Engineering in Sports

Teach 1	Names of student(s) teaching:
Teach date: Teach time: Teach length: 45-50 minutes	Title of lesson: Engineering in Sports Source (Kit, Lesson, Page #):

Concept statement/Main idea:
Students will think about how engineering is involved in sports. After a discussion of kinetic and potential energy, an associated hands-on activity gives students an opportunity to explore energy-absorbing materials as they try to protect an egg from being crushed.

Standards for the lesson:
Use evidence to construct an explanation relating the speed of an object to the energy of that object. Identify and describe the variety of energy sources.

Objectives	Evaluation
Write objectives in SWBAT form	Write at least one question to match the objective you listed or describe what you will look at to be sure that students can do this.
SWBAT **list** examples of how engineers help athletes stay safe	1) What is one way engineers help athletes to stay safe? A) Not allowing the teams to hit one another B) By providing safety equipment to teams C) By giving softer equipment, such as balls, to be utilized
SWBAT **define** kinetic and potential energy and explain the difference between the two	2) Kinetic energy is energy that is _____ , while potential energy is energy that is _____ .

Engagement

Estimated time: 5 minutes

Description of activity: Students will evaluate various pictures of athletes in their uniforms for various sports such as hockey and snowboarding.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
The teacher will demonstrate photos to students of various athletes participating in the Winter Olympics. The teacher will also introduce the terms kinetic and potential energy with a skier example	The students will identify and discuss the various equipment the players are wearing for their respective sports.	What type of equipment is the hockey player wearing? What type of equipment is the snowboarder playing? What type of equipment is the skier wearing? Are there any similarities between the equipment? Are there any differences between the equipment? Why do you think it's important to have this type of equipment?

Resources needed:
Powerpoint and projector

Safety considerations:

Exploration

Estimated time: 15 minutes
Description of activity: Students will construct safety equipment that will have to protect an egg from a drop of about 4 feet.

What the teacher does	What the student does	Possible questions to ask students — think like a student

		and consider possible student responses
The teacher will supply the materials and give instructions for the egg drop. The teacher will supervise the egg drop.	The student will construct safety equipment for the egg and drop it from about 4 feet (with the teacher's supervision). The student will also draw out their plans on their worksheet while demonstrating where the kinetic and potential energy points are in the design for their experiment.	How do you think your egg will hold up after it is dropped? Do you think your egg will survive the landing? What changes could you make to make your egg more secure?

Resources needed per group:

- 1 egg
- Foam
- Tape
- Scissors
- Paper
- Straws

Safety considerations:

Use caution if standing on a chair to drop the egg.

If raw egg gets on the hands of the students, be sure to have them wash their hands with soap.

Explore Worksheet

Explanation

Estimated time: 10 minutes

Description of activity: Students will explain the concept of their design and whether or not their equipment kept their egg safe.

What the teacher does	What the student does	Possible questions to ask students — think like a student

		and consider possible student responses
The teacher will ask students questions about their design and final outcome of their equipment.	The student will discuss their results and explain if they would change anything to improve their design.	What changes, if any, would you make to improve the design for your egg? What additional materials could you have used to improve on your design?

Resources needed:
Students' egg equipment (if the egg survived)

Safety considerations:

Elaboration

Estimated time: 10 minutes
Description of activity: Students will connect their egg equipment to real-world equipment that is used in the Olympic games.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
The teacher will ask the students questions about any similarities or differences between their egg equipment and that of equipment that is used in athletic events.	The students will connect their egg equipment concept to that of equipment that is used in athletic events.	Are there any similarities between the equipment you constructed and the equipment used in sporting events? Are there any differences between the equipment you constructed and the equipment used in sporting events? What do engineers have to take into consideration when

		making safety equipment for athletes? How important do you think it is for athletes to have safety equipment?

Resources needed:
Powerpoint and projector
Safety considerations:

Evaluation

Estimated time: 5 minutes
Description of activity: Students will complete the evaluation quiz on their own and turn it in once it is completed.

What the teacher does	What the student does	Possible questions to ask students — think like a student and consider possible student responses
The teacher will distribute the evaluation and pick up the evaluations once they are completed.	The students will complete the evaluation quiz on their own and turn it in when they are finished.	

Resources needed:
Evaluation Quiz
KEY

Safety considerations:

Name: _____
Date:_____

Bumps and Bruises

Instructions: Your task as a team is to come up with a piece of safety equipment that will keep your player, Mr. Egg, safe during his sporting event. You may use any supplies that are provided. Do **NOT** remove the egg from the plastic bag, if you remove the egg from the plastic bag your team is **disqualified** from the event.

Prior to constructing your safety equipment, draw out your design plan for Mr. Egg.

Before participating in the sporting event, sketch a diagram below of where the kinetic and potential energy will be before, during, and after the free-falling event.

Name: **Date:**

Engineering Sport – Energy Matching Quiz

Directions

Write the letter of the correct answer on the left hand line next to the question. One of the answers will be used twice, and one of the answers will not be used.

_____ 1. Define kinetic energy.

_____ 2. What type of energy does an apple have when hanging in a tree?

_____ 3. Define potential energy.

_____ 4. What kind of energy does a skier have when skiing down hill?

_____ 5. What kind of energy does a hockey player have, when skating on ice?

_____ 6. If an object is not moving, what type of energy does it not have?

_____ 7. If an item is on the flat ground and it not moving, which type of energy does it have?

_____ 8. Which has more potential energy? A skier at the top of a hill or a skier at the bottom of a hill.

A. Stored energy

B. Potential energy

C. On the ground

D. Energy of motion

E. On the tree

F. Kinetic energy

G. Both kinetic energy and potential energy

H. Neither kinetic energy or potential energy

Name: **Date:**

Lesson 4, Engineering Sport – Energy Matching Quiz – Answers

Directions

Write the letter of the correct answer on the left hand line next to the question. One of the answers will be used twice, and one of the answers will not be used.

D 1. Define kinetic energy.

B 2. What type of energy does an apple have when hanging in a tree?

A 3. Define potential energy.

G 4. What kind of energy does a Skier have when skiing down hill?

F 5. What kind of energy does a hockey player have when skating on ice?

F 6. If an object is not moving, which type of energy does it not have?

H 7. If an item is on the flat ground and it not moving, which type of energy does it have?

E 8. Which has more potential energy? A skier at the top of a hill or a skier at the bottom of a hill.

A. Stored energy

B. Potential energy

C. On the ground

D. Energy of motion

E. On the tree

F. Kinetic energy

G. Both kinetic energy and potential energy

H. Neither kinetic energy or potential energy