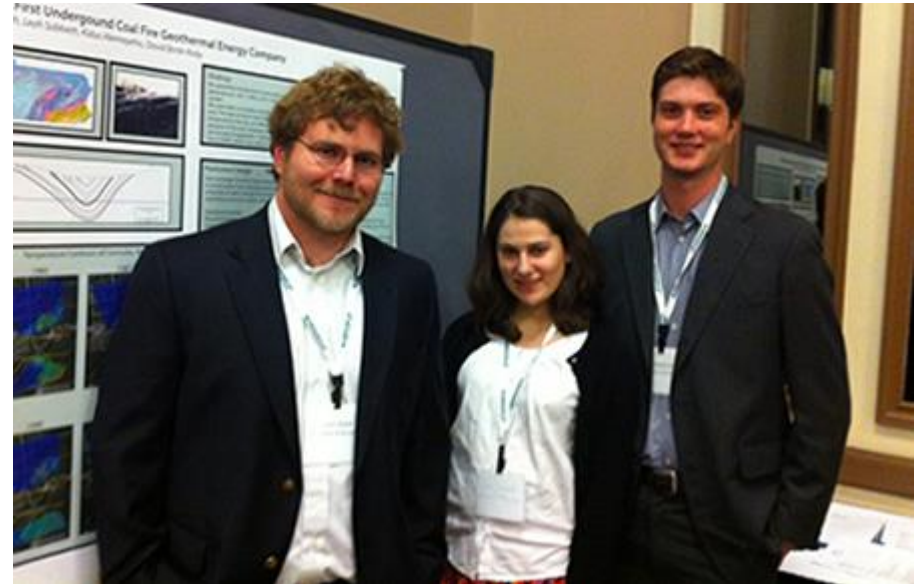
<http://energychallenge.energy.gov/>

Geothermal Student Competition

Through the National Geothermal Student Competition, leading research universities harness the excitement of intercollegiate competition to position geothermal energy as a contender in the global race for clean energy.

Now in its fourth year, the NGSC provides students with invaluable experience in the field while promoting cutting-edge research that can advance the geothermal sector.

<http://orise.ornl.gov/science-education/capabilities/science-education-events/eere-geothermal-student-competition.aspx>



This year's winner in the National Geothermal Student Competition is the University of Rochester, New York. Pictured here are student team members Talor Walsh, Leah Sabbeth, and team leader David Brink-Roby. Kidus Alemayehu is not pictured.



Georgetown University Energy Prize

The Georgetown University Energy Prize (GUEP) is a \$5 million prize that challenges communities to reduce their energy usage per-capita.

The Georgetown University Energy Prize provides a unique platform that will bring together residents, government leaders and utilities in competing communities, united in the goal of improving their energy efficiency.

<http://www.guep.org/>

Participating communities will be asked to develop a long-term energy efficiency plan and to demonstrate initial effectiveness and sustainability over a two-year period. Communities will be judged in part on their ability to:

- Spur innovative approaches for communities to decrease their per-capita energy usage;
- Highlight best practices for communities working with utilities, businesses, and their local governments to create and implement inventive plans for sustained energy efficiency;
- Educate the public and engage students in energy efficiency issues including methods, benefits, and the environmental costs of the full fuel cycle;
- Increase the visibility of Georgetown University and competition sponsors who are working to facilitate new and creative approaches to energy efficiency.

Buildings

[Better Buildings Challenge](#)

The Better Buildings Challenge supports commercial and industrial building owners by providing technical assistance and proven solutions to energy efficiency.

General Energy and Environment

[Energy Challenge](#)

Teams of college engineering students design energy efficiency and waste-minimization concepts that have real applications in the pulp and paper industry.

Hydrogen / Fuel Cells

[Hydrogen and Fuel Cell Competitions for Students and Teachers](#)

Check out these contests on hydrogen and fuel cells.

[H2U Student Contests](#)

This contest challenges university teams to develop and design a hydrogen application.

Solar

[American Solar Challenge](#)

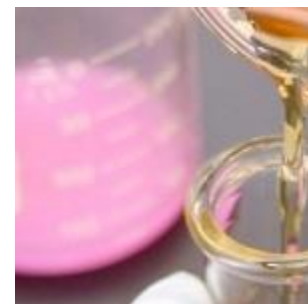
To compete in the American Solar Challenge, university teams, companies, and clubs from around the world build solar-powered cars and race them across the country.

Technologies and Engineering

[The Doctor Bernard S. Baker Award for Fuel Cell Research](#)

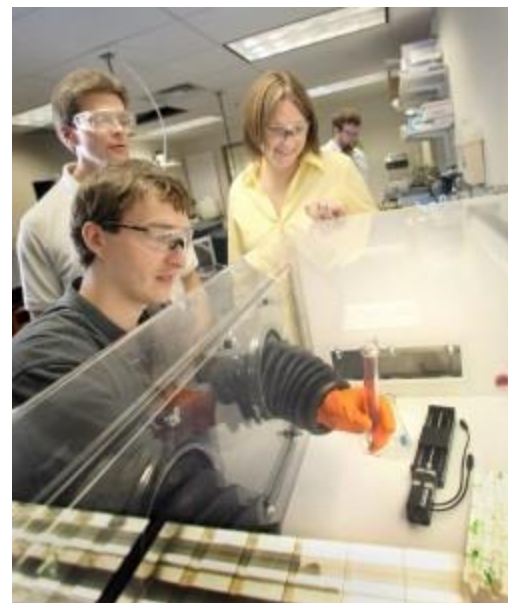
This award recognizes exceptional undergraduate and graduate students pursuing research in a fuel cell-related field.

http://www1.eere.energy.gov/education/university_competitions.html



Small Business and Innovation Research Program (SBIR)

- Adaora Nwokoye Ph.D
- Tina Kaarsburg Ph.D



SBIR and Outreach Initiative

Tina Kaarsberg, PhD
and
Adaora Nwokoye, PhD

Dec 13, 2013

- **SBIR**: The Small Business Innovation Research (SBIR) program became law in 1982 at 11 federal agencies. SBIR eligibility requires minimum 50% Small Business effort.
- **STTR**: The Small Business Technology Transfer Research (STTR) program became law in 1992. STTR focuses on collaboration between small businesses and research institutions (e.g., national laboratories and research universities.) STTR eligibility requires 40% minimum Small Business and 30% minimum Research Institution effort.
- **TTO**: a Technology Transfer Opportunity is a **topic** not a **program**. Small businesses can apply for either an SBIR or an STTR grant under a TTO topic. One award is made per TTO.

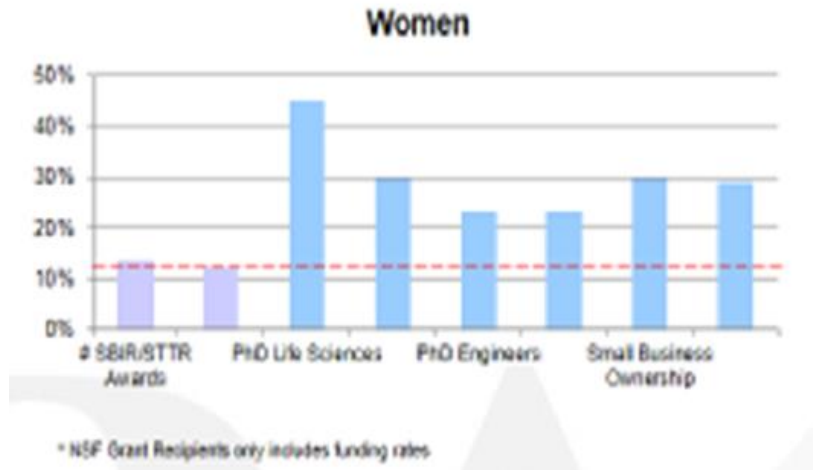
Why Diversity?

- Women-owned and socially and economically disadvantaged firms are underrepresented in many technology sectors (e.g. Clean Tech)
- Technology companies recognize that a diverse workforce is critical to the creation and execution of new technologies and services.
- Therefore, Clean Tech companies that lead in fostering and encouraging diversity have a major competitive advantage.



The Small Business Administration has set goals to increase applications from Underserved Populations. By the time the 2011 SBIR/STTR Reauthorization is fully implemented awards to underserved populations should increase from the 2011 values:

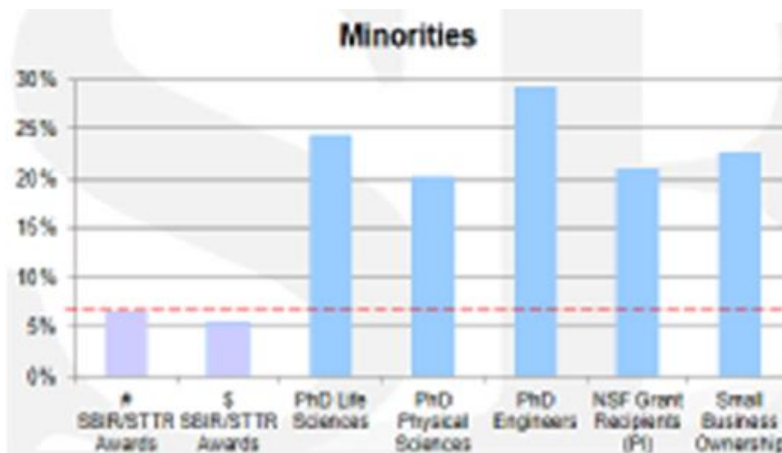
- Awards to women-owned small businesses were 13.3% of SBIR/STTR awards in 2011.
- Awards to minority owned small businesses were 6.5% of SBIR/STTR awards in 2011
- Awards to the bottom 26 states were 8.2% of SBIR/STTR awards in 2011.



Small Business Administration

SBA analysis
Benchmarking
SBIR/STTR award
rates against

- PhD recipients and
- small business ownership



- Contact regional and national organizations with **established networks** of women and/or underserved minorities involved in “clean tech” and provide EERE SBIR information.
- Link with offices **within DOE** that already interact with small clean tech businesses and have them forward EE SBIR information to these networks.
- Participate in CleanTech **conferences** and other outreach opportunities where we discuss and hand out information about the EE SBIR program.
- Organize and participate in DOE and EERE SBIR **webinars**
- [Future] **Collaborate** within/across federal SBIR agencies on workshops aimed at first-time or one-time SBIR applicants

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Home > Clean Tech SBIR: Small Business Innovation Research (SBIR) for the Office of Energy Efficiency and Renewable Energy

CLEAN TECH SBIR: SMALL BUSINESS INNOVATION RESEARCH (SBIR) FOR THE OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

THE BEST-KEPT FUNDING SECRET FOR MINORITY- AND WOMAN-OWNED BUSINESSES?
Could your firm use \$1.1-1.7 million? Apply by December 16, 2013!
[More >](#)

Clean Tech SBIR: Small Business Innovation Research (SBIR) for the Office of Energy Efficiency and Renewable Energy

[About EERE Small Business Innovation Research Diversity Initiative](#)

[Eligibility](#)

[How to Apply](#)

[Success Stories](#)

A SUCCESS STORY

The federal government supports research at thousands of small innovative businesses through the Small Business Innovation Research (SBIR) program. SBIR is a competitive program that links government agencies' needs and missions with funding for the development and commercialization of new ideas and innovative research by diverse small business.

Note: energy.gov/eere/sbir is a shortcut for...

<http://energy.gov/eere/clean-tech-sbir-small-business-innovation-research-sbir-office-energy-efficiency-and-renewable>

Outreach Initiative

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Home > About EERE Small Business Innovation Research Diversity Initiative

ABOUT EERE SMALL BUSINESS INNOVATION RESEARCH DIVERSITY INITIATIVE



Clean Tech SBIR: Small Business
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of Energy Efficiency and Renewable Energy

About EERE Small Business Innovation
Research Diversity Initiative

Eligibility

How to Apply

Success Stories

MEDIA INFO

For more information on the EERE team and
its engagement efforts, please contact:

EE.Communications@ee.doe.gov

WHY FOCUS ON WOMEN- AND MINORITIES- SBIS?

<http://energy.gov/eere/about-eere-small-business-innovation-research-diversity-initiative>

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ELIGIBILITY

Quickly check your eligibility status to find out if you can apply for SBIR funding.

SBIR is designed to support small U.S. businesses doing innovative research. Several rules—including size limits, ownership structure, the role of the principal investigator and partnerships with other organizations—determine whether a particular company is eligible.

PLEASE NOTE: The 2011 Reauthorization Act made several key changes to the SBIR Program relating to eligibility, the SBIR award process, and SBIR Program administration. If you have pre-2011 SBIR experience, it may not apply now. Generally speaking, however, the new rules have broadened eligibilities.

To check if your business is NOW eligible for U.S. Department of Energy (DOE) SBIR funding, ask yourself:

- Is your organization (the one proposing a project) a for-profit company with 500 or fewer employees (i.e. a small business)?
- Do you own 50% or more of your company?
- If you do not yet have a company, would you be able to establish a for-profit company (sole proprietor, LLC etc.), obtain a DUNS number and a SAMS account before the final application deadline?

If you answered YES to the questions above, then SBIR is for you.

[Clean Tech SBIR: Small Business Innovation Research \(SBIR\) for the Office of Energy Efficiency and Renewable Energy](#)

[About EERE Small Business Innovation Research Diversity Initiative](#)

[Eligibility](#)

[How to Apply](#)

[Success Stories](#)

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EE.Communications@ee.doe.gov



<http://energy.gov/eere/eligibility>

How to apply



[Home](#) » [How to Apply](#)

HOW TO APPLY

Awards are made through a formal process that has changed dramatically since 2011. So let us walk you through it step by step.

"INNOVATION PAYS."

— JOHN KAO, INNOVATION NATION

SUBMIT A LETTER OF INTENT

- On October 28, 2013, the U.S. Department of Energy (DOE) announced on the [DOE SBIR website](#) a preview version of the technical topics for which it will later accept funding applications. These topics will be found on the DOE's [Funding Opportunity Announcements page](#). The EE SBIR page lists those topics that are cleantech (specific to EERE). We also recommend that you sign up for the EE-SBIR and DOE-SBIR mailing lists. The EE SBIR mailing list signup is at https://public.govdelivery.com/accounts/USEERE/subscriber/new?topic_id=USEERE_442. The DOE-SBIR mailing list is at the bottom of the DOE-SBIR page. Be advised that DOE purges this list frequently, so do not assume that you will continue for more than a year after you sign up.
- Once the topics are published, you can ask DOE contacts questions about them. EERE will also posts on its web page and distribute to its mailing list frequently asked questions on topics.
- On November 25, 2013, DOE will release its Funding Opportunity Announcement (FOA) through the grants.gov page. If you have signed up here or through the DOE-SBIR page, you will receive instructions on how to locate the FOA on the [grants.gov](#) page.

[Clean Tech SBIR: Small Business Innovation Research \(SBIR\) for the Office of Energy Efficiency and Renewable Energy](#)

[About EERE Small Business Innovation Research Diversity Initiative](#)

[Eligibility](#)

[How to Apply](#)

[Success Stories](#)

MEDIA INFO

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EE.Communications@ee.doe.gov



<http://energy.gov/eere/how-apply>

http://www1.eere.energy.gov/office_eere/oe_sbir.html

<http://science.energy.gov/sbir>

Overview of the SBIR Program at DOE

http://www.youtube.com/watch?feature=player_embedded&v=kOmxEm_F8eE

Phase I Release 2 Topics

http://www1.eere.energy.gov/office_eere/pdfs/sbir_topics_10-28-13.pdf

Phase I Release 2 FOA (on Admin/non topic)

http://science.energy.gov/~media/grants/pdf/foas/2014/SC_FOA_0001046.pdf

Webinar on the Phase I Release 2 FOA (on Admin/non topic)

<http://cc.readytalk.com/play?id=4s1k3t>

LOI example

http://science.energy.gov/~media/sbir/word/Example_Letter_of_Intent_40913.docx

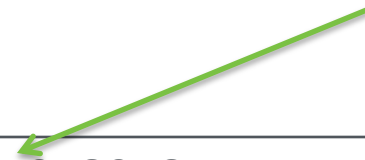
Instructions for application

http://science.energy.gov/~media/sbir/pdf/Application_Resources/Application_Guide_2013_10_03_13.pdf

Application template

<http://science.energy.gov/sbir/applicant-and-awardee-resources/grant-application/>

FY 2014 Phase I



Letters of Intent Due	December 16, 2013
Full Applications Due	February 4, 2014
Award Notification	Late April, 2014
Grant Start Date	Early June, 2014

Sign up to our mailing list for updates and announcements

https://public.govdelivery.com/accounts/USEERE/subscriber/new?topic_id=USEERE_442

If you have suggestions/comments

.....

- On how EERE/DOE can improve its outreach efforts particularly to women and underserved minorities or other networks to, which we can link-up
- On how to improve our website to be more accessible to First time applicants, and all applicants

Please send your suggestions to:

adaora.nwokoye@ee.doe.gov

Or

tina.kaarsberg@ee.doe.gov

Session 2 Questions and Answers

DOE Office of Economic Development and Diversity, Office of Science and Office of Nuclear Energy

Minorities in Energy Initiative -AnneMarie Horowitz
Visiting Faculty Program- Kate Bannan
Mickey Leland Program- Alan Perry

Office of Economic Impact and Diversity

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Engaging Students in Energy
Dot Harris, Director
Office of Economic Impact and Diversity

energy.gov/diversity

Addresses the needs of underrepresented communities in the energy sector and aligns with President Obama's agenda for engaging more Americans in energy and science, technology, engineering, and math fields.

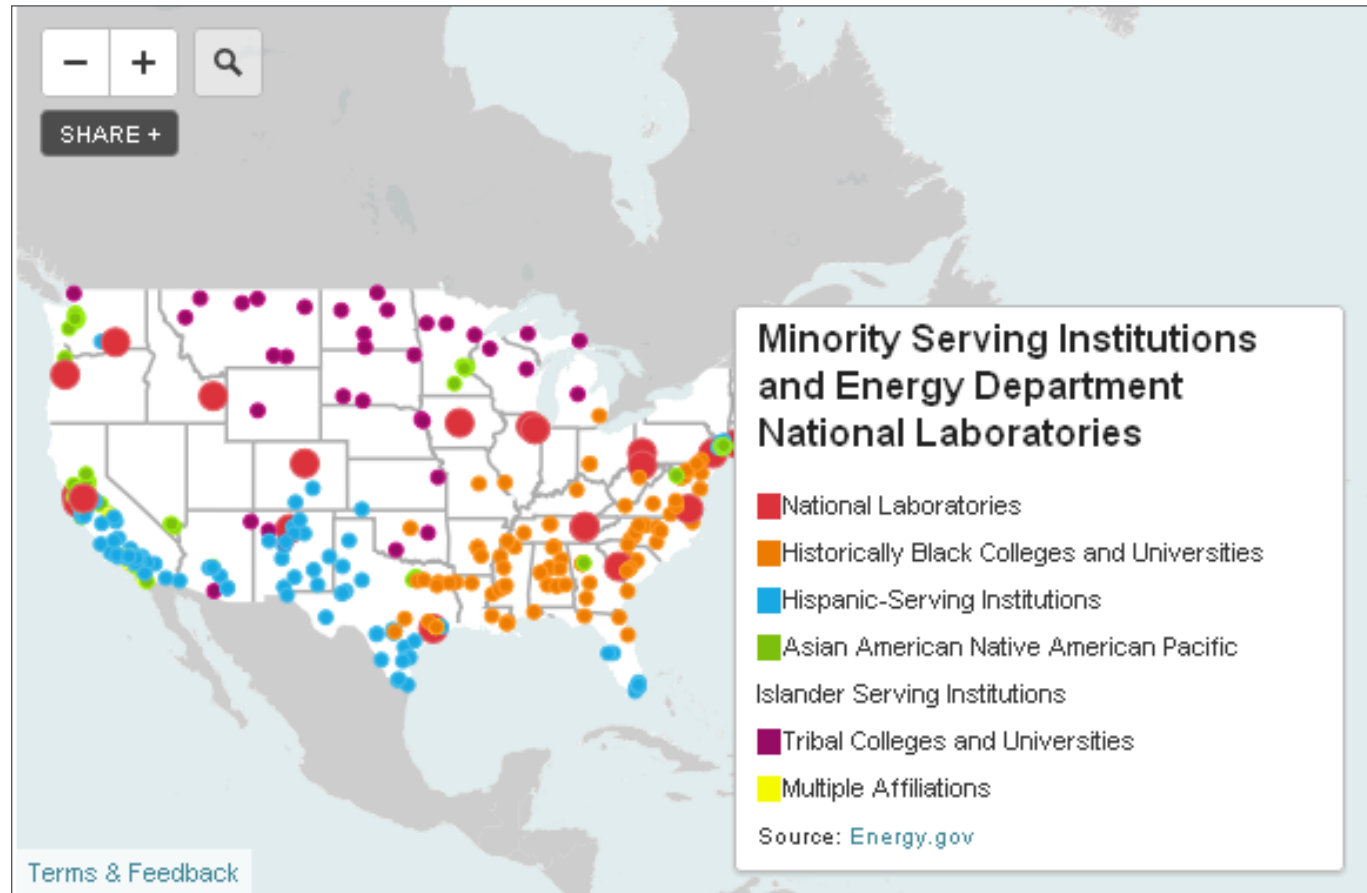
Empower, equip, and prepare businesses, communities, schools, and individuals to partake in the technical, procurement, engagement, workforce, and energy literacy resources of the Department of Energy and the energy sector overall.

Sectors



Minority Serving Institutions

We provide management and technical assistance to Minority Serving Institutions (Historically Black Colleges & Universities, Tribal Colleges & Universities, Asian American and Pacific Islander Institutions, and Hispanic-Serving Institutions).



For more: <http://energy.gov/diversity/working-us/minority-serving-institutions>

Minority Educational Institution Student Partnership Program

U.S. DEPARTMENT OF
ENERGY

Energy Efficiency &
Renewable Energy



Gain 10 weeks of substantive professional and technical career experience while working side-by-side with an assigned mentor who is a subject matter expert. Mentors help students tailor their practical work experience to their professional interests.

For more information: email MEISPPINTERNSHIPS@VARCOM.COM

STEM for urban native youth –
partnering with American Indian
Science and Engineering Society to
engage students in the National
Science Bowl



For more information: <http://diversity.energy.gov>



economicimpact@hq.doe.gov

(202) 586-8383

Office of Economic Impact and Diversity



U.S. DEPARTMENT OF
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ENERGY

Office of Science

Visiting Faculty Program (VFP)

Kate Bannan

Kate.Bannan@science.doe.gov

<http://science.energy.gov/wdts/vfp/>



Office of Science: Visiting Faculty Program (VFP)

Opportunities for faculty from academic institutions that are typically underrepresented in the DOE research community to engage in a jointly developed research project at a DOE laboratory during the Summer Term. The scope of the projects should be robustly connected to ongoing host lab research project activities. This, or its predecessor program, have been in operation since 2003.

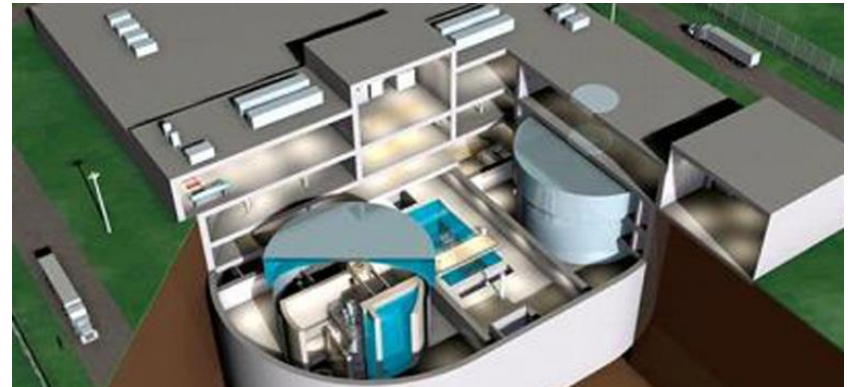
- Must be a full-time faculty member at an accredited U.S. degree granting, postsecondary, institution of higher education historically underrepresented in the U.S. research community, in an area of physics, chemistry, biology (non-medical), mathematics, engineering, environmental sciences, materials sciences, or computer / computational sciences (link to list of *ineligible* institutions is on VFP webpages).
- Operates during a 10-week Summer Term (May through August) - **Application process for the 2014 Summer Term closes on Jan. 10, 2014 at 5:00 PM ET.**
- Faculty may optionally invite up to two students to participate, one of whom may be a graduate student. VFP- Students must meet eligibility requirements, apply separately, and only if invited.
- Faculty receive stipend of \$13,000 for 10 week term, undergraduates receive stipend of \$500/week per term; all participants are provided travel to and from the laboratory, and possibility for a housing allowance.
- Faculty must, through their own efforts, establish a collaboration with a laboratory scientist and co-develop a 6-page research project proposal prior to applying to the program.
- Applicants must be a U.S. citizen or PRA. Faculty may participate up to three terms.

Please visit <http://science.energy.gov/wdts/vfp/> for full details and how to apply.





Presenter: Alan Perry
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MICKEY LELAND ENERGY FELLOWSHIP

INTERNSHIP PROGRAM

Sponsored by the U.S. Department of Energy Office of Fossil Energy

- Entering 19th year
- 10-week summer internship program
- Science, technology (IT), engineering, or mathematics (STEM majors).
- Goal: improve opportunities for minority and female students in these fields.
- Mentorship from program officials and researchers.
- Hands-on research projects consistent with Office of Fossil Energy mission.
- Paid stipend, approved housing allowance and transportation expenses.
- "Technical Forum" at conclusion of program.
- Expect approximately 50 fellows in 2014.
- Application closes January 15, 2014



For more information please contact:

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U.S. Department of Energy

Washington, DC 20585

202-586-4484

<http://energy.gov/fe/mickey-leland-energy-fellowship>

<http://orise.ornl.gov/mlef/index.html>



- Thank you for attending!
- Please reach out using any of the contact information presented here today or by emailing energy101@ee.doe.gov
- Webinar is recorded and will be posted soon after the webinars conclusion. We will follow up with an email as soon as the presentation and webcast recording is ready.

Session 3 Questions & Answers