NSTA WEB SEMINARS

LIVE INTERACTIVE LEARNING @ YOUR DESKTOP

NSDL/NSTA Web Seminar

Teach Engineering: Because Dreams Need Doing

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Thursday, February19, 2009

6:30 p.m. to 8:00 p.m. Eastern time

Agenda:

1. Introductions
2. Tech-help info
3. Web Seminar tools
4. Presentation
5. Evaluation
6. Chat with the presenters

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Supporting the NSDL Presenting Team is…

For additional Tech-help call:

Elluminate Support,

1-866-388-8674 (Option 2)

Jeff Layman

Tech Support

NSTA

jlayman@nsta.org

703-312-9384

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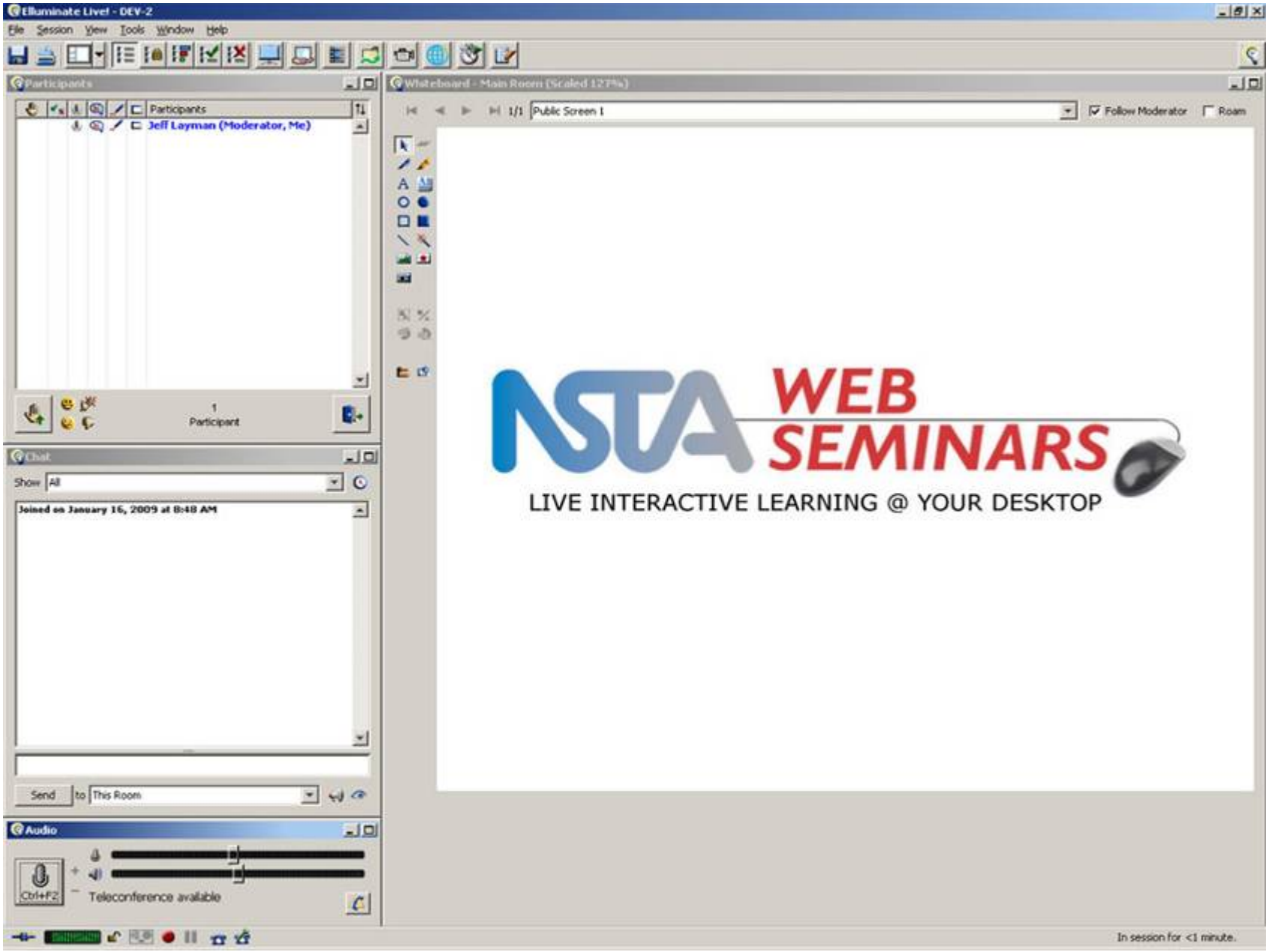
Screenshot


Elluminate Live! - DEV-2
File Session View Tools Window Help
Participants
Participants
Jeff Layman (Moderator, Me)
1
Participant
Chat
Show All
Joined on January 16, 2009 at 8:48 AM
Send to This Room
Audio
Ctrl+F2
Teleconference available
Whiteboard - Main Room (Scaled 127%)
1/1 Public Screen 1
Follow Moderator
Room
NSTA WEB SEMINARS
LIVE INTERACTIVE LEARNING @ YOUR DESKTOP
In session for <1 minute.

We would like to know more about you…

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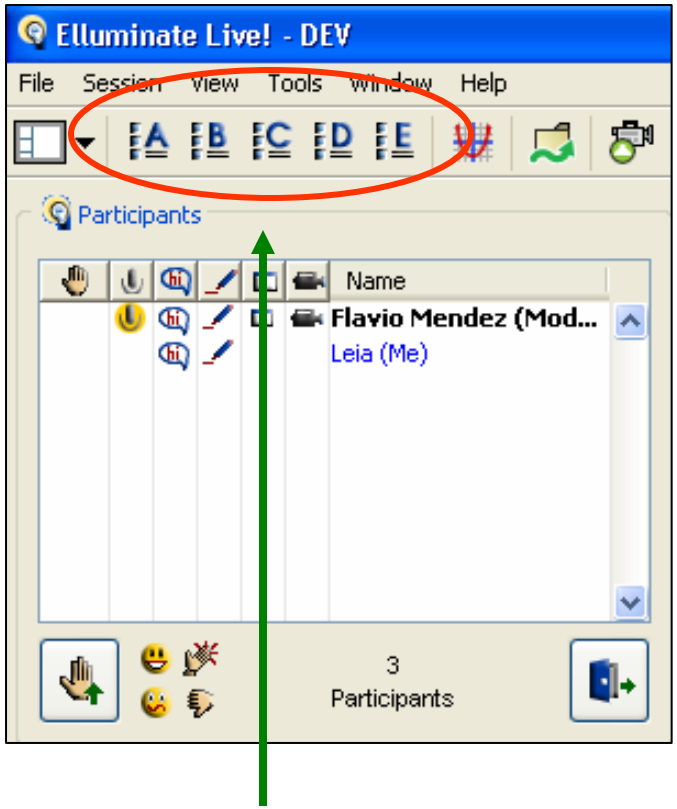
How many NSTA web seminars have you attended?



Use the letters A-E located at the top left of your actual screen to answer the poll

A. 1-3

B. 4-5

C. More than 5

D. More than 10

E. This is my first web seminar

NSTA WEB SEMINARS

How many NSTA web seminars have you attended?

A. 1-3

B. 4-5

C. More than 5

D. More than 10

E. This is my first NSTA web seminar

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Where are you now?

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What grade level do you teach?

A. Elementary School, K-5.

B. Middle School, 6-8.

C. High School, 9-12.

D. I teach college students.

E. I am an Informal Educator.

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NSDL/NSTA Web Seminar

Teach Engineering: Because Dreams Need Doing

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Thursday, February 19, 2009

Who's presenting today

Mindy Zarske

K-12 Engineering Coordinator
Integrated Teaching and Learning Program
University of Colorado at Boulder
Boulder, CO
"Nobody ever suggested engineering to me."

Mike Mooney

Associate Professor of Engineering
Colorado School of Mines
Golden, CO
“a high school guidance counselor told me I wasn’t *smart enough* to be an engineer”

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http://nsdl.org

-NSDL Pathways for specific content & audience

-NSDL Engineering Pathway: K-Gray

-Rich variety of materials found in one place

http://engineeringpathway.org

Goal: Use of Engineering Design to Engage Students in Learning

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TEACH Engineering Resources for K-12

A collection of high-quality curriculum within the NSDL Engineering Pathway

http://teachengineering.org

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Outline:

- ✓ What do engineers do?
- ✓ What is the engineering design process?
- ✓ What are types of engineering?
- ✓ What are some engineering activities that I can use with my students?

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What do Engineers Do?

Stamp all the ones you think apply

Fix Broken Cars	Design Medical Equipment	Build new wind turbines	Design sport shoes	Create a sculpture

What do Engineers Do?

Fix Broken Cars	Design Medical Equipment	Build new wind turbines	Design sport shoes	Create a sculpture
technician		technician		artisan

Engineers ***design*** everything…

- ✓ Medical devices
- ✓ Roller coasters
- ✓ Computer games
- ✓ Music studio technology
- ✓ iPods, cell phones
- ✓ Alternative energy technologies
- ✓ Water filtration systems
- ✓ Hybrid cars

Grand Challenges for Engineering

- ✓ Make solar energy economical
- ✓ Provide energy from fusion
- ✓ Develop carbon sequestration methods
- ✓ Manage the nitrogen cycle
- ✓ Provide access to clean water
- ✓ Restore and improve urban infrastructure
- ✓ Advance health informatics
- ✓ Engineer better medicines
- ✓ Reverse-engineer the brain
- ✓ Prevent nuclear terror
- ✓ Secure cyberspace
- ✓ Enhance virtual reality
- ✓ Advance personalized learning
- ✓ Engineer the tools of scientific discovery

…awaiting engineering solutions in the 21st century!

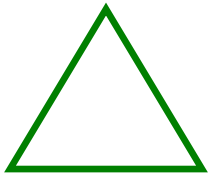
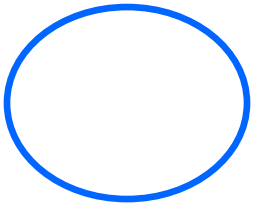
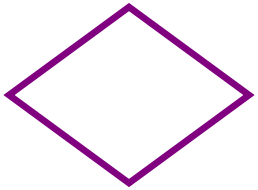
*As determined by a committee of the National Academy of Engineering.
http://www.engineeringchallenges.org/

Engineering Design Process

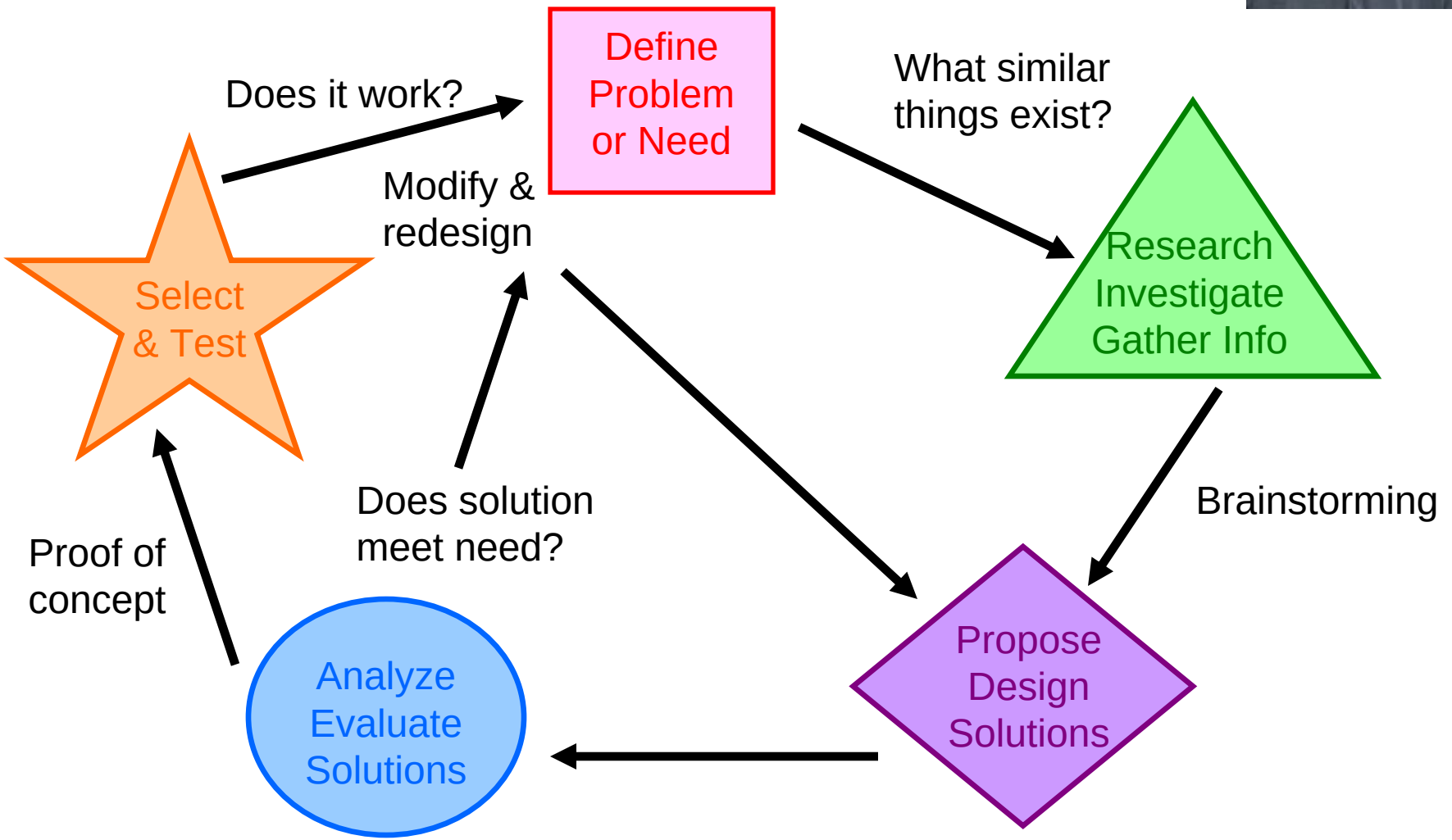
common to all designed items

What order is typically followed?

Order the steps below from 1 to 5…

 Select & Test	 Define Problem or Need	 Research Investigate Gather Info	 Analyze Evaluate Solutions	 Propose Design Solutions

Engineering Design Process



Engineering Design Process

Define Problem or Need

What is the problem? What do we want to accomplish? What are the project requirements? What are the limitations? Who is the customer? What is our goal?

Gather information and conduct research - talking to people from many different backgrounds.

Engineering Design Process

Propose Design Solutions

There is always more than one possible way to solve a problem …. lots of brainstorming involved. This is where really creative ideas come from.

Engineers evaluate multiple design solutions to determine if and how well they meet the design criteria.

Analyze Evaluate Solutions

Select & Test

Per qualitative or quantitative rating system, a final design is selected. The final design is then thoroughly tested.

What are the different types of engineers?

What are some types of engineers that you are familiar with?

1	2	3
4	5	6
7	8	9

Type your answers in the boxes

There are many types of engineering

Here are some of them…

- **Aerospace**
- **Agricultural**
- **Biological**
- **Biomedical**
- **Chemical**
- **Civil**
- **Computer Science**
- **Electrical**
- **Environmental**
- **Geotechnical**
- **Industrial and Systems**
- **Material Science**
- **Mechanical**
- **Metallurgical**
- **Nuclear**
- **Petroleum**
- **Software**

Your Portal to Engineering Education Resources

Engineering Pathway

Quick Search GO

Advanced Search: K-12 | Higher Ed

- Higher Ed Resources »
- K–12 Resources »
- Broadening Participation »
- Advanced Search »
- Browse
- Submit Resources
- My Workspace
- About Us

Help for First Time Users

News and Events

March is Women's History Month! Check out our Gender Equity and Women in Information Technology resources. Read and comment on the National Academies' Beyond Bias and Barriers report.

ASEE's Engineering Research Council Summit is March 11-13.

The National Collegiate Inventors and Innovators Alliance Meeting is March 22-23.

TEACH Engineering *Resources for K-12*

MyTE
Login
What is MyTE?

- Home
- Search Curriculum
- Browse Curriculum
- Browse Edu. Stds.
- Living Labs
- Why K-12 Engr?
- Get Involved
- About the Site
- Resources

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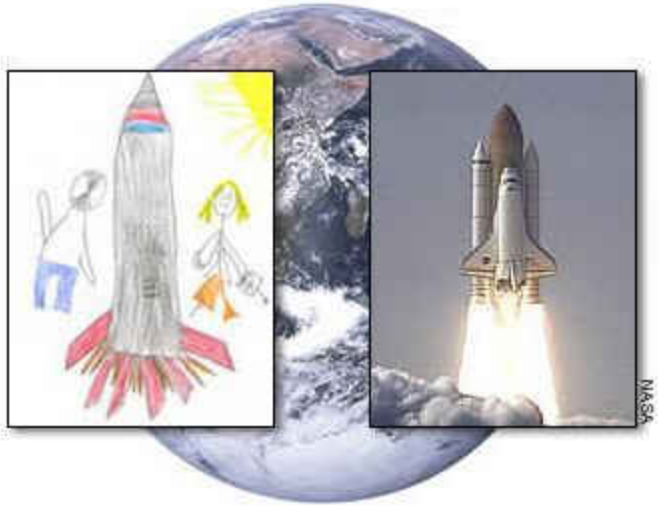
Welcome to the world of K-12 engineering!

Engineers have a hand in designing, creating or modifying nearly everything we touch, wear, eat, see and hear. Introducing engineering into the K-12 classroom connects science and math concepts to the everyday engineering that surrounds us. This teacher resource, *TeachEngineering.com*, helps teachers enhance learning, excite students and stimulate interest in science and math through the use of hands-on engineering.

Just a cute kid with a great imagination...
or an aspiring engineer who will shape our world?



The *TeachEngineering* digital library provides teacher-tested, standards-based engineering content for K-12 teachers to use in science and math classrooms. Engineering lessons connect real-world experiences with curricular content already taught in K-12 classrooms. Mapped to educational content standards, *TeachEngineering*'s comprehensive curricula are hands-on, inexpensive, and relevant to children's daily lives.

There are many ways to access the materials in this collection:

- Search the collection by specifying keywords, grade levels, educational standards, or other criteria
- Browse curricular contents by subject area, curricular units, lessons or activities
- Access your favorite items and submit reviews in your own personalized MyTE area

And remember — you don't need knowledge of engineering to use these curricula!

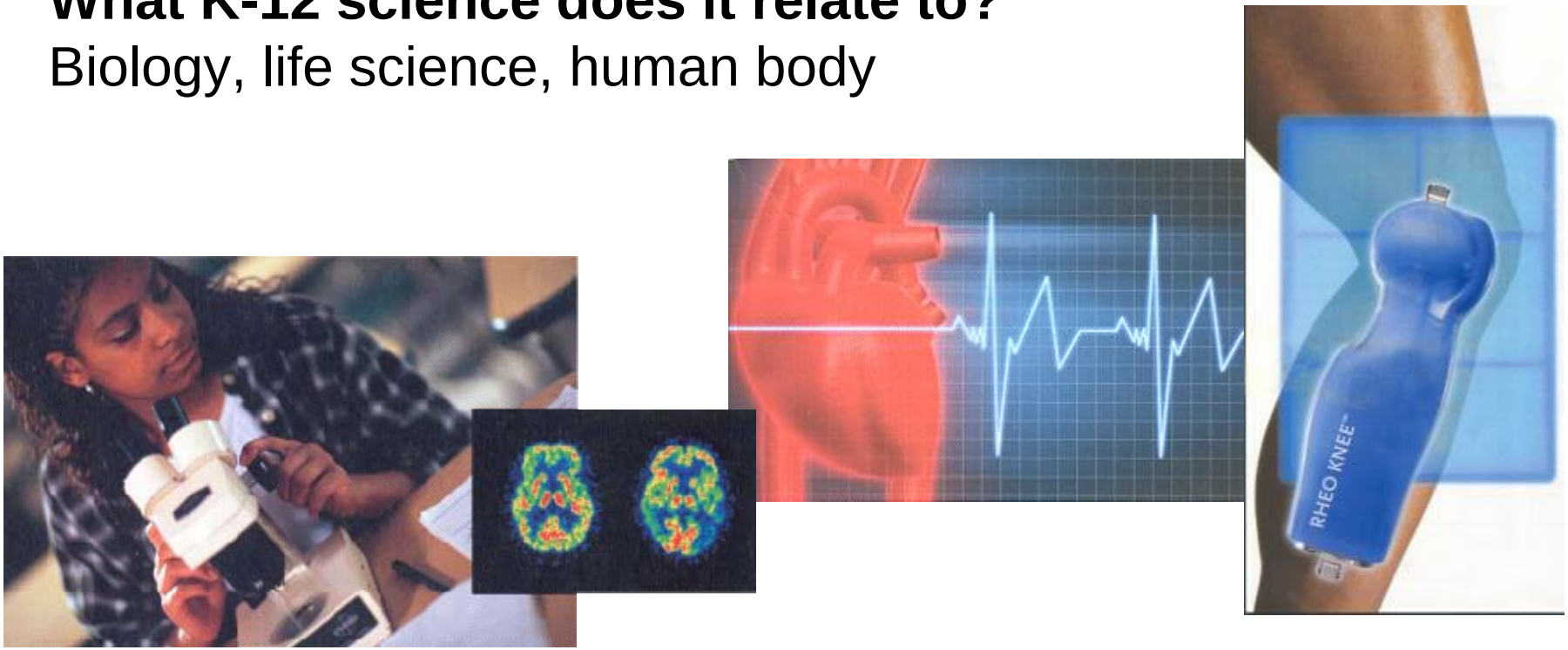
Biomedical engineering

What is it?

Biomedical engineering applies the engineering design process to the medical and biological sciences to improve health care and people's quality of life.

What K-12 science does it relate to?

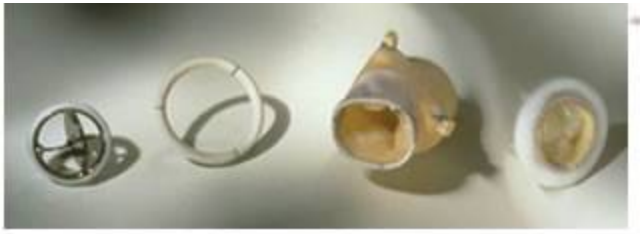
Biology, life science, human body



Example TeachEngineering Activities for Biomedical Engineering

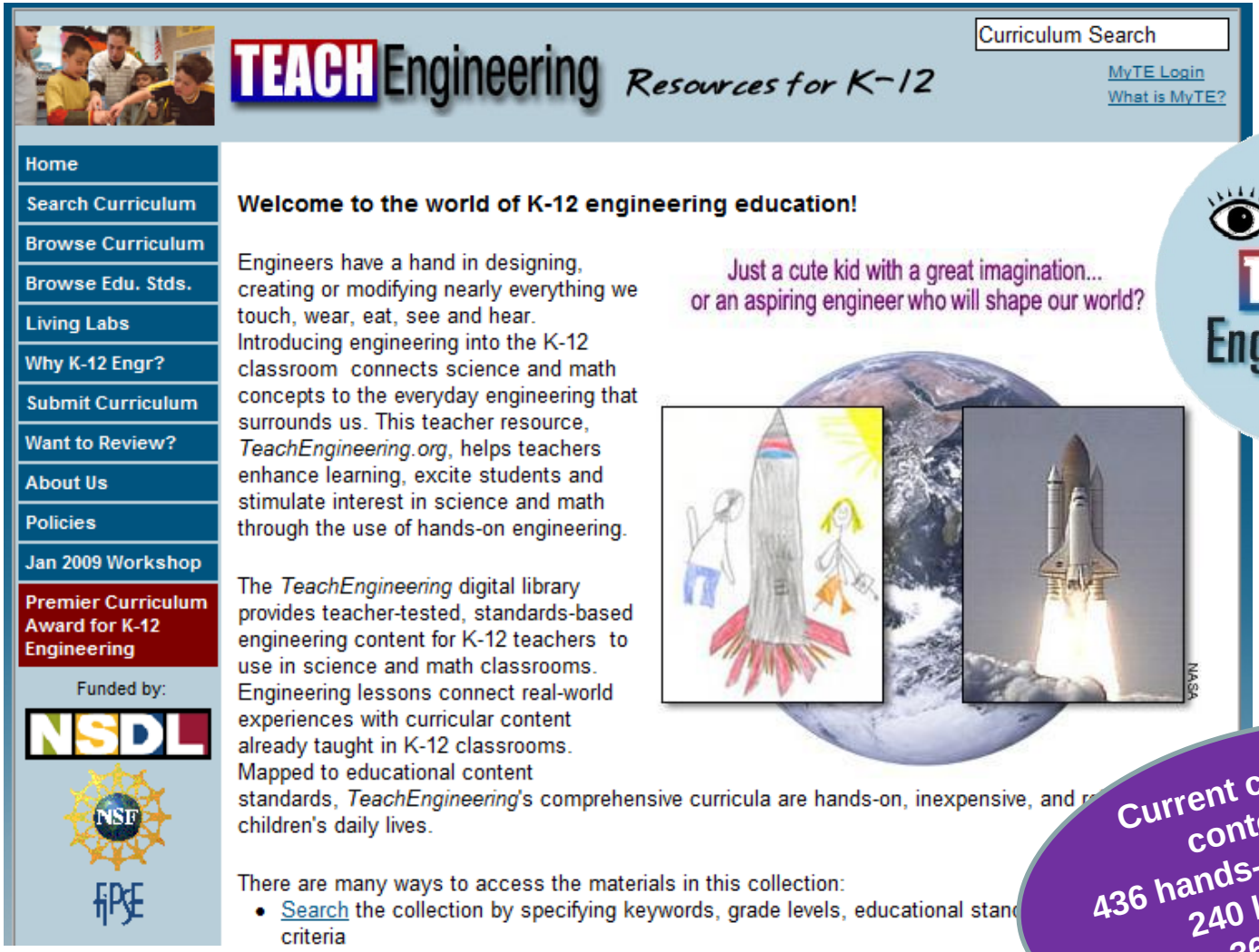
Prosthetic party
Student teams investigate biomedical engineering and the technology of prosthetics. Students create a model prosthetic lower leg using various materials. Each team demonstrates its prosthesis' strength and consider its pros and cons, giving insight into the characteristics and materials biomedical engineers consider in designing artificial limbs.

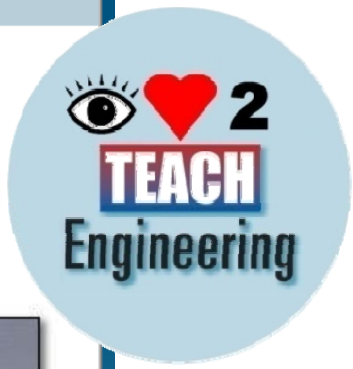
No Valve in Vain
In this activity, students will design and create their own heart valves out of a variety of materials. This activity will not only test their understanding of how a one-way valve works and its purpose, but will also allow them a chance to think outside of the box and practice engineering problem-solving.



TEACH Engineering Resources for K-12

Let's go check it out!





Current curricula contents:
436 hands-on activities
240 lessons
36 units

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http://teachengineering.org

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Environmental engineering

What is it?

Environmental engineering applies the engineering design process to air, water and land resources to improve the quality of human life and other organisms, and to remediate pollution.

What K-12 science does it relate to?

Life science, ecology, water, geology

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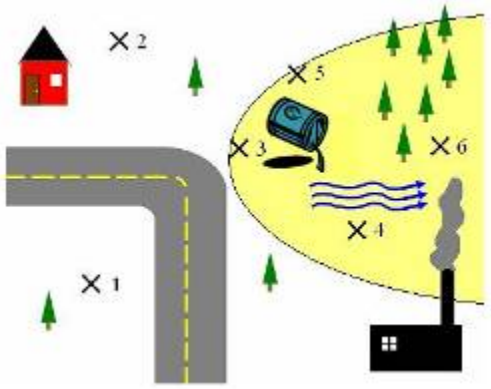
Example TeachEngineering Activities for Environmental Engineering

Engineers Speak for the Trees

Students begin by reading Dr. Seuss' The Lorax as an example of how overdevelopment can cause long-lasting environmental destruction. Student teams are asked to serve as natural resource engineers, city planning engineers and civil engineers with the task to replant the nearly destroyed forest and develop a sustainable community design that can co-exist with the re-established natural area.

Groundwater Detectives

Student teams locate a contaminant spill in a hypothetical site by measuring the pH of soil samples. Then they predict the direction of groundwater flow using mathematical modeling. They also use the engineering design process to come up with alternative treatments for the contaminated water.



TEACH Engineering Resources for K-12

How engaging do you think these types of activities are for girls?

(A) Very engaging

(B) Somewhat engaging

(C) Definitely engaging

How engaging do you think these types of activities are for girls?

Girls want a career that ***makes a difference.*** Engineering design activities give young women an opportunity to be creative and a context for how they can help improve the health, happiness and safety of others.

Geotechnical engineering

What is it?

Geotechnical engineering applies the engineering design process to subsurface conditions and materials to determine physical and chemical properties of an area.

What K-12 science does it relate to?

earth science, rocks & minerals, geological processes

Example TeachEngineering Activities for Geotechnical Engineering

ADVENTURE ENGINEERING

Asteroid Impact

Asteroid Impact unit

An asteroid is on a collision course with earth; it is projected to impact somewhere in North America. The surface of the earth will be uninhabitable for one year. Your engineering team must design underground caverns to house the 10 million people of Alabraska for one year.

Unit Summary

- 8 lessons
- 450 to 550 minutes

TEACH Engineering Resources for K-12

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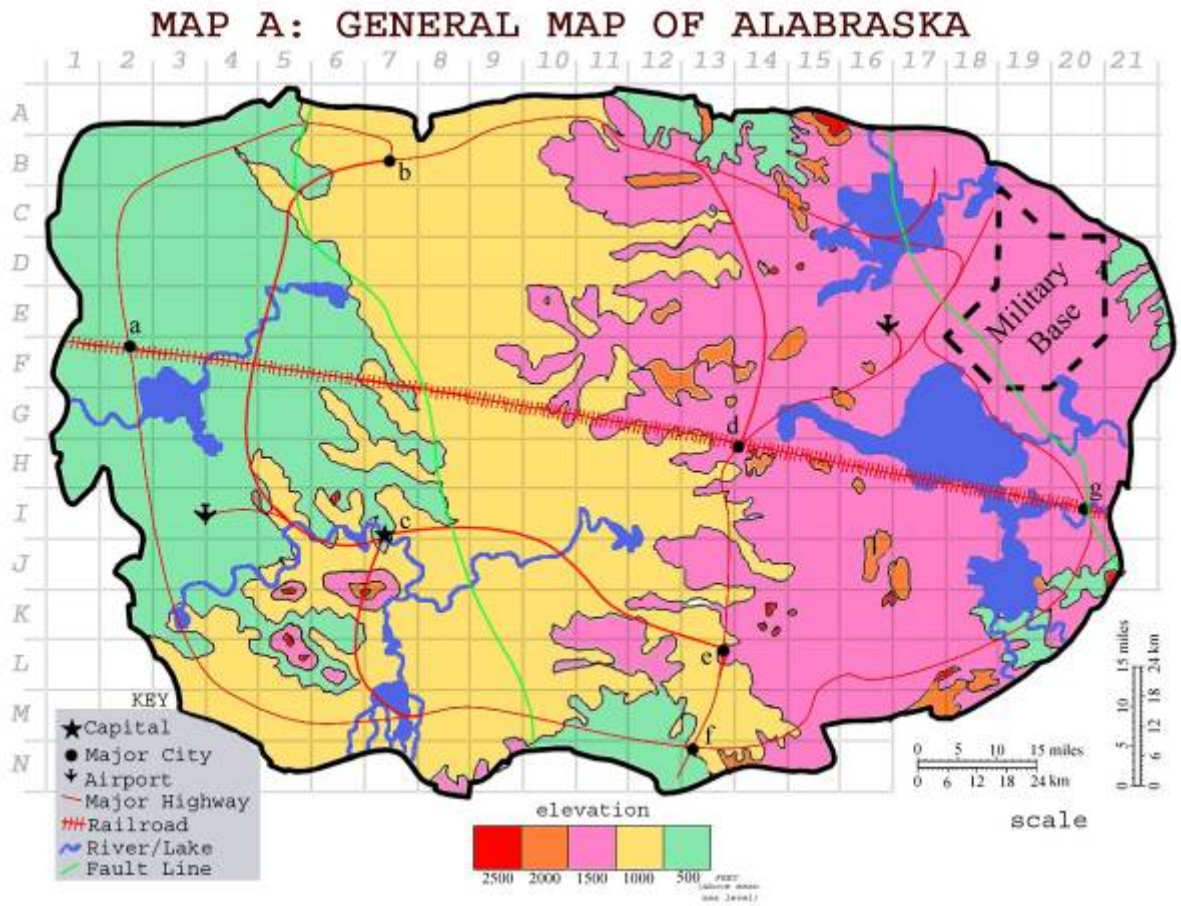
ADVENTURE ENGINEERING

Asteroid Impact



Student teams:

(1) explore general and geological maps

(2) determine the area of their classroom to help determine the cavern size

(3) learn about map scales

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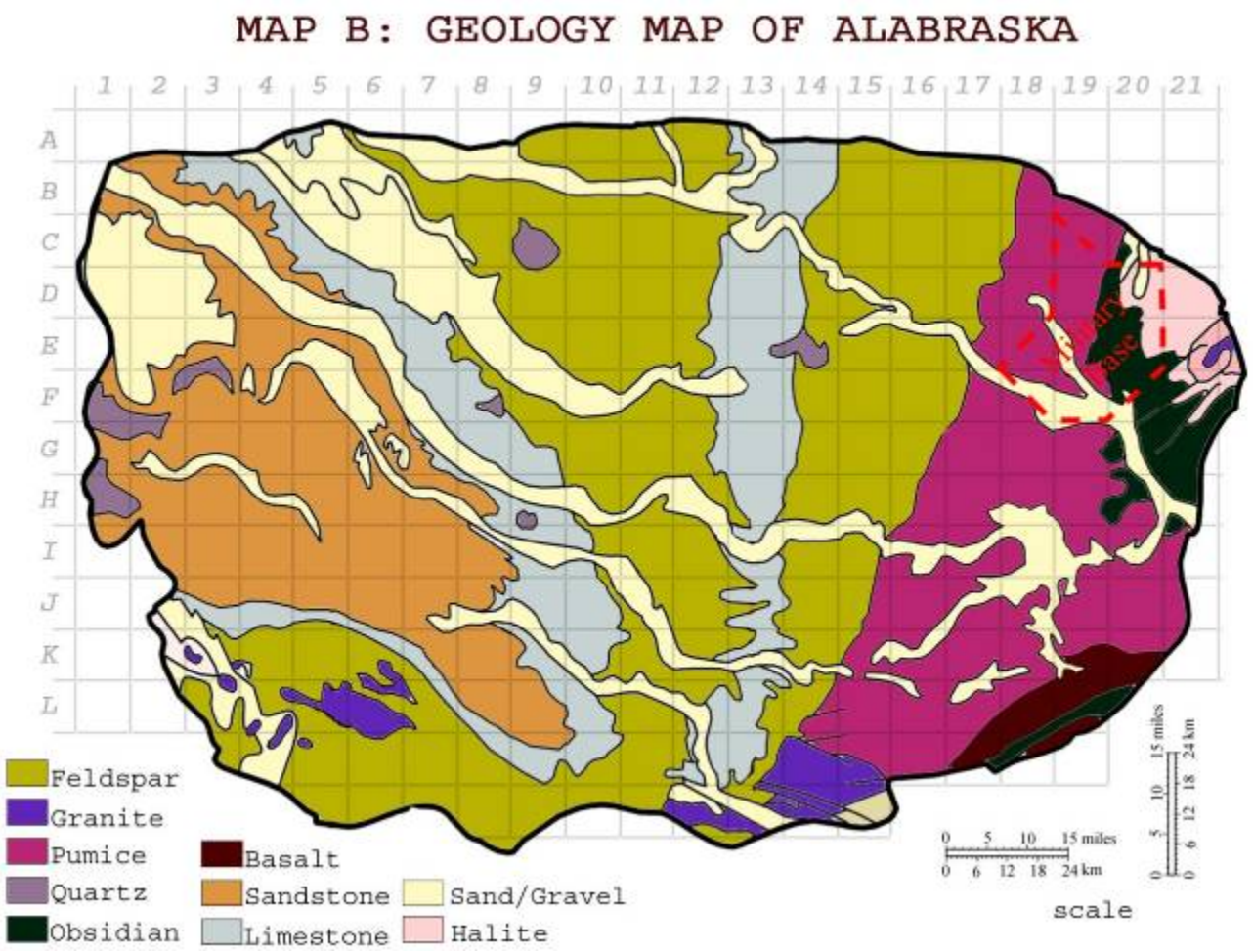
ADVENTURE ENGINEERING Asteroid Impact



Student teams:

(4) test and classify rocks

(5) identify important rock properties for underground caverns

(6) choose a final location and size

In what rock type would you build caverns?

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How likely are you to try an engineering activity in your classroom?

(A) Not very likely

(B) I might give one a try

(C) I definitely want to try one

(D) I already do engineering activities.

http://engineeringpathway.org

http://teachengineering.org

Mindy Zarske
malinda.zarske@colorado.edu

Dr. Mike Mooney
mooney@mines.edu

Robert Payo
rpayo@nsdl.ucar.edu

THANK YOU!

NSTA WEB SEMINARS

Resources from this seminar:

http://www.diigo.com/list/nsdlworkshops/web-sem-engineering

Search for “diigo nsdl workshops engineering”

Learn about new tools and resources, discuss issues related to science education, find out about ways to enhance your teaching at:
http://expertvoices.nsdl.org/learningdigitalK12

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http://www.elluminate.com

NSTA WEB SEMINARS

http://learningcenter.nsta.org

NSTA WEB SEMINARS

- *NSTA: How to Maximize Your NSTA Conference Experience*

March 3, 2009

- *NSTA Learning Center: Focus on Education Leaders*

March 11, 2009

- *NSTA: Energy: Stop Faking It!*

March 25, 2009

National Science Teachers Association

Dr. Francis Q. Eberle, Executive Director

Zipporah Miller, Associate Executive Director Conferences and Programs

Al Byers, Assistant Executive Director e-Learning

NSTA Web Seminars

Flavio Mendez, Senior Director

Jeff Layman, Technical Coordinator

Web Seminar Evaluation:

Click on the URL located on the Chat Window