

## ROLLER COASTER ME CRAZY: TEACHER GUIDE

**Subject:** Physical Science

**Grade Level:** Middle School

**Last Updated:** June 05, 2011

### **Case Summary**

The Magic Kingdom is opening a new Michael Jackson roller coaster ride. Unfortunately the roller coasters are not functioning properly. The roller coaster cars will not transition over the first ramp. The CEO is looking for engineers to fix the problem.

### **Credits**

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### **Learning Objectives**

1. Apply the law of conservation of energy
2. Illustrate and demonstrate an understanding of energy transformations
3. Compare and contrast potential and kinetic energy
4. Explain and demonstrate the relationship between potential and kinetic energy

### **Georgia Performance Standards**

- S8P2.* Students will be familiar with the forms and transformations of energy.
- a. Explain energy transformation in terms of the Law of Conservation of Energy.
  - b. Explain the relationship between potential and kinetic energy.

### **Assessment**

Box Chart

Potential and kinetic energy transformation concept map

Illustration and a written description of how to improve the roller coaster

Unit reflection

Venn Diagram – Compare and contrast Potential and Kinetic Energy

Thinking Map – Demonstrating an understanding of energy transformation.

## Implementation Strategy

Students should have some understanding of potential and kinetic energy prior to the PBL. The dialogue can be read by the teacher, graduate student, or volunteer students depending on the dynamics of the classroom. The students should complete a box chart following the completion of scene one. Teacher and graduate student should facilitate the process of identifying facts and learning issues. The students should then conduct research of the learning issues followed by a class or group discussion to confirm understanding and obtain answers to new questions. Students should then be given a specified time to complete the scene one assignment. This assignment will have the students to research the law of conservation of energy, potential energy, and kinetic energy further if needed. Ask the student to describe what they see using the terms that were learned in their research. Following the research assignment, students are to create an illustration of a roller coaster with a written explanation that describes why their design will work and be best suited for the new ride at the theme park. Students will present their designs and explanations. The class can vote on the best design and explanation using a rubric that illustrates the expectation as it relates to the standard.

Day 1 (90 minutes)

Scene 1: Skit performed by teachers/grad students and student volunteers as other students read along (10 minutes)

Box Chart – Facts, learning issues, action plan (10 minutes)

Research/Discussion (30 minutes)

Assignment – Venn Diagram or Thinking Map (30 minutes)

Roller Coaster Design and explanation (Class work or homework)

## Case Notes

*Students handed in products however a camera was not available to document the products. In the future, products will be collected and immediately documented.*

**What worked:** A mini-lesson about the law of conservation of energy and potential energy/kinetic energy. The comical nature of the skit also got students involved in the activity. The students were very successful working in groups to complete their posters and diagrams. Shared responsibility of the of the assignment task worked well for completion. Group presentations were ideal when considering the time. Students were also responsible for individual reflections in which some required assistance from peers or teachers.

**What didn't work:** Students required more time than expected for research and demonstrations. Some students needed assistance with the write up and individual reflections. Allowing students to complete write ups and reflections for homework didn't work because many of the assignments weren't returned. Students had difficulty with calculations and measurements of their model roller coaster.

**How did students respond:** The students responded very well. The students engaged well and most worked to expectation when completing the task.

**How can the case be improved or altered?** Increasing time for research and task completion if necessary could increase productivity. Eliminating some of the task could reduce time required. Also, adding another day to complete all task to increase productivity.

## **Resources**

Murray, S. (2009). Physics online quizzes. *Kinetic vs Potential Energy?* Retrieved June 5, 2011 from  
<http://www.cstephenmurray.com/onlinequizes/physics/workandenergy/kineticvspotentialenergy.htm>.

ProProfs Quiz Maker (2011). *Energy Practice Test*. Retrieved June 5, 2011 from  
<http://www.proprofs.com/quiz-school/story.php?title=Energy-Practice-Test>