# Student Mousetrap Powered Watercraft

**LEARNING AREA:** Inquiry and Research
**EDUCATIONAL LEVEL:** Middle School
**CONTENT STANDARDS**: Inquiry

Standard 18. "Students will develop an understanding that transportation vehicles are made up of subsystems. They include propulsion, suspension, guidance, control and support that must function together for a system to work effectively." (MTEA)

**STANDARD:** This package includes practice in:

1. Accessing and analyzing sources.
2. Reflection on the process of analyzing information and processes relating to mathematics and science.
3. Brainstorming questions regarding design, propulsion, control and guidance.
4. Brainstorming potential materials and processes for construction of the suspension system.
5. Journaling of the project.
6. Sketching and drafting of designs and revisions of the project.
7. Reflecting on the design processes and the effects on the watercraft.

**WHAT THE STUDENTS WILL LEARN:**

**DESCRIPTION: Student Mousetrap Powered Watercraft**

Students will work in groups of three to design and build a watercraft that will be powered by a single mousetrap. The team will design, systems including the hull, as well as a propulsion system that can be a paddle, propeller, or system of their choice. The team will do a presentation that will identify the propulsion, suspension, guidance, control, structure, and support of the vehicle.

**PRODUCTS/EVIDENCE OF LEARNING:**

A student shall:

A. Access information and use a variety of sources to study watercraft designs and options by:
   1. Using electronic media or other available means to access relevant information.
   2. Determining how to record and organize information.
   3. Gathering information from multiple sources, and

4. Evaluating the relevance of the information.

B. Answer questions regarding the vehicle.

| | |
|---|---|
| 1. What hull design will be used? | *Suspension* |
| 2. By what means will the vehicle be propelled? | *Propulsion* |
| 3. How will the vehicle be steered through the water? | *Guidance* |
| 4. What materials will be used for the building process? | *Structure* |
| 5. What support systems are necessary for watercraft? | *Support* |
| 6. How does the angle and number of blades affect the control of the watercraft? | *Control* |

C. Construct a watercraft.
1. Did they complete construction of a watercraft?
2. Is it within the specifications?

D. Test the watercraft.
1. Did the craft move a given distance?
2. Did the craft float?

E. Reflection on the processes and performance of the watercraft.

## OVERVIEW:

***Statement of Purpose***

Step I. Introduction of technological terms needed to fully understand the activity.

1. The terms include, but are not limited to: control, machine, motion, velocity, acceleration, kinetic energy, potential energy, efficiency of power, propulsion systems, buoyancy, stability, aerodynamics, draft, keel, hull, rudder, propeller pitch, aft, and stern.

2. Students will be quizzed on these terms before any construction begins on this project. After discussing and taking a quiz on hull design, then the team may design and start work.

Step II. Construction of the watercraft.

3. The class will be divided into teams consisting of three students each. Each team will have a design engineer who is responsible for the schematic of the craft, a construction engineer responsible for the building of the main part of the craft, and a parts procurer.

4. Student teams will provide their own construction materials for hulls, paddles, props, etc. The mousetrap must be the sole source of power. At this point a design brief (sketches and written report on intent) will be required. Student teams will be given one standard Victor mousetrap.

5. The craft will be tested in a tank 2 inches deep, 12 inches wide, and 10 feet long. Size of the watercraft must be limited to 5 inches wide and 12 inches long. Remember: the lighter the craft, the farther it will travel.

6. A data table will be required to show changes in design.Things to include in the table will be distance, time, average speed, and weight of the vehicle. The teams must document any changes such as number of blades, propulsion system, size, angle of the blades used to propel the craft through the water.

Step III. Presentation.

7. Each team will give a presentation five to ten minutes long.
    a. Each member must participate.
    b. The design chosen will be explained to the class.
    c. Each team will explain how they incorporated the scientific principles into their vehicle.
    d. Each team will cover the six parts of a system.

Step IV. Testing the Watercraft.

8. Each team will run twice for the distance.
9. Adjustments may be made between runs. No new items can be added.
10. The best distance over the course will be declared the winner.
11. Ties will be broken by a second run.
12. Winners from each class may be arranged to compete against each other.
13. If time permits, a redesign of the craft can be run with different hulls and propulsion systems.

**CHECKLIST:**

**STUDENT** **TEACHER**

__________ __________ The student kept a detailed journal of their daily participation throughout the project in their portfolio.

__________ __________ The student included appropriate notes and detailed information within their portfolio.

__________ __________ The design group created a research data lot that included relevant information from at least three documented sources.

__________ __________ The team's proposed vehicle was well thought out and supported by their research.

__________ __________ The presentation lasted between five to ten minutes.

__________ __________ Each member of the team participated during the presentation.

__________ __________ The final drawing documented the ideas, systems, and construction of the proposed vehicle.

__________ __________ The prototype was completed according to the requirements and used during the presentation.

__________ __________ The design group members were knowledgeable and able to appropriately answer questions from the audience after their presentation.


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