

# The Energy, Light, & Rube Goldberg Project Summary Introduction

Dear Parents, Guardians, and Students,

This is the first project of the new school year and it is my hope that it will prove to be both educational and fun. This project involves two parts. In the first, students are to complete activities 1 through 8, which will be assembled in an authentic book that they will create. Ideas for what an authentic book might look like can be found on page 3. The second part of the project involves completing options 1, 2 or 3 described on activity number 9 on the next page. This part focuses more on the Rube Goldberg Machine. (A Rube Goldberg Machine is a complex device, made with simple machines that accomplishes a simple task in a very complex way).

There are also two grading options for this project. Students may choose to only go for a “C” by **only** completing the Project Book [Activities 1, 2, (not 3) and 4-9]. Or, students may go for an “A+” by completing both the Book [Activities 1-9 (including 3)] and one of the options described in activity number 10.

In the attached packet you will find general project directions, more specific requirements for the Rube Goldberg Machine, and support pages that are to be included in the finished book, and a calendar showing benchmark and final due dates.

## **Placer County STEM Exposition Fair**

Although grading for this project will count for 1<sup>st</sup> semester, students also have the option of using this same project to earn extra credit points for 2<sup>nd</sup> semester.

In the month of March, William Jessup University is having a county fair where students compete against other students from around Placer County. At this fair, two of the categories that our students will have the option to enter are the Scientific Category and/or Rube Goldberg Category. Students may enter this project in the Rube Goldberg Category, and their Science Fair Project (That they will be doing later in the school year) in the Scientific Inquires Category. They can earn extra credit from BOTH categories if they so choose! More information about this fair can be found at the Placer County STEM Exposition Fair website (<http://www.stemexpo.org/>).

On a side note, it is my experience that students doing a project for these types of competition get much more out of it than if they just do it for a grade. Students who know they are going to be competing tend to invest more of themselves into the process, learn more, and find it to be a more rewarding experience.

Sincerely,

Don Scott

# The Energy, Light, and Rube Goldberg Project

## ACTIVITIES:

- 1) **Creative Cover/ Table of Contents**– Cover should demonstrate thought and creativity. It should reflect the contents of the booklet. Be creative!
- 2) **Machine Diagram 1<sup>st</sup> Draft**– Design and sketch a roughdraft diagram of your own Rube Goldberg machine (Before you build it!). Label the following: simple machines used, step number, direction of forces, kinetic, potential, energy transfer/type happening at each step. Labels may be handwritten for this draft.
- 3) **Machine Diagram Final**– Draw a final diagram of your completed Rube Goldberg Machine. This is only to be done once you have finished and successfully run your machine! Labels should be typed and pasted on you diagram. Students entering the Rube Goldberg at the Placer County STEM Expo Fair need an excellent job on this part!
- 4) **Step-by-Step Description of Machine**– Typed explanation of the actions taking place at each step (should be at least 10 steps), the type of simple machine being used at each step (i.e. wedge, screw, lever, incline plane, axle or wheel, pulley) (should use at least three of the six simple machines), and when kinetic, potential, or transfer of energy is taking place. Include all the same information as done with the Machine Diagram but in more detail. All typing should be standard page set up and 11 to 14 pt. typeface.
- 5) **Questions**– Type a short paragraph for each of the following four questions (Use the same type style, size, and formatting as outlined in #2 & #3):
  - a. Describe a part of your Rube Goldberg machine that demonstrates Newton’s first law of motion. Explain why.
  - b. Describe a part of your Rube Goldberg machine that demonstrates Newton’s third law of motion. Explain why.
  - c. Explain how the Law of Conservation of Energy is working in your Rube Goldberg Machine.
- 6) **Crossword Puzzle**– Choose **ONE** of the three crossword puzzles to complete and include it in your book. You may do all of them for extra credit.
- 7) **Word Search**– Complete the word search and include it in your book.
- 8) **Vocabulary**– Write definitions for all vocabulary
- 9) **Evaluation Check List**– Grade yourself... If it seems honest you will earn those points.
- 10) **GOING FOR AN “A”**– Completing items 1-9 qualify you to earn a “C”. To qualify for an “A+”, you must also do one of the following:
  - **Option 1-** At home build a Rube Goldberg Machine that you designed from #2 & #3 and bring it to school to operate for the class. The machine needs to be self-contained (No or VERY little assemblage needed at school), fit through the door, about 3 feet by 3 feet.
  - **Option 2-** Build an action-packed Rube Goldberg Machine with many steps and simple machines at home that stays at home! This option should be larger than 3 feet by 3 feet. Infact, it can be as large as you want! You will video record the machine functioning and show it in class.
  - **Option 3-** Type a 1,000 word research report about Rube Goldberg or a topic we have studies in class. Give a 10-15 minutes presentation w/visuals and demo. about your topic. Use the same type styles as you did in steps #2 & #3.

### **Extra Support & Helps**

- 1) Check out the class website ([www.classhappenings.com](http://www.classhappenings.com)) at the "Project" link. I have placed a copy of the project directions, copies of all the puzzles and vocabulary hunt, the power point presentation that I showed the kids in class, and a dozen sample images of Goldberg Machines other students have done.
- 2) You can find a lot about Goldberg Machines with a simple Google search. Also, YouTube has lots of sample Goldberg projects worth watching.

### **Authentic Cover Ideas**

- 1) Relief of a Goldberg model on cover
- 2) Create a Blueprint of Goldberg model for cover
- 3) Cover with a relief model of one or more of the six simple machines (Incline Plane, Screw, Wedge, Lever, Pulley, Wheel and Axle) on cover.
- 4) Cover that reflect energy in some way
- 5) Cover that somehow shows the electromagnetic spectrum
- 6) Cover with a model of a machine that uses kinetic and potential energy (i.e. roller coaster, spool racer, etc.) on it
- 7) Three-dimensional model showing electromagnetic spectrum
- 8) Be creative, you choose!

# Rube Goldberg Machine Specifics

**Rube Goldberg Machine Basic Requirements** (Note: These basic requirements also satisfy the requirements for the Placer County STEM Expo Fair)

## GOING FOR AN “A+”— OPTION 1 & 2:

- Machine must have a minimum of 10 ‘cause and effect’ steps
- Machine must have at least three simple machines (i.e. lever, wheel & axel, pulley, incline plane, screw, and wedge).
- Machine needs to runs from start to finish with no outside intervention. There can be no human assistance once the process begins. Interference with your Goldberg Machine once it has begun to run will result in a full letter grade reduction. You will have three chances at a clean run. Finally, you cannot be part of the machine.
- Machine needs to accomplish a simple task in a complex way (i.e. ring a bell, turn on a light, flick a switch, fill a cup, pop a balloon, etc. Failure to successfully complete task will result in a grade reduction.
- Built with simple things that might be found around house or in a garage. DON’T GO OUT AND SPEND A LOT OF MONEY! Rather, be CREATIVE with your use of supplies.
- Should run for a **minimum of 5 seconds**
- Not mandatory, but, it would be nice if you labeled the machine (i.e. Step 1, Step 2, Step 3, etc. so that it matched your step-by-step description of machine (#4). That way, I could see where each step was on the machine.
- If you are entering Placer County STEM Expo fair, check out their website at <http://www.stemexpo.org/category/RubeGoldberg>
- Option 1- needs to be about 3 ft. by 3 ft. and self-contained. That is, it is already built.
- Option 2- is built and ran at home. Therefore, it can be any size. You will need to video record it and show it to the class.

## GOING FOR AN “A+”— OPTION 3:

- You will need to type a 1,000-word report (11-14 pt. type size, same as you have used on the rest of you book) about Rube Goldberg. If you use a typeface like Times Roman then use a 13 or 14-point type size. If you use a Helvetica or Arial type then make your type size 11 or 12 point. Subheads are to be between 16 and 24-point type size.
- Finally, you will need to give a 10-15 minute presentation about Rube Goldberg, the Rube Goldberg Machine, or any topic we have studied about energy. Presentation should include some type of mini demo and lots of visuals. For instance, you could demonstrate a few simple machines (i.e. pulley, lever, etc.) and you could do a power point presentation with images from the Internet as your visuals.