

SUMMER INSTITUTE FOR ENGINEERING AND TECHNOLOGY EDUCATION

MECHANICAL ENGINEERING - TEACHER MODULE 3

EGG DROP

CONCEPT

This experiment is designed to demonstrate the concepts of Newton's second law, acceleration, collision, and resilience.

OBJECTIVES

Students will apply the principles of Newton's second law, concepts of force and acceleration due to gravity, collision, and resilience to build a housing for an egg so that it will survive being dropped from the maximum height possible.

SCIENCE PROCESS SKILL

- Design
- Communication
- Experiment
- Interpret data and conclusions
- Group Decision Making
- Evaluation

AAAS SCIENCE BENCHMARK

1B: Scientific Inquiry

3B: Design and System

3A: Technology and Science

12C: Manipulation and Observation

SCIENCE EDUCATION CONTENT STANDARDS (NRC)

Grades 5-8

- Design and Conduct a Scientific Investigation
- Use Appropriate Tools and Techniques to Gather, Analyze and Interpret Data
- Construct Explanations and Models Using Evidence
- Think Critically and Logically About Relationships Between Evidence and Explanations
- Recognize and Analyze Alternative Explanations and Procedures
- Communicate and Analyze Explanations and Procedures
- Motion and Changes in Motion

Grades 9-12

- Identify the Questions and Use Concepts to Guide Scientific Investigations

- Construct and Revise Scientific Explanations and Models Using Logic and Evidence
- Recognize and Analyze Alternative Explanations and Models
- Communicate and Defend a Scientific Argument
- Forces and Motion
- Interactions of Energy and Matter

STATE SCIENCE CURRICULUM FRAMEWORKS

Grades 5-8: 1.1.9, 1.1.10, 1.1.11, 1.1.13, 1.1.14, 1.1.15, 1.1.16, 3.1.2, 3.1.3, 3.1.7, 3.1.8, 3.1.21, 3.1.22, 3.1.23

Grades 9-12: 1.1.20, 1.1.21, 1.1.22, 1.1.23, 1.1.24, 2.1.14, 2.1.15, 3.1.34, 3.1.38, 3.1.39

MATERIALS AVAILABLE

(Assigned a dollar value for each item)

- 1) Materials Eggs
- 2) Shoe Box or any other cardboard box
- 3) Filler materials like newspaper, sponges, marsh mellows, Styrofoam blocks, Styrofoam peanuts, rubber, popcorn, cotton, rags, plastic, etc.
- 4) Fastening materials like tape (duct, masking, scotch), paper clips, strings, rubber bands.
- 5) Tools like scissors, pliers, knives.

THE JOB

The job of a Mechanical Engineer does not end at the workshop or at the manufacturing plant. Once the parts are manufactured according to the specifications, proper care should be taken in packing the products for transportation. Poorly packed products lead to breakage, distortion, or improper functioning of the part. There is a strong need to pack these products properly to survive transportation, stacking etc.

A well packed product also enhances the image. Keeping these points in mind, your Job is to design a housing for the egg. The housing should be designed in such a way that the egg will survive being dropped from the maximum height possible. Build this housing by making use of the materials provided. You are also advised to team up with 3 or more students to work on the experiment. When the designs are complete each group's housing will be tested by dropping the housing along with the egg inside from incremental distances until the egg breaks.

The students goal is to design a packing that will protect the egg from the greatest fall for the least amount of money.

NOTE: There are two things to consider when making package.

- The speed of the entire package when it hits the ground.
- How much cushion there is for the egg when it hits the ground.

ASSESSMENT

Grade 5-12

.After dropping the egg allow the students a chance to redesign their package in order to improve performance.

Grade 9-12

It is recommended that all students complete an age appropriate lab report based on teacher specifications.

BIBLIOGRAPHY AND REFERENCES

PETROSKI HENRY, *To Engineer is Human: The role of Failure in successful Design*, St. Martin's Press, New York, 1985.

PETROSKI HENRY, *Beyond Engineering: Essays and other Attempts to Figure without Equations*, St. Martin's Press, New York, 1986.

GLORIOSO, R.M. AND HILL, F.S, *Introduction to Engineering*, New Jersey, 1975.

BLOTTER, P.T, *Introduction to Engineering*, New York, 1981.