

## Physics Project

### Mousetrap

### Powered

### Vehicle

A WebQuest

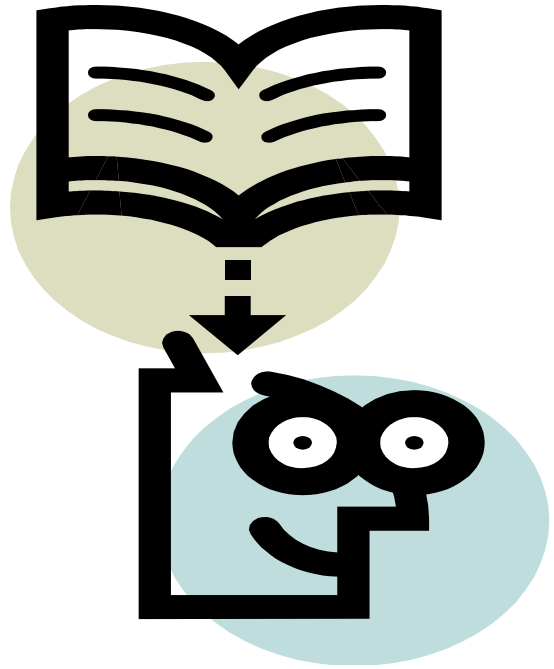
For

Glenwood Community High School

Science 9

Designed by Brad Rasmussen

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### *Introduction*

Technology is on the move and new ideas to address new issues are being developed. You are an engineer, an inventor, and a designer. You are designing a prototype vehicle to save our natural resources. This new vehicle must be energy efficient, non-polluting, carry passengers, and yet have power and speed to get around. Your vehicle will need to be safe and comfortable. You will be presenting your prototype and report to a group of business executives the purpose and reasons as to why your product is needed. Engineers, inventors, and designers need to be concerned about the costs of materials, efficiency of the design, the comfort of the passengers, safety of the product, and many other details.

### *Task*

You are an engineer, an inventor, and a designer and you are to design and build a vehicle powered by a mousetrap. This vehicle must travel at least 10 meters (from the starting line to the finish line), while meeting the goal of being fast and yet efficient. We can define fast as being the vehicle to cross the finish line first. Efficient is defined as running smoothly, in line, and safely crosses the finish line. Power and environmentally friendly are also important items to be considered in your design. It is important to test your vehicle several times to insure it works properly. You will present your idea to a group of business executives with the purpose and reasons your product is the one for the future.

### *Supporting Information*

In the world, we are asked to be responsible. We have been taught and shown to take care of our belongings and the belongings of others. We have been asked to share with others. We have been asked to make decisions and have faced consequences. We have chosen sides and shown emotions. We have had to compromise. We have been on winning sides and losing sides. We have hurt and been hurt. We have been taught and have taught. We learned some lessons well and others we continue to learn. There are times we have struggled and almost given up, but we learned from these times. We have learned there are risks and benefits to all decisions. We now face this task and need to work through a procedure and establish a product and presentation (report) based on facts. We need to develop the best product for the future.



## *Process*

*\*\*\*The objective – What are you going to learn?\*\*\**

You will build a vehicle (mousetrap powered) and write a report.

You will need to conduct research (define, identify, and collect information) on the task and on the topic to be explained in your report.

You will need to analyze this information to help you design and build your vehicle. You will also use this data to explain various topics relating to physics.

You will need to share your ideas and plans to a group of Business Executives.

You will need to evaluate your work.

- Was the goal attained?
- What were some problems? Why?
- What went well? Why?
- How can this be used in the future?
- Etc.

Humans are in constant conflict with new ideas, because of their attitudes, feelings, and traditions. You need to be aware of consumer interests, consumer safety, and the concerns of environment while working on this project.

## *Procedure/Directions*

1. You need to state the problem you are trying to solve in your own words.

Cover page

- State the problem
- Your name
- Your class period
- The date
- Your teacher's name
- A picture or drawing of your prototype vehicle

2. You need to gather data by doing research. You will need to use at least 4 sources. You will include a MLA style bibliography which you can create on Noodle Tools.

- One book
- One website (from the pre-selected options on the resource page)
- One reference book (encyclopedia, handbook, etc.)
- One article from sirs researcher

This information needs to be researched and included in your project and/or report.

- Materials to build and test the vehicle
- Newton's 3 Laws of Motion
- Inertia
- Center Mass
- Friction
- Momentum
- Potential Energy
- Kinetic Energy
- Transfer of Energy
- Conservation of Momentum
- Centripetal Force
- The 6 Simple Machines and their Mechanical Advantage (pulley, lever, screw, wedge, wheel and axle, incline plane)
- Renewable Sources of Energy

This information also needs to be researched and included in your project and/or report.

#### Equations

- Momentum = Mass x Velocity
- Acceleration =  $\frac{\text{Final Velocity} - \text{Original Velocity}}{\text{Time}}$
- Speed = Distance/Time
- Work = Effort (resistance in Newtons) x Distance Moved (in meters)

3. You will develop a plan for designing and building your prototype. You will also need to write your report and will share this information with the business executives.

- What is your goal?
- What questions do you need answered?
- What are the steps you need to follow to meet your goal?
- How will you evaluate results?
- Etc.

4. You will share your prototype vehicle and report.

## Conclusion

*Change is the only constant in life. If there is one thing you can always count on, it is change will happen! Technology is like change, in with the new and out with old!*

5. You will reach a conclusion and be able to support your thoughts with facts.

You will need to answer the following items to conclude your paper.

- Should your vehicle be the one manufactured in the future?
- Why is your vehicle the one vehicle, which will be consumer friendly, environmentally friendly, safe (yet powerful), and will be able to withstand wear and tear of being used?

You need to staple your paper in the top left corner.

## *Resource Page*

### Manuscript

- Physics Powerpoint

### Websites

- [www.physicsclassroom.com](http://www.physicsclassroom.com)
- [www.docfizzix.com/how\\_work.htm](http://www.docfizzix.com/how_work.htm)
- [www.iowaacaonline.org/](http://www.iowaacaonline.org/)

### Books

- Motion, Forces, And Energy

### Magazine Articles

- Alternative Sources of Energy (SIRS Researcher)
- Iowa Engineer – University Of Iowa
- Inventor's Digest The Magazine For Idea People

### Reference Books

- Motion and Forces
- Science Saurus
- World Book Encyclopedia

### Bibliography

- Noodle Tools

## Physics Report Rubric

CATEGORY	5	4	3	NI
<b>Cover page</b>	A quality cover is attached to report with all the required information included. One image is included that supports the theme of the research report.	A quality cover is attached to report with all the required information included. No image is included.	A cover is attached to report with most of the required information included. No image is included.	No cover or a poor cover is attached to report with most of the required information not included. No image is included.
<b>Amount of Information, Knowledge</b>	All topics are addressed and all questions answered with at least 2 sentences about each. Able to answer all questions relating to the topic when asked	All topics are addressed and most questions answered with at least 2 sentences about each. Able to answer most questions with demonstrable knowledge	All topics are addressed, and most questions answered with 1 sentence about each. Able to answer some questions.	One or more topics were not addressed. Is not able to answer any questions that are brought up by the report.
<b>Quality of Information</b>	Information clearly relates to the main topic. It includes several supporting details and/or examples.	Information clearly relates to the main topic. It provides 1-2 supporting details and/or examples.	Information clearly relates to the main topic. No details and/or examples are given.	Information has little or nothing to do with the main topic.
<b>Sources</b>	All required sources (information and graphics) are accurately documented in MLA format.	All required sources (information and graphics) are accurately documented, but a few are not in MLA format.	All required sources (information and graphics) are documented, but many are not in MLA format.	All required sources are not used and sources are not documented using MLA format.
<b>Mechanics and Formatting</b>	No grammatical, spelling or punctuation errors. Typed in either New Times Roman or Ariel font. The document is in 12 point type and is double-spaced. There are no extra lines between paragraphs.	Almost no grammatical, spelling or punctuation errors. Typed in either New Times Roman or Ariel font. The document is in 12 point type and is double-spaced.	A few grammatical, spelling, or punctuation errors. Mostly typed in either New Times Roman or Ariel font. The document is in 12 point type.	Many grammatical, spelling, or punctuation errors. Typed.
<b>Handouts, Appendices, Visual Aids</b>	All handouts, appendices and visual aids are organized, easy to locate, relevant to the report and documented.	All handouts, appendices and visual aids are fairly organized, easy to locate, relevant to the report and documented.	Any handouts, appendices and visual aids are present and relate to the report. They are not documented	No handouts, appendices and visual aids are present.

<b>Evaluation: Physics</b>				
<b>Physics Standards</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>N. I.</b>
The student will demonstrate an understanding of motions and forces.				
The student understands Newton's 3 Laws of Motion.				
The student understands inertia.				
The student understands center of mass.				
The student understands friction.				
The student understands momentum.				
The student understands centripetal force.				
The student understands the 6 simple machines (pulley, lever, screw, wedge, wheel and axle, incline plane) and their mechanical advantage.				
The student will demonstrate an understanding of conservation of energy and the increase in disorder.				
The student understands potential energy.				
The student understands kinetic energy.				
The student understands transfer of energy.				
The student understands conservation of momentum.				
The student understands renewable sources of energy.				
The student will apply the following equations to their project. <ul style="list-style-type: none"> <li>- Momentum = Mass x Velocity</li> <li>- Acceleration = Final Velocity – Original Velocity/Time</li> <li>- Speed = Distance/Time</li> <li>- Work = Effort (resistance in Newtons) x Distance Moved (in meters)</li> </ul>				
The student will demonstrate an understanding of physical science facts, concepts, principles, theories, models, which are important for all students.				
The student knows the role of science and technology in their career pathways.				
<b>Benchmark</b>				
The student knows how to evaluate their plan and why their product should be used.				
<b>Complex Reasoning Processes</b>				
The student will act responsibly. The student will display reliability and basic work ethic.				
The student will cooperate. The student works well with diverse individuals and in diverse situations.				
The student will be respectful. The student will demonstrate leadership skills.				
The student will develop decision making skills. The student will apply decision making techniques.				
The student will solve problems. The student will apply basic trouble shooting and problem solving techniques.				
The student will analyze situations. The student understands and applies basic principles of logic and reasoning.				
The student will support her/his conclusion. The student will understand and apply basic principles of presenting an argument.				
The student will communicate effectively. The student demonstrates competencies in speaking, reading, listening, and writing as tools for learning.				

## Scoring Descriptions

5	Exemplary	An efficient high quality attempt has been made to demonstrate the outcomes with a few errors revealing an outstanding understanding of the outcomes.
4	Proficient	A clear and advanced attempt has been made to demonstrate the outcomes, but some minor errors have been made revealing a competent understanding of the outcomes.
3	Satisfactory	An adequate attempt has been made to demonstrate the outcomes, but some factual errors have been made revealing a sufficient understanding of the outcomes.
N. I.	Needs Improvement	A limited attempt or no attempt has been made to demonstrate the outcomes and/or major errors have been made revealing a lack of understanding of the outcomes.

