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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, and this is our fourth year. A wide variety of lessons are available on our website.



Program funded by National Science Foundation Grant #0139312 & matching funds by University of Cincinnati.



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

STEP Technology Workshop

Project **STEP's Technology Workshop** on November 11th, was a success! Read what the teachers said about the experience.

"Being exposed to new possibilities!"

"Learning about new ways to use the technology I already have. Nice Job!"

"Great resources. Some techniques will be utilized immediately, some will take long range planning. But thanks for this opportunity!"

"Even on an off day, it was worth the effort. The presentations were very closely related."



2006 Science and Engineering Expo

The University of Cincinnati is hosting **Southwestern District Science Day, Science and Engineering Expo** March 11th, 2006.

This is a fantastic opportunity for 7-12 grade students to present results of their innovative experimental research projects and have them evaluated by scientists and science educators.

Outstanding projects from the District Science Day are eligible for participation in the State Science Day May 6th, 2006.

There are many different subjects that can be investigated including, but not limited to, biochemistry, botany, chemistry, engineering, mathematics, medicine, and behavioral science.

In order to participate in this exciting research project, you must complete the required application forms by February 10, 2006 and receive a superior rating from a local or school fair before coming to the district competition.

Visit the website at <http://www.uc.edu/sciencefair/> for more information or contact tom.cruse@uc.edu



2005 Science & Engineering



Realize, Research, Reconstruct: A Hurricane Katrina Project

Western Hills Design Technology High School

Fall 2005

Lesson Information

Grade Level

9

Subject areas

Math, English, Science, Social Studies

Duration

Ten 70-minute class blocks

Setting

Standard classroom and computer lab

Materials

- Katrina handouts
- Computer with projector
- Poster board
- Sticky letters
- Construction paper
- Glue / tape
- Scissors
- Markers / colored pencils

Background Knowledge

Students should have some basic knowledge of graphing (lines) and should be exposed to reading histograms. They also should have some background (historical) information about New Orleans.

Developed by
Fellow:

Bartley Richardson

Summary

This lesson was designed as an introductory interdisciplinary lesson for incoming freshmen students. Stemming from the devastating effects of Hurricane Katrina in late 2005, students use knowledge from all of their core classes to research hurricanes (specifically Katrina), learn about hurricane categorization, research and decide on an overall reconstruction plan, and present their plan to the class in the form of a visual aid (poster) and oral presentation. The project requires time given to its completion from multiple classes.



Students display their posters

Objectives

Students will be able to:

- identify the various tropical storm and hurricane classifications,
- use a computer to perform directed research on a list of topics,
- critically determine which aspects of a reconstruction project are more important than others),
- use data given in tabular form to create a simple histogram, and
- work in small groups to prepare a visual aid (poster) and present their reconstruction plan to the class in the form of an oral presentation.

Ohio Standards

From the Ohio Mathematics Benchmarks:

Patterns, Functions, and Algebra

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

From the Ohio English Benchmarks:

Writing Applications

- Use documented textual evidence to justify interpretations of literature or to support a research topic.

Writing Conventions

- Use correct spelling conventions, punctuation and capitalization.
- Demonstrate understanding of the grammatical conventions of the English language.

Communication: Oral and Visual

- Give informational presentations that present ideas in a logical sequence, include relevant facts and details from multiple sources and use a consistent organizational structure.

Research

- Organize information from various resources and select appropriate sources to support central ideas, concepts and themes.

From the Ohio Social Studies Benchmarks:

Geography

- Analyze the cultural, physical, economic and political characteristics that define regions and describe reasons that regions change over time.

Economics

- Explain how the US government provides public services and promotes economic growth and stability.

Teacher Profile

Kim Warfield is an Algebra I teacher at Western Hills Design Technology High School. This is her 7th year with Cincinnati Public Schools. She began her career in teaching as a sub for CPS and had her first long-term sub assignment at North Fairmount in 1997 teaching 7th and 8th grade math.

"I knew I had found my calling the first day I walked into a 5th grade class at Rockdale to sub." This day sparked her journey into the Master's program at Xavier.

She has been at West High since the



Kim in her classroom

2000-2001 school year. This is her second year with the STEP program.

"I have found my experience with STEP to be a wonderful resource for my students and me. The Fellows I have worked with have come up with ideas and projects I would have never thought of and enhanced the learning experience of my students."

Student Profiles

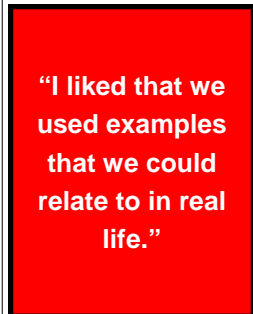
Some of the students participating in Bartley's recent STEP lessons had the following comments.

"I enjoyed the application to real-world engineering."

"This activity combined math we learned before with a new real-world situation."

"What we learned today is something that I might use a lot."

"I liked how we use real data in the activity."



"I liked the entire activity because it reminded me of forensics."

"I didn't think I'd like the presentation, but it was good to show the rest of the class what I had learned."

Fellow Profile

Bartley Richardson is a third year graduate student at the University of Cincinnati. He is pursuing his Ph.D. in



Computer Science with research focus on database systems and XML query language optimization and processing. Bartley has

worked for various computer engineering companies, including GE Aircraft Engines, Rockwell Software, and Apple Computers.

In his first year with Project STEP,

Bartley served as the technology/web coordinator. He transitioned to a Fellow at the start of his second year and worked with multiple physics and physical science classes at Hughes High School. This is Bartley's third year in Project STEP, and he is currently assigned to Algebra I classes at Western Hills Design Technology High School.

When he's not in school or working, Bartley enjoys group exercise and is an accomplished fitness professional with multiple certifications. Relaxation usually involves playing the piano or guitar, going to plays or musicals, and just spending quality time with family and friends.

PI Profile

Dr. Suzanne Wegener Soled marks her twentieth year as an Associate Professor of Educational



Foundations in the College of Education, Criminal Justice and Human Services (CECH) at the University of Cincinnati. Her research interests are focused on teaching & learning and evaluation.

Dr. Soled has been recognized for her excellence in classroom teaching and has received the Outstanding Teaching Award from CECH.

Suzanne is the mother of five children, ages 13-22, and is married to cartoonist Jim Borgman. She enjoys contributing to her community through volunteer work, reading, scrap booking, and traveling with her family. Her recent travel include trips to the Amalfi Coast of Italy, London and the Galapagos Islands.

School Profile

Western Hills Design Technology High School features 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 well with Project STEP's goals, making for a great partnership.



Western Hills Design Technology High School



Runaway Roller Coaster

Hughes Center High School - CAMAS

Winter 2004

Lesson Information

Grade Level

11 / 12

Subject areas

Physics

Duration

One 70-minute class block

Setting

Standard classroom (large amount of board space is preferred)

Materials

- Roller Coaster packet
- Clear plastic tubing
- Copper BBs
- Plastic cups
- Heavy-duty tape
- Meter sticks
- Board space (white or chalk)

Background Knowledge

Students should have minimal knowledge of kinetic and potential energy. They should be familiar with significant digits and rearranging algebraic equations to solve for a given variable.

Developed by Fellow:

Bartley Richardson

Summary

This lesson was designed to incorporate civil engineering into a particle physics classroom. Through the designing, modeling, and testing of a roller coaster design, students familiarize themselves with the engineering design process. It also incorporates physics concepts such as potential energy, kinetic energy, energy conservation, and energy transformation in order to relate this process back to their classroom work.

Students work in small groups to complete the lab.



Students work as a team to model their roller coaster using their design

Objectives

Students will be able to:

- recognize the difference between stored (potential) energy and energy in motion (kinetic),
- design a roller coaster to meet a certain set of requirements (constraints),
- identify areas of potential and kinetic energy and areas where energy transitions between the two,
- calculate potential and kinetic energy at various locations throughout their roller coaster, and
- understand how civil engineering relates to the design of a roller coaster.

Ohio Standards

From the Ohio Science Benchmarks:

Physical Sciences

- Demonstrate that energy can be considered to be either kinetic (motion) or potential (stored).

Scientific Inquiry

- Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data.

Measurement Standard

- Apply various measurement scales to describe phenomena and solve problems