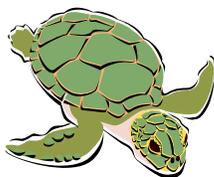
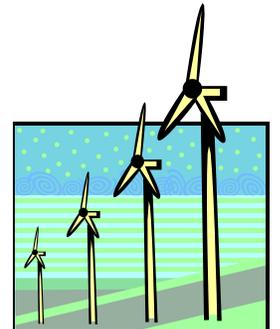
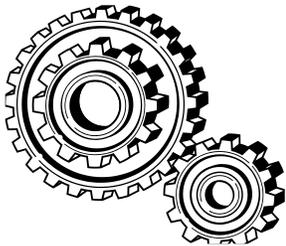
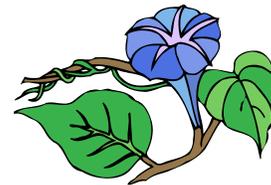
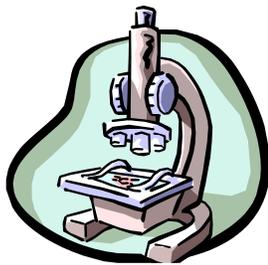


INVENTION PROJECT

3RD – 5TH GRADE



Student Information Packet





ELEMENTARY

SCIENCE & ENGINEERING FAIR STUDENT INFORMATION PACKET

Revised 2009, 2011, 2015



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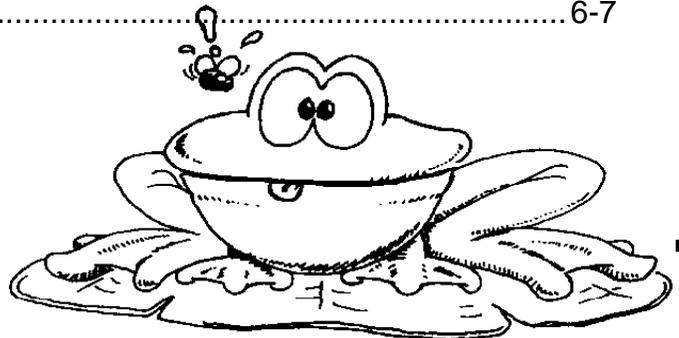
INVENTION PROJECT

----- PUTTING IT ALL TOGETHER -----

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SCIENCE & ENGINEERING FAIR

STUDENT INFORMATION PACKET

INTRODUCTION

You are surrounded by science. Everything uses some form of science to make it work. The chair you sit on was made by some person. All the tools used to build it are because of knowledge from science and technology. Someone had to know what shape to make the saw and how sharp the teeth are to cut wood, right? How did they know to make one saw for wood and a different one for metal? Why does the wood saw have big teeth and the metal saw have small teeth?

Science is asking questions and finding answers. A science project, simply put, is the process of asking a question you have about something you are interested in, hypothesizing (best-guessing) what the answer might be, researching for information on that topic, experimenting, inventing, collecting or doing in-depth research, analyzing your results, and coming to a conclusion!

What your accomplishment will mean for you:

- ★ Gaining self confidence
- ★ Proving you can do it
- ★ Learning new things
- ★ Being recognized by your school and community
- ★ Knowing what the scientific method is and how it can help you.

Everything you need to know about doing a great science project is inside this packet. You'll be discussing the contents with your teacher and also your parents. Approximately every two weeks between now and your school science fair, your teacher will give you a **Student Timeline for Science & Engineer Fair Project** sheet to check your project's progress. The timeline sheet is designed to keep you, your parents and your teacher on target.

You must keep this packet, timeline sheets, letters home to parents, and all other information in a separate folder. Your science fair folder should be kept at home unless your teacher asks you to bring it to school.

You will find the science fair to be an exciting and rewarding experience. Let's make this year's fair the best ever!

Helpful Hints for Students



- ⌚ Start EARLY; don't wait until the last two weeks before it is due.
- ⌚ Plan it out. It will be much more fun if you spread the out over several days per week or several weekends, and you won't have to race to get it done! It might look like this:
 - Week 1 – Decide on your PROBLEM – what you want to solve.
 - Week 2 – Collect and read information about your topic.
 - Week 3 – Work the steps of your project.
 - Week 4 – Think about the results and make your charts or graphs.
 - Week 5 – Write your report.
 - Week 6 – Make your display.
- ⌚ Check with your parent or teacher if you want to use a web site for research. Not all web sites give correct information.
- ⌚ Students in 4th and 5th grades should be doing almost all of this by themselves.
- ⌚ Students in 3rd grades should be able to do many parts.
- ⌚ This is to be a fun process. "Success" is a completed project where you had fun and learned a lot.
- ⌚ Enjoy the fun!

INVENTION: ENGINEERING NEW IDEAS



CREATING A SCIENCE & ENGINEERING FAIR

INVENTION PROJECT USING THE ENGINEERING DESIGN PROCESS

For Grades 3 through 5 ONLY

Nearly everything we use, work with, or wear is engineered. Someone had to think of how to design that object to solve a particular problem. Anyone can be an engineer! An engineer is someone who uses knowledge of science and math, and their own creativity to design objects or processes (inventions) to solve problems.

I. PROBLEM

Ask a question about an everyday problem you would like to solve. Inventions can be almost anything created to solve a problem or meet a need. Examples include pencils, cups, cell phones, processes to clean water or move heavy objects, etc.

II. RESEARCH

Research products/processes already available to meet a need or serve a similar function. To do your research, look online, visit stores, and interview experts as well as potential invention users.

III. POSSIBLE SOLUTIONS

Brainstorm possible solutions. Imagine a few different set-ups or designs. Compare and talk about the positive and negative points of each idea. Do not just try your first idea, but choose the *best* one. Reach consensus on which idea is the best possible solution.

IV. PLAN & CREATE

- A. Draft Plan:** Make a plan and explain it. Draw a diagram and label the parts of your diagram. Use symbols to label the parts.
- B. Materials:** Make a list of the materials you would like to use for your invention and the amounts you will need. Collect the materials you will need for your invention. It is best to borrow, make, or use inexpensive materials.
- C. Build:** Build your invention according to your “plan.”
- D. Obstacles:** Keep a log of difficulties you run into and how you address them.

V. TEST & IMPROVE

- A. Test:** See if it works! Keep a data log of when and how you tested. Evaluate the results.
- B. Improve:** Gather information from the “test” of your first design to help find problems that need improvement. Improve your first design to make it better!
- C. Re-Test:** See if it works better! Add the new data to your data log to show the change.

VI. CONCLUSION & APPLICATIONS

Review how well your invention worked and how it might be useful to others.

ELEMENTARY INVENTION

WRITTEN REPORT CONTENT

3rd through 5th Grades

* **TITLE PAGE**

See *Written Report Format* on next page.

* **PURPOSE**

In three sentences or less, tell why you did your science project on the topic you chose.

* **ACKNOWLEDGEMENTS**

In one or more sentences, say “Thank You” to those who have helped you with your project. You should include those who gave you guidance, materials, and the use of facilities or equipment.

* **TABLE OF CONTENTS**

List each of the following sections and the page numbers for each. Type the page number at the bottom of each page after you have finished the final copy of your report.

* **PROBLEM**

State the problem in the form of a question. The problem is one sentence long and specific. Your page numbering begins here.

* **RESEARCH**

This is where you summarize information that was found by other engineers, designers, and potential users of your invention.

* **POSSIBLE SOLUTIONS**

Describe and/or diagram possible solutions you considered. Include a table that shows positive and negative points (strengths and weaknesses) for each. Identify the solution you chose to try, explaining why you chose it.



* **PLAN & CREATE**

A. DRAFT PLAN

Describe and explain the details of **how your invention will work**. Show your diagram (drawing) with the parts labeled, using symbols.

B. MATERIALS

List and describe the materials you used and briefly tell how and where you obtained them

C. BUILD

Explain how you put your invention together according to your plan.

D. OBSTACLES

Make a log of the troubles you run into with materials or the building process. Discuss how you make changes or discover ways to make it work.

* **TEST & IMPROVE**

A. TEST

Use your data log, diagram with labels, and any charts you created to explain the ways you tested your invention. Use two or three sentences to evaluate how well your invention worked.

B. IMPROVE

Based on your data, describe changes you made to your invention so that it would work even better.

C. RE-TEST

Tell about the results of your improved design. Did the redesign help or not?

* **CONCLUSION & APPLICATIONS**

Now that you have finished your project, use this section to share with others your thoughts about this experience. What would you do differently next time? What went well? Explain how what you learned applies to the real world.

* **SOURCES / BIBLIOGRAPHY**

List all books, articles, pamphlets and other communications or sources that you used for researching your topic and writing your paper. You must have at least two sources, and only one may be an encyclopedia. Interviews with experts in your field of study are encouraged.

BOXED topics are part of the rubric criteria for judging. The other parts are used only for grading the written report by the teacher.

ELEMENTARY INVENTION WRITTEN REPORT FORMAT

Each line with a box () preceding it begins a new page in the report.

ALL of the items listed below must be included in reports for **grade 3-5 Invention** projects.

Title Page

Title
in middle of page

In lower right-hand corner:
Last Name, First Name
Grade ____
Teacher Name
School Name
Date (include year)

- Purpose
- Acknowledgements
- Table of Contents (with page numbers)
- Problem (Question) (page numbering starts here)
- Research
- Possible Solutions
- Plan & Create
 - A. Draft Plan
 - B. Materials
 - C. Build
 - D. Obstacles
- Test & Improve
 - A. Test
 - B. Improve
 - C. Re-Test
- Conclusions & Applications
- Sources / Bibliography (Use format on next page.)

1. The original report goes inside the report pocket on the display board.
2. A COPY should be kept at home or on the computer.



**ELEMENTARY INVENTION
WRITTEN REPORT FORMAT
FOR**



SOURCES / BIBLIOGRAPHY



Entries in a bibliography are alphabetized by the last name of the author or the first word of the title. An entry for which the author is unknown, such as a newspaper article or an unsigned review, is alphabetized by the first word of the title, excluding the articles *A*, *An*, and *The*.

Books

Basic Form Bronowski, Jacob. The Ascent of Man. Boston: Little & Brown, 1973.

Two Authors March, James G., and Herbert A. Simon. Organizations. New York: Wiley, 1958.

Magazines

Weekly Tuchman, Barbara W. "The Decline of Quality." New York Times Magazine, 2 Nov. 1980: 38-57.

Monthly Brown, Norman O. "Apocalypse: The Place of Mystery in the Life of the Mind." Harper's. May 1961: 27-35.

Newspapers

Basic Entry Kristof, Nicholas D. "Oil Futures Plunge on OPEC Doubt." New York Times, 3 Jan. 1985: D13.

Reference Works

Encyclopedia Entry, Unsigned

"Huygens, Christiaan." Encyclopedia Britannica. 13th ed.

Dictionary Entry

"Advertisement." Webster's Third International Dictionary. (Because the number of the edition appears in the title, the date is not necessary.)

Atlas Entry

"Hidden Face of the Moon." Times Atlas of the World. 1981 ed.

Nonprint Sources

Video

Redford, Robert, dir. Ordinary People. With Mary Tyler Moore and Donald Sutherland. Paramount, 1980.

Computer Materials

Computer Software

Visispell: Fut.heuristix. Version 1.00. Computer software. San Jose: Visicorp, 1983. Disk.

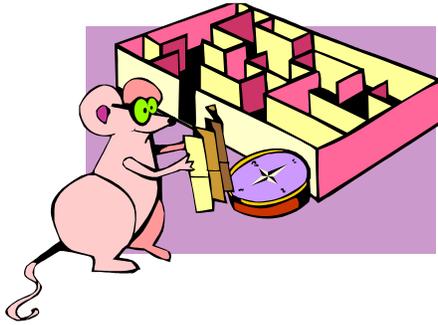
Web Sites

Corte, Corrinne. "Why Are British Sailors Called Limeys?" *Ask A Biologist*. Arizona State University.
<http://ls.la.asu.edu/askabiologist/research/scurvy/index.html> (8 Mar. 2001)

Interview

Persons name (last name first), position or work title, place of interview, date of interview.





ELEMENTARY INVENTION DISPLAY INFORMATION

BACKBOARD MATERIALS

The backboard must be sturdy and stand by itself on a table. Foam core-board and cardboard are the best materials. If you need to cut through the sides of your core-board to make “wings”, do not cut all the way through.

COLORS

If you need to paint your backboard, enamel paint works best. Do not use water-based paint. Contact paper may also be used. Use a minimum of three contrasting colors on your board.

LETTERING

Your title and subtitles may be computer-generated or cut from construction paper. Do not freehand the letters. The title letters should be 3-4 inches high. The subtitle letters should be 1-2 inches high. The subtitles, which are mandatory on the display board, are: [Purpose](#), [Problem](#), [Research](#), [Possible Solutions](#), [Plan & Create](#), [Test & Improve](#), and [Conclusion & Applications](#). All items on the display must be glued to the board. Do not use pins, tacks, staples, or tape.

DIAGRAMS, PHOTOS, AND GRAPHS

Drawings and photos are most useful on the display. Drawings should be drawn in pencil first and then retraced. Drawings should be in color and outlined in thin black felt tip pen. All graphs and charts must have explanatory titles. Graph axes must be labeled.

If you have a camera, you should photograph your invention in progress. A photo of you with your invention is encouraged. All photos must be titled.

DISPLAY DIMENSIONS

1. When backboard (display portion) is flat, it should be 48 inches wide.
2. Side panels (“wings”) should be 12 to 18 inches.*
3. Height should be no more than 48 inches.

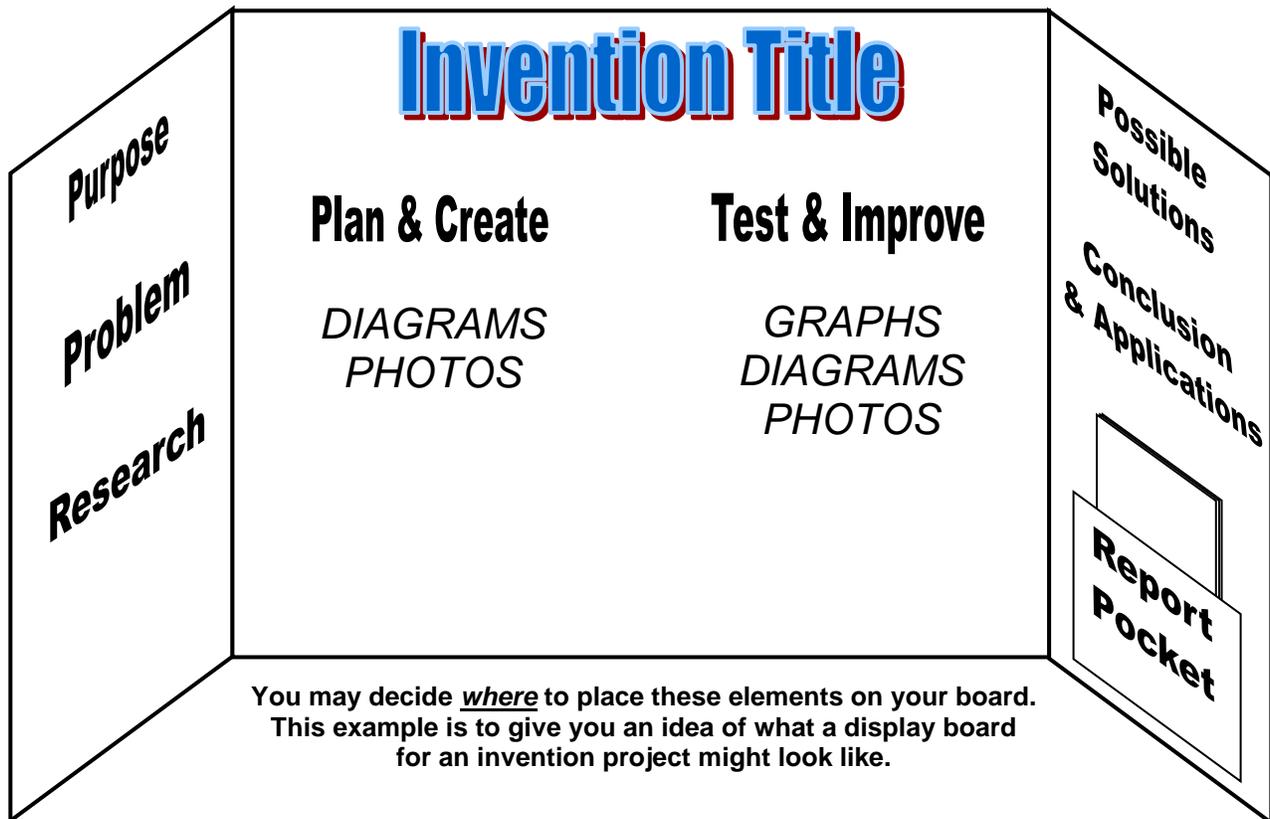
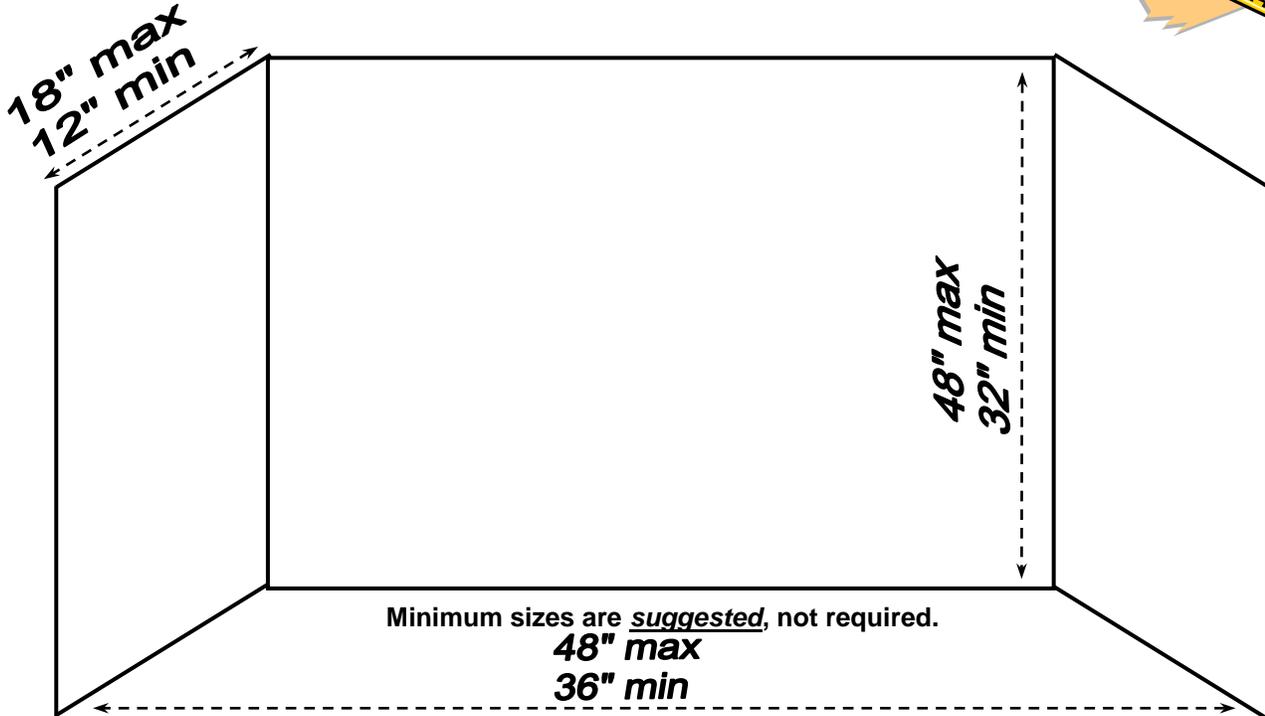
REPORT POCKET

There must be a “pocket” on the display to hold your report.

When you have decided what you are going to put on the backboard (display), lay the unglued display on the floor and look at it carefully. Have family and friends look at it and ask their opinions. Then, you should glue everything into place. Examples of displays will be shown and discussed in class.

DISPLAY SIZE & SET-UP

FOR SCHOOL SITE AND LBUSD SCIENCE & ENGINEERING FAIRS





PURPOSE

PROBLEM

**POSSIBLE
SOLUTIONS**

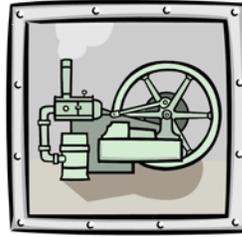
PLAN & CREATE

TEST & IMPROVE



CONCLUSION & APPLICATIONS REPORT

DISPLAY ITEMS



Part of your display should include something that represents the project and should be placed in front of or on the display board. Depending on the type of project you do, the display items may or may not be the focus of the display.

If you cannot decide what to use to represent your project, brainstorm with family, friends, and classmates. Keep in mind that the items you choose will set the tone for your display and must be approved.

No part of your display may pose a safety hazard. Do not include harmful chemicals, bacterial cultures, sharp objects, or any source of heat or flames. No live or preserved animals are allowed at the LBSD district-level science fair, at the Los Angeles County Fair, or at the California State Fair.

Some examples of display items are listed below:

- ◆ **Equipment or materials** you have built or used as part of your project or experiment (i.e., an incubator, variously shaped kites, a solar oven, a microscope with slides, etc.)
- ◆ **Models**
- ◆ **Artistic representations** of your topic (i.e., a large paper maché nose for an odor project, toothpick bridges for a physics project, or a collage of leaves for a plant project)
- ◆ **Samples or specimens**
- ◆ **Simulated items** such as photos, video, and audio taken while working on your project or during your experiment. (Keep in mind that use of extension cords require special permission.)

There are endless possibilities. Be creative! Put on your thinking cap!



Inventions: Engineering New Ideas (3rd-5th Grade)

Rubric for School Site Science & Engineering Fair

	Attempted 1 point	Proficient 3 points	Advanced Proficient 5 points
Purpose & Problem <i>(Double Points) (x2)</i>	Addresses a practical need to which there is already a common solution.	Addresses a somewhat practical need some people have.	Creatively addresses a practical need some people have.
Research	Fails to mention a known similar idea in common use, or material is copied rather than written in the student's own words.	Mentions known similar ideas with some elaboration. Makes a general connection to a similar idea in the student's own words. May or may not address the needs of potential users	Makes a clear and well-elaborated connection with a known similar idea and with the needs of potential invention users in the student's own words.
Possible Solutions	Proposes three or fewer solutions, some of which may be fanciful. Solution description is unclear or incomplete.	Proposes at least three practical solutions with limited description of each solution.	Proposes three or more practical solutions. One or more are very creative. Provides sufficient description for reader to easily understand.
Plan & Create <i>(Double Points) (x2)</i>	Provides few details, leaving the reader unclear about how the invention works. Obstacles are not mentioned.	Provides adequate diagram and explanation of the invention, giving the reader a general understanding of how the invention works. Obstacles and their solutions are mentioned briefly.	Diagrams and explains the invention, addressing all labels and details needed to give the reader a clear understanding of how the invention works. Obstacles encountered in the building process are described well and solutions to the obstacles are explained.
Test & Improve <i>(Double Points) (x2)</i>	Student-developed criteria may be generic and do not apply specifically to the problem. Or, criteria may not be student-developed. Or, there is no evidence of redesign and retesting.	Criteria are student-developed. Some criteria apply to how the invention addresses the problem. There is evidence of a design change, but connection to data may be unclear. Improved design is tested.	Criteria are student-developed specifically to test how well the invention addresses the problem. The student uses data from the test to improve the design. The improved design is tested using the same criteria as before.
Conclusion & Applications	Fails to analyze obstacles related to the practical design and function of the invention (i.e., may list obstacles that refer only to shopping for materials or cosmetic issues). Or, fails to mention applications.	Provides some analysis of the obstacles related to the practical design and function of the invention (i.e., durability, strength, ease of use, etc.). Mentions potential applications.	Demonstrates in-depth analysis of the obstacles related to the practical design and function of the invention (i.e., durability, strength, ease of use, etc.). Invention is clearly connected to real world applications.
Display Presentation	Project has limited eye appeal or is not easily readable at approximately two feet distance. The project has limited organization, or contains confusing visuals, or contains major language or spelling errors.	Project is appealing and readable at approximately 2 feet distance. It is organized and clear, uses understandable visuals and/or models, and contains few language and spelling errors.	Project is appealing and neat, and is readable at approximately 2 feet distance. It is well organized and clear, makes striking use of inventive or amusing visuals and/or models, and uses language and spelling flawlessly.

(Projects will receive between 10 and 50 points when all rubric criteria have been addressed.)

Science Fair **Inventions: Engineering New Ideas** (3rd-5th Grade)

Targets for an Excellent Science & Engineering Fair Project



	Advanced Proficient 5	“TRANSLATED”
Purpose & Problem (x2) <i>(Double Points)</i>	Creatively addresses a practical need some people have.	Explain the problem you want to solve.
Research	Makes a clear and well-elaborated connection with a known similar idea and with the needs of potential invention users in the student's own words.	Research thoroughly. Connect the research to your question.
Possible Solutions	Proposes three or more practical solutions. One or more are very creative. Provides sufficient description for reader to easily understand.	Describe three ideas to solve the problem.
Plan & Create (x2) <i>(Double Points)</i>	Diagrams and explains the invention, providing all labels and details needed to give the reader a clear understanding of how the invention works. Obstacles encountered in the building process are described well and solutions to the obstacles are explained.	For your best idea, make a diagram with labels to show how it works. Describe what was hard and how you got past it.
Test & Improve (x2) <i>(Double Points)</i>	Criteria are student-developed specifically to test how well the invention addresses the problem. The student uses data from the test to improve the design. The improved design is tested using the same criteria as before.	Describe how you test your invention to make sure it works. Explain how this helps you to improve your invention. Describe the results of re-testing after making improvements.
Conclusion & Applications	Demonstrates in-depth analysis of the obstacles related to the practical design and function of the invention (i.e., durability, strength, ease of use, etc.). Invention is clearly connected to real world applications.	Is your invention strong, easy to use? Will it last? Could people really use it?
Display Presentation	Project is appealing and neat, and is readable at approximately 2 feet distance. It is well organized and clear, makes striking use of inventive or amusing visuals and/or models, and uses language and spelling flawlessly.	Make your project fun to look at with pictures and colors. Use large, clear lettering. Check grammar and spelling.