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*LA is language arts, and tech is technology.

QuickView

Students design a mousetrap vehicle that will travel to an exact distance.

Standards

NSTA 9-12
Students develop the abilities to do scientific inquiry.

- Students identify questions and concepts that guide scientific investigations.
- Students design and conduct scientific investigations.
- Students use technology and mathematics to improve investigations and communications.
- Students formulate and revise scientific explanations and models using logic and evidence.
- Students communicate and defend a scientific argument.

NCTM 9-12
Students compute fluently and make reasonable estimates.

- Students judge the reasonableness of numerical computations and their results.

Students use mathematical models to represent and understand quantitative relationships.

- Students draw reasonable conclusions about a situation being modeled.

Students understand measurement attributes of objects and the units, systems, and processes of measurement.

- Students make decisions about units and scales that are appropriate for problem situations involving measurement.

Students formulate questions that can be addressed with data collect, organize, and display relevant data.

- Students understand the meaning of measurement data and categorical data, of univarate and bivariate data, and of the term variable.

Students recognize and use connections among mathematical ideas.

- Students recognize and apply mathematics in contexts outside of mathematics.

ITEA 9-12
Students develop an understanding of the attributes of design.

- Students learn design problems are rarely presented in a clearly defined form.
- Students learn that design needs to be continually checked and critiqued and the ideas of the design must be redefined and improved.

Students develop abilities to apply the design process.

- Students learn to identify the design problem to solve and decide whether or not to address it.
- Students learn to evaluate the design solution using conceptual, physical, and mathematical models at various intervals of the design process in order to check for proper design and to note areas where improvements are needed.
- Students learn to develop and produce a product or system using a design process.

- Students learn to evaluate final solution and communicate observation, processes, and results of the entire design process, using verbal, graphic, quantitative, virtual, and written means, in addition to three-dimensional models.

Time Required

225-550 minutes (will vary with class size)

Content Areas

Primary: Technology
Secondary: Math; science; language arts

Vocabulary

- model
- constraint
- design
- specification
- inference

Materials

- Mousetrap vehicles kit(s)
- Glue
- CA glue (Superglue)
- Scissors
- Sandpaper (optional)
- Graphite (optional)
- Tape measure
- Timber cutter or hobby knife
- Dremel tool or portable hand drill
- Wire cutters
- Needle-nose pliers
- Cool-melt glue gun and glue slugs
- Masking tape
- Ruler
- Graph paper
- Pencil
- Design logbook or notebook

Procedure

1 Build a standard mousetrap vehicle following the instructions included with the kit.

This activity will work best if students are allowed to use two kits – one built to the stock specifications and one built to the students' design specs. If this is not possible, students should be given access to spare parts such as axles, lever arms, wheels, and balsa wood scraps to create the redesigned vehicle for the challenge phase.

2 Develop a process for testing the mousetrap vehicle. In particular, test specifications in the design of the vehicle that could be altered to change the distance achieved by the vehicle. For example, test whether or not the number of times the string is wrapped around the axle affects the distance the car travels or if the position of the mousetrap on the chassis affects distance. Record your testing data in your design logbook or a notebook.

Students should record the testing procedure in a scientific format. They could follow a standard scientific method layout, or they could use a modified problem-solving format. It is important that the students clearly identify what specification of the design they are testing, how they are testing the spec, and what the results of the tests are. You may wish to have students bring a notebook to use as a design logbook, or you may wish to duplicate and place templates from this guide in a binder for use as a design logbook. Students should get in the practice of keeping track of ideas, testing procedures, and data.

3 Refer to your testing data. Record any inferences or conclusions you can make about how distance is affected by different design specifications.

You may want to discuss with your students what inferences are, how they are made, and how to tell if they are reasonable. This should be fairly simple, but some students will need to be reminded how to make a reasonable inference from testing data.

4 Test your theories.

Students should test their inferences and/or conclusions using the "stock" mousetrap vehicle. For example, if they infer that the position of the mousetrap on the vehicle's chassis influences the distance traveled by the vehicle, they should reposition the mousetrap and test this theory.

5 Evaluate your theories and retest if necessary.

Here students have the opportunity to evaluate what they thought to be true and retest if needed.

Procedure continued

6 Build a vehicle to travel a specific distance. Your teacher will determine the distance.

For this part of the process, you will need to travel to determine a distance for the vehicles to travel. This can be made into a mini competition or kept as an individual challenge.

7 Test the vehicle.

After building the vehicle to meet the challenge you have set forth, the students should get a chance to test their vehicles before the challenge.

8 Complete three distance trials. Record how close you were to the target distance.

Give students three chances to reach the challenge distance. You may even want to give a prize to the student that comes closest to the target distance.

9 Write a report summarizing the design and testing process you went through. Give reasons why you think that your design was successful or unsuccessful. Include factors that may have contributed to the success or failure of the designs.

Students' reports should follow rules of grammar, punctuation, and spelling as well as being technically accurate.

Note: *As an extension of this activity, have students design a mousetrap vehicle that they can vary the distance traveled. The distance (between three and 10 meters) is kept secret until race time.*

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