PACT - Day 2

created with taskstream

Author: Stephen Herr
Date created: 04/04/2012 2:44 PM PDT ; **Date modified:** 04/11/2012 8:27 PM PDT

BASIC INFORMATION

Date(s) Taught

3/13/2012

Content Area

Science

Grade/Level

Grade 9

Topic(s)

- Kinetic Energy
- Elastic Potential Energy
- Energy Transfer

Agenda

Tuesday is a shortened period day.
10:06 – 10:10 Students quietly work on the warm up problem displayed on the projector.
10:11 – 10:25 Students whiteboard their graphs from the lab.
10:26 –10:36 Students whiteboard their combined analysis.
10:26 – 10:45 Class results are compared and discussed. The teacher leads the class in a post lab discussion and and explains the expectations of the lab report.
10:45 – 10:59 Students white board problems from homework assignments #1 and #2.
10:55-11:00 Teacher distributes and explains homework assignment #3.

STANDARDS AND OBJECTIVES

California Content & ELD Standards

Display: Collapse All Expand All

CA- California K-12 Academic Content Standards

Subject: Science

Grade: Grades Nine Through TwelveStandards that all students are expected to achieve in the course of their studies are unmarked. Standards that all students should have the opportunity to learn are marked with an asterisk (*).

Area: Physics

Sub-Strand: Conservation of Energy and Momentum

Concept 2: The laws of conservation of energy and momentum provide a way to predict and describe the movement of objects. As a basis for understanding this concept:

Standard a.: Students know how to calculate kinetic energy by using the formula E =(1/2)mv^2 .

Standard b: Students know how to calculate changes in gravitational potential energy near Earth by using the formula (change in potential energy) = mgh (h is the change in the elevation).

Standard c: Students know how to solve problems involving conservation of energy in simple systems, such as

falling objects.

Standard h: Students know how to solve problems involving conservation of energy in simple systems with various sources of potential energy, such as capacitors and springs.

Area: Investigation and Experimentation

Sub-Strand 1: Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other four strands, students should develop their own questions and perform investigations. Students will:

Standard b: Identify and communicate sources of unavoidable experimental error.

Standard c: Identify possible reasons for inconsistent results, such as sources of error or uncontrolled conditions.

Standard d: Formulate explanations by using logic and evidence.

Standard g: Recognize the usefulness and limitations of models and theories as scientific representations of reality.

Standard j: Recognize the issues of statistical variability and the need for controlled tests.

Standard k: Recognize the cumulative nature of scientific evidence.

Standard m: Investigate a science-based societal issue by researching the literature, analyzing data, and communicating the findings. Examples of issues include irradiation of food, cloning of animals by somatic cell nuclear transfer, choice of energy sources, and land and water use decisions in California.

Standard n: Know that when an observation does not agree with an accepted scientific theory, the observation is sometimes mistaken or fraudulent (e.g., the Piltdown Man fossil or unidentified flying objects) and that the theory is sometimes wrong (e.g., the Ptolemaic model of the movement of the Sun, Moon, and planets).

Learning Objective(s) for Content

- Students will explain that the kinetic energy of an object is proportional to its velocity squared. Students made this discovery after they linearizing the graph of the velocity versus kinetic energy of data collected in this lab. All students will be able to adequately explain this relationship in an oral discussion according to the criteria set out in the "Whiteboarding Rubric".
- Students will explain that the velocity of an objected squared is proportional to the inverse of its mass if kinetic energy is kept constant. Students will make this discovery after they linearizing the graph of the velocity versus mass of data collected in this lab. All students will be able to adequately explain this relationship in an oral discussion according to the criteria set out in the "Whiteboarding Rubric".
- Students will explain that the kinetic energy of an object is proportional to mass. Students made this discovery after they combine the two proportionalities listed above. All students will be able to adequately explain this relationship in an oral discussion according to the criteria set

out in the "Whiteboarding Rubric".

- Students will combine these to proportionalities to produce a quantitative model for kinetic energy of the form kinetic energy = kmv^2, where k is a constant. Students will calculate the value of this constant with less than a 15% error compared to the accepted value of 0.5.
- Students will be able to correctly calculate the kinetic energy of an object given its mass and velocity using the equation kinetic energy = 0.5 mv^2 with 100% accuracy on homework assignments and the unit quiz.
- Students will be able to solve problems involving the conversion of elastic potential energy to kinetic energy by using the energy flow diagram approach with 100% accuracy on the lab report, homework, and unit quiz.
- Students will be able to write a lab report with in one week of completing this activity that scores at least 18 out of 25 based of a rubric. This lab report will show their understanding of error analysis, proper equipment usage, interpretation of graphs, logical explanations, the scientific method, scientific terms, creating and using models, analyzing situations, problem solving, and statistical variability.

Learning Objective(s) for Academic Language

Students will be able to effectively communicate their ideas in the classroom setting with their peers using the standards conventions of oral English. The "Whiteboarding Rubric"contains the criteria for evaluating student performance

Prerequisite Knowledge and Skills

- Students must understand the procedure that was done the previous day.
- Students must have analyzed this data and be ready to discuss it with the class.
- Students must know English to participate in the class discussions.
- Students must posses the necessary math and physics skills to take part in this activity .

LEARNING ACTIVITIES, ASSESSMENT, AND RESOURCES

Sequence of Activities

- Students work quietly on the warm up problem displayed on the projector.
- Students whiteboard their graphs from the lab. The teacher leads a student discussion of the significance of these graphs.
- Students whiteboard their combined analysis.
- Class results are compared and discussed. The teacher leads the class in a post lab discussion and and explains the expectations of the lab report.
- Students whiteboard problems from homework assignments #1 and #2. The teacher leads a discussion of these problems and address issues that students may have.
- Teacher distributes and explains homework assignment #3.

Prepared questions:

- What is the significance about kinetic energy being proportional to velocity^2?

- What were sources of error in the lab?
- How does your groups data compare to the class set? Why is your data different?
- What could be done differently to create a more accurate model?
- Under what conditions can we apply tho model of Kinetic energy? What is the domain of this model?
- How would the "constant" have been affected if friction was not compensated for? How about if friction was over compensated for?

Differentiated Instruction

Whiteboarding provide excellent opportunities for differentiated instruction. The teacher can quickly uses the whiteboards to tell which students are not understanding the information. The teacher can then address the needs of these specific students. In many cases, the students are able to differentiate the instruction for each other. Many of the students provide excellent explanations in the whiteboard discussions that their peers can relate to.

Monitoring and Assessing Learning

The teacher will assess learning by observing student whiteboards, asking them questions, and facilitating the classroom discussion. The whiteboard rubric will be used to assess student learning during the whiteboard discussion.

Rubrics (if applicable)

Rubrics:

1. Whiteboarding Rubric

Resources and Materials

- Whiteboard Markers
- Whiteboards
- Whiteboard Erasers
- Whiteboard Easels

Attachments:

1. **Homework Assignment #1**
2. **Homework Assignment #2**

REFLECTION

Reflection

Directions for learning tasks

100% of the students in the class completed the analysis of the data from the previous lab for homework and promptly wrote it on the board (graphs, equations, combined analysis) when asked. This indicates that my expectations and directions for this learning task were sufficiently clear.

All lab groups the graphs they created, the equations of the graphs, and their combined analysis.

Inquiry Skills

The focus of this day was data analysis. The classroom discussion revolved

analyzing the data from all of the lab groups as a single data set, discussion sources of error, improving the procedure, and discussing the conclusion.

Time management

I ran out of time to discuss the implications of equation for kinetic energy.

The whiteboard discussions lasted longer than expected. This took away the time for students to begin to work on homework assignments 1 and 2.

I should have at least handed out the homework assignment about two minutes before the bell. I had to hold the students after class about 30 seconds after the bell rang to distribute and explain the worksheets.

Summary

Students did an excellent job participating in the class discussion. They were very engaged. I saw this as a learning opportunity and didn't want it to end. Because of this, I will have to spend more time tomorrow discussing the expectations of the lab write up and the post lab.