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

## Announcements

### CONGRATULATIONS!

Project STEP has been awarded Track II funding, a 5 year continuation and expansion of the current program.

Thanks goes out to all the STEPper's who worked so hard writing the proposal!

Issue 4 — <http://www.eng.uc.edu/step/>

January 2, 2006



## About STEP

Project **STEP - Science and Technology Enhancement Program** is a University of Cincinnati & 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, 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. A wide variety of lessons are available on our website.

## STEP Technology Workshop

The **Technology Workshop** is designed by Fellows to provide relevant hands-on technological training to middle and high school teachers interested in gaining technology skills and learning technology integration.

This year's hands-on workshop consisted of the following five sessions:

- Web Quests and Internet Resources
- Concept Mapping
- Digital Story Telling
- Excel
- Word and Graphics

Upon completion of the workshop, attendees participated in evaluating all facets of the workshop. Analysis of their input is important for STEP in creating and improving workshops to meet the needs of teachers. Exciting results were tabulated from participants' input. The results concluded that participants strongly agreed



that Fellows had developed quality training. The workshop had provided teachers with valuable information for using technology in their classrooms,

was aligned with technology standards that would help them address standards, and provided relevant skills and resources that they will be able to utilize in their classrooms.



### Teachers commented on their experience:

*"Everyone did a great job and the time and effort involved in the preparation and presentation was obvious."*

*"Fantastic job!"*

*"There was no one thing that I would say I couldn't find very helpful with teaching. It was a GREAT workshop (especially the Digital Story Telling)!"*

# The Bengal's Oily Mess

Shroder Paideia Academy

Fall 2005

## Lesson Information



**Grade Level**  
11 or lower

### Subject areas

Environmental Science

### Duration

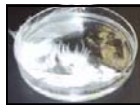
Three (3) 50-minute class periods

### Setting

Standard classroom with large tables and sink

### Materials

Petri Dishes  
Oil



Water

Clean-Up Materials:

Cotton Balls, Feathers,  
Straws, Sand, Pebbles,  
Powdered Sugar, Card-  
board, Paper towels

### Background Knowledge

Students should have knowledge about water, water pollution, and have a basic understanding of oil and its reaction when mixed with water.

### Additional Resources

- <http://earth.google.com/>  
- National Ocean Service Office of Response and Restoration  
- additional websites

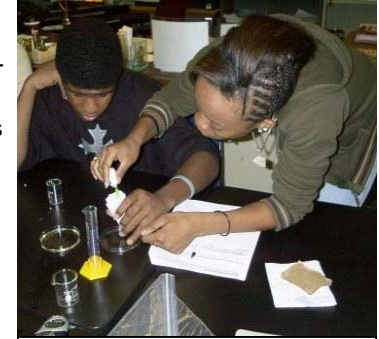
Developed by Fellow:

Michelle L. Daniel

## Summary

In this activity, students play the role of environmental engineers working for the Cincinnati EPA (Environmental Protection Agency). In a classroom scenario, **Voll Oil Inc.** has a disastrous oil spill on the Ohio River in which it is the job of the students to develop an **Oil Removal Plan** to remove all of the oil in the river.

In this activity, students design and implement a scale model oil removal plan. Students explore water pollution issues specifically related to the Ohio River, as well as the Exxon Valdez Oil spill. In addition, students learn about real-world remediation techniques and environmental issues associated with oil spills.



Two Shroder students work diligently to remove the oil from their scale model

## Objectives

Students will be able to:

1. **Design** an oil removal plan to effectively and efficiently remove the oil from Harry Voll Oil Incorporated's oil spill. This design must use the "removal materials" provided in class.
2. **Apply** their knowledge of the properties of water and oil to design their oil removal plan.
3. **Implement** their team's oil removal plan using a scale model.
4. **Apply** knowledge of real-world remediation techniques to the *Bengal's Oily Mess*.
5. **Recall** what oil is used for as well as what causes oil spills.
6. **Describe** the effects of oil spills on the environment and wildlife.
7. **Justify** who they think is responsible for paying for the oil spill remediation.

## Ohio Standards

**From the Ohio Science Benchmarks:**

### Earth and Space Sciences

**Benchmark C:** Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future.

**Benchmark F:** Explain how human choices today will affect the quality and quantity of life on earth.

### Scientific Ways of Knowing

**Benchmark C:** Explain how societal issues and considerations affect the progress of science and technology

**From the Ohio Technology Benchmarks:**

### Technology and Society Interaction

**Benchmark A:** Interpret and practice responsible citizenship relative to technology.

### Design

**Benchmark A:** Identify and produce a product or system using a design process, evaluate the final solution and communicate the findings

**Benchmark B:** Recognize the role of teamwork in engineering design and of prototyping in the design process



Clean-up Materials

## Teacher Profile

**Harry Voll** is an Environmental Science teacher at Shroder Paideia Academy. He is in his 17<sup>th</sup> year of teaching middle and high school. This is his third year working with Fellow's from

"Teaching is an art."

the STEP program. "Anyone can give out information, review it, and then test for its understanding. But to really impart knowledge and retain it, is artful teaching. It is this belief that has encouraged me to pursue a Master's Degree in Administra-



Harry at his desk

tion. My experiences with STEP have increased the rigor of my classroom teaching and evaluation. As a long time veteran of teaching, it is good to have a fresh perspective of things that I have done for many years. The Step Fellows have made me a better teacher and I believe this experience to be one of the most productive relationships I have had in my teaching career."

## PI Profile

**Dr. Anant R. Kukreti** is a Professor



and Head of the Department of Civil and Environmental Engineering at the University of Cincinnati. He is the Principal Investigator and Project Director of

STEP. He teaches courses in the area of structural engineering and his research interests include experimental and finite element analysis of structures, earthquake problems, and constitutive modeling. He has received two Professorships, and won four University and two American Society of Engineering Education (ASEE) teaching awards.

In his spare time, Anant pursues his hobbies including painting, gardening, classical music, & Hindi movies. He is an avid reader, and has traveled extensively in Southeast Asia, Indian subcontinent, South Africa and Europe.

## Student Profile (s)

The Students participating in Michelle's recent STEP lessons had the following comments.

"I liked learning about new things I didn't know."



"I liked that it (the activity) was a challenge."

"I liked that we had the chance to act like environmental engineers."



"I liked learning about how water helps the environment and our bodies."

"I liked making a mess!"

## School Profile

**Shroder Paideia Academy** is dedicated to the belief that "The clearer the expectations, the better the response." The Paideia philosophy emphasizes a liberal arts course of study with active student learning, mastery of skills, and conceptual understanding.

The new \$13.5 million building will be located on a 8.8 acre site in Madisonville . It will be open for the students in Fall of 2006.

The New Shroder Paideia



Under Construction

## Fellow Profile



**Michelle Daniel** is a 2<sup>nd</sup> year graduate student at the University of Cincinnati. She is pursuing her Masters in Secondary Education as well as her teaching license in Integrated Science .

Michelle became involved with Project STEP in 2003 while she was completing her B.S in Civil Environmental Engineering.

This is Michelle's 3<sup>rd</sup> year with Project STEP. She is currently assigned to four Environmental Science classes at Shroder Paideia Academy. Her past STEP experiences have included teaching in Physics, Physical Science, Calculus and Algebra I classes at the Hughes Center.

"I hope to be a high school physics teacher someday !"

In her spare time, she enjoys running, reading, hiking, going to concerts, and travel.

# Crash Test Dummies

Hughes Center / Western Hills Design Technology

Fall 2004 / Fall 2005

## Lesson Information

### Grade Level

9

### Subject Areas

Algebra I



### Duration

2—70 minute blocks

### Setting

Standard classroom with computer and projector

### Materials

Power Point Presentation  
 Computer  
 Internet  
 Projector  
 Portfolio Packet  
 2 pieces of graph paper

### Background Knowledge

Newton's First Law of Motion  
 Graphing Scatter Plots  
 Correlations  
 Trend lines  
 Creating Data Tables  
 Writing Equations  
 Defining Variables  
 Solving Equations

### Additional Resources

[http://www.auto-buying-tips.com/video\\_sound/crash\\_test\\_videos.htm](http://www.auto-buying-tips.com/video_sound/crash_test_videos.htm)

<http://www.nhtsa.dot.gov/people/injury/airbags/>

[OccupantProtectionFacts/young\\_adults.htm#opinions](http://www.nhtsa.dot.gov/people/injury/airbags/Seatbelt%20Broch%20Web/nonpolice.html)

<http://www.nhtsa.dot.gov/people/injury/airbags/Seatbelt%20Broch%20Web/nonpolice.html>

Developed by Fellow:  
 Michelle L. Daniel

## Summary

This portfolio project will provide students with a basic understanding of the physics behind car crashes and seatbelt use (i.e. Newton's First Law of Motion). Students will perform **mathematical analyses** on statistical data obtained from the Insurance Institute for Highway Safety concerning car accidents and fatalities. Students will also analyze Car Insurance costs through writing equations, solving equations, graphing insurance data. Students will also write a conclusion essay, summarizing what they learned during the portfolio project.



Students working on their Crash Test Dummy portfolio

## Objectives

### Students will be able to:

- **Understand** how Newton's First Law applies to car crashes
- **Identify** ways to avoid car crashes and car crash injuries
- **Understand** the importance of seatbelts
- **Understand** how seatbelts work
- **Understand** how good grades affect car insurance rates
- **Apply** mathematical knowledge to construct data tables and graphs
- **Apply** mathematical knowledge to write and solve equations
- **Apply** mathematical knowledge to construct word problems and solve them.



## Ohio Standards

### From the Ohio Mathematics Benchmarks:

#### Number, Number Sense and Operation

**Benchmark D:** Connect physical, verbal and symbolic representations of integers, rational numbers and irrational numbers.

**Benchmark G:** Estimate, compute and solve problems involving real numbers, including ratio, proportion and percent, and explain solutions.

#### Patterns, Functions and Algebra

**Benchmark C:** Translate information from one representation (words, table, graph or equation) to another representation of a relation or function.

**Benchmark D:** Use algebraic representations, such as tables, graphs, expressions, functions and inequalities, to model and solve problem situations.

**Benchmark H:** Solve systems of linear equations involving two variables graphically and symbolically.

#### Data Analysis and Probability

**Benchmark A:** Create, interpret and use graphical displays and statistical measure to describe data; e.g., box-and-whisker plots, histograms, scatter plots, measures of center and variability.

**Benchmark F:** Construct convincing arguments based on analysis of data and interpretation of graphs.

### From the Ohio Science Benchmarks:

#### Scientific Inquiry

**Benchmark A:** Participate in and apply the processes of scientific investigations to create models and to design, conduct, evaluate and communicate the results of these investigations.

#### Physical Sciences

**Benchmark D:** Explain the movement of objects by applying Newton's three laws of motion.

