Activity done October 18, 2007

HUGK12 Activity

TITLE:

Follow Up for Rotational Equilibrium – Investigation of Center of Mass

PREPARED BY:

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DCPS STANDARDS:

8.7.2
Observe and explain that when the forces on an object are balanced (equal and opposite forces that add up to zero), the motion of the object does not change. (The activity is indirectly related to this objective in that the actual concept is that net torque equals zero rather than net force equaling zero.)

8.1.8
Read analog and digital meters on instruments used to make direct measurements of length, volume, weight, elapsed time, rates, or temperatures, and choose appropriate units. Explain how to interpolate on analog scales.

GOALS:

1. Students will understand what a lever is.

2. Students will determine the center of mass of a ruler.

3. Students will understand that the center of mass of the ruler was a factor in the rotational equilibrium experiment.

OBJECTIVES:

1. Students will understand the meaning of center of mass.

PREREQUISITE KNOWLEDGE:

A lever is a thin rod that rests on a pivot point called a fulcrum.

The load is the object to be lifted.

The effort is the force that the user inputs to the lever.

The load arm is the distance from the load to the fulcrum.

The effort arm is the distance from the applied force to the fulcrum.

In a first class lever, the load force is at one end of the rod, the effort is made at the other end of the rod and the fulcrum is between the load and the effort.

ESSENTIAL QUESTIONS:

How does a first class lever work?

What is the center of mass?

LABORATORY MATERIALS:

1 ruler

Setup of experimental apparatus:

None

DIFFERENTIATING INSTRUCTION:

None

RATIONALE:

This activity will lead students to the conclusion that the center of mass served as an additional force in the rotational equilibrium experiment.

RESEARCH ACTIVITY:

1. Discuss the results of the lever experiment with the students. Students should come to the conclusion that an effort arm that is longer than the load arm will allow less force to be applied to lift the load.

2. Give each student a ruler.

3. Have each student balance the ruler on their finger and determine the marking on the ruler at which it balances.

4. Explain to the students that the center of mass is the point at which all of the weight of an object is considered to be acting.

EVALUATION AND ASSESSMENT:

Ask the students how the center of mass of the ruler affected the rotation and torque experiment.

References:

Motion and Forces. McDougal Littell, 2005.

Tippens, Paul E. Physics. Columbus, Ohio: Glencoe/McGraw-Hill, 2001.

Wood, Elaine and Walker, Pam. 50 Terrific Science Experiments. Grand Rapids, Michigan: Instructional Fair • TS Denison, 1998.

Wood, Elaine and Walker, Pam. Scientific Investigations. Grand Rapids, Michigan: Instructional Fair • TS Denison, 1998. (Source of terminology "load arm" and "effort arm)