Project STEP

Issue 2 — http://www.eng.uc.edu/STEP

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Inside this issue:

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http://www.eng.uc.edu/step

About STEP

Project STEP - Science and Technology Enhancement Program is a University of Cincinnati and National Science Foundation Grant designed to educate, nurture, and facilitate science, math and technology graduate students into bringing their experiences and knowledge into middle and high school classrooms, while preparing them to become future educators.

We currently work with four high schools in the Cincinnati Public School District, Hughes Center, Shroder Paideia Academy, Western Hills University High School and Western Hills Design Technology High School.

STEP involves eight graduate Fellows from the University of Cincinnati, nine secondary science and mathematics teachers, a project coordinator, an evaluation Fellow, a web designer and ten faculty members (from the College of Engineering and College of Education).

Project STEP began in July of 2002, this is our fourth year. A wide variety of lessons are available on our website.

Announcements

STEP Open House

on

March 30th, 2006

Come and get a glimpse of

what we do!

Free Technology Workshop being offered Nov 11th, 2005 from 8 AM– 3:30 PM.

Integrating Technology into Math, Science & Technology curriculum.

Location: Annie Laws Library located inside Teachers College.

Email Kelly Obarski at kobarski@cinci.rr.com to sign up or visit our website at www.eng.uc.edu/step

Family Science Academy

The Family Science Academy explores fundamentals of science through hands-on experiences shared by 4th-7th grade students and their families.

This summers project involved the engineering principles of design, building, and testing a tall structure strong enough to withstand a violent earthquake. The engineering shake tables were used to test the stability of the structure. Points were awarded for height, earth quake resistance, construction care, and accounting accuracy.

There was a catch. Each piece of material used was assigned a price value so that in the case of a tie the most cost effective team was the winner.

The First Place winners were Austin, Robert & Cleo Jones. Austin attends Liberty Bible Academy.

The second place winners were Mark Patel and his son Tyrone Patel the school that he attends is St Mary's School.

The third place winners were Yatta Chambers & Kenneth Armstrong II. Kenneth attends Freedom Elementary.

Family Science Academy First Place Winners 2005

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Medical Products

Western Hills Design Technology High School | Fall 2005

Lesson Information

Grade Level
11

Subject Areas
Algebra II

Duration
2—70 minute classes

Setting
Standard classroom

Materials
Handouts

Intro PowerPoint

Laptop and Projector

Graphing Calculators

Key Concepts
Graphing data points with calculator

Determining linear regressions using graphing calculator

Diseases and medical devices

Background Knowledge

Basic graphing calculator functions

Basic biology

Additional Resources

http://www.heartpioneers.com/

http://www.strokeassociation.org/

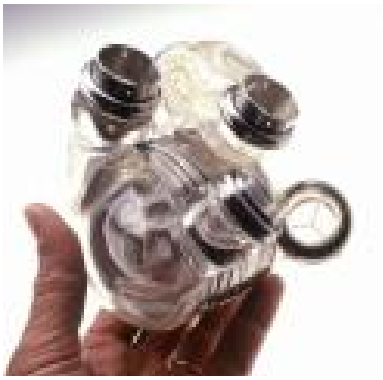
Developed by Fellow:

Michael J. Rust

Summary

In this activity, students learn about medical products and the diseases they treat. Students use graphing calculators to plot data and analyze trends in disease statistics. Then they make decisions about the design of medical devices to treat those diseases.

This lesson was developed as a part of a module that introduces biomedical engineering concepts to high school algebra students. The lesson can be easily connected to a discussion about careers in medicine and science.



Students learn about medical devices like the artificial heart

Objectives

- Students will be able to:

  1. Use a graphing calculator to calculate linear regressions and plot data
  2. Identify diseases and their treatments with medical devices
  3. Use data trends to make decisions

Ohio Academic Standards

Science

Standard: Life Sciences

Grade 11

- Benchmark B - Indicator 3 - Relate how birth rates, fertility rates, and death dates are affected by various environmental factors.

Mathematics

Standard: Data Analysis and Probability

Grade 11

- Indicator 4 - Create a scatter plot of bivariate data, identify trends, and find a function to model the data
- Indicator 8 - Analyze and interpret univariate and bivariate data to identify patterns, note trends, draw conclusions, and make predictions.

Teacher Profile

Lea Brinker, a math teacher at Western Hills Design Technology High School, has been working for Cincinnati Public Schools for almost 20 years. Having been involved with STEP at its inception in an advisory capacity, Mrs. Brinker is excited to be an active classroom participant this year.

"The STEP program is one of the best ideas I've seen in my time here," she said. "It promotes active student involvement in mathematics and has a good 'carryover into other aspects of instruction.

A recent project in her classroom is shown on the preceding page. The lesson was a great fit for the math curriculum, and students learned valuable skills in calculator manipulation. "I'm sure that when we use those calculator functions again, the students will be able to do it."

Lea in her classroom

Student Profile (s)

Students participating in Project STEP offer their feedback on recent lessons in their classroom:

"I thought the lesson was interesting."

"I liked everything about today's activity. It was very stimulating."

"What I liked most about this activity was working with the calculators."

"It helped me improve my skills on a graphing calculator."

"It was interesting to learn about treatments of diseases."

"I liked everything about today's activity. It was very stimulating"

"I liked the hands-on and clear explanations."

"I liked learning something new."

Fellow Profile

Michael Rust is a third year graduate student at the University of Cincinnati. He is pursuing his Ph.D. in Electrical Engineering with research focus on biomedical applications. Prior to joining Project STEP, Michael worked for a variety of engineering firms, including Texas Instruments, Ethicon Endo-Surgery, and AtriCure.

In his first year with Project STEP, Michael worked at Shroder Paideia Academy, where he developed and implemented lessons in several math and science classes. This is Michael's second year in Project STEP and he has been assigned to Western Hills Design Technology High School, where he is working in Algebra II, Pre-Calculus, and Chemistry classes.

Outside of school and work, Michael enjoys a variety of physical activities, including soccer, basketball, running, swimming, racquetball, and hockey. To relax, he enjoys a good book (J.K. Rowling and Michael Creighton are at the top of his reading list) or a good movie (popcorn required).

PI Profile

Dr. Karen C. Davis is an Associate Professor of Electrical & Computer Engineering and Computer Science at the University of Cincinnati. Her research interests include database design, query processing and optimization, and data warehousing. Dr. Davis has been recognized with several awards for her excellence in classroom teaching and her innovation in curriculum and course development, including the HKN ECECS Student Body Outstanding Professor of the Year Award.

In her spare time, Karen enjoys reading novels (especially science fiction and British classics), cooking (and eating) vegetarian food, cycling, hiking, and watching her daughter and husband play soccer.

School Profile

Western Hills Design Technology High School is a pre - engineering program that features a project-based curriculum and develops creative problem-solving skills. At the same time, students gain a strong academic foundation preparing them for graduation, college, and a satisfying career.

The mission of Western Hills Design Technology High School aligns very well with Project STEP's goals, making for a great partnership.

Western Hills Design Technology High School

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Boat Float Challenge

University of Cincinnati

Shroder Paideia Academy **Fall 2005**

Lesson Information

Grade Level
9

Subject Areas
Physical Science

Duration
Five 50 minute classes

Setting
Standard Classroom

Materials

- Computer, w/ LCD projector
- Worksheets
- Construction materials: straws, cardboard, Styrofoam, construction paper, tape, paper clips, scissors, toothpicks, craft sticks, aluminum foil.

Background Knowledge

- Basic familiarity with density
- Basic manipulation of craft tools

Additional Resources

- Introductory PowerPoint
- Several web-based resources

Developed by Fellow:

Michael Rust

Summary

This lesson engages students in a hands-on engineering design activity that relates to the concept of density. Students are given the task of designing a boat using a limited set of materials and a fixed budget. Each design is tested and awarded points for the following categories:

1) Distance traveled with one blow
2) Amount of weight it can hold
3) Cost efficiency

The students work in groups of 2-3 and compete for the top scores in all three categories.

Students working on a class activity

Objectives

Students will be able to:

- Implement the engineering design process to construct a boat
- Describe their design to others in written and verbal communication

Ohio Standards

From the Ohio Science Benchmarks:

Science and Technology

A.2 Identify a problem or need, propose designs and choose among alternative solutions for the problem
A.3 Explain why a design should be continually assessed and the ideas of the design should be tested, adapted and refined
B.1 Describe means of comparing the benefits with the risks of technology and how science can inform public policy

Technology and Society Interaction

A.1 Explain how making decisions about the use of technology involves weighing the trade-offs between the positive and negative effects.

Design

A.1 Explain and apply the methods and tools of inventive problem-solving to develop and produce a product or system
B.2 Explain how a prototype is a working model used to test a design concept by making actual observations and necessary adjustments.