

Science Fair 2014

Student Information Packet

St. John de la Salle Catholic Academy

Invention Project

Science Fair 2014 – Student Information Packet – Invention Project

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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 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 should keep this packet, timeline sheets, letters home to parents, and all other information in a separate "Science Fair" 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 TIPS FOR PARENTS

This should be a fun project! Success is when your child asks their own question, completes their project with a smile, and knows more than when they started. Enjoy this time of discovery and fun for you and your child!

- ❖ The science fair project reinforces reading, writing, logic and math skills, and creativity.
- ❖ The goal is that your child learns “the scientific method” or “the engineering design process” through direct experience.
- ❖ For their daily reading, recommend they choose a science book that can be a research resource for their project.
- ❖ A **Report** is part of the process.
 - o Both the rough draft and final draft of the report must be typed.
 - o Type the report *as your child wrote it or dictated it to you*. If the sentence structure is off, ask them if it needs correction. **Guide** them to the correction.
 - o Use their words; children say things in unique and fun ways.
- ❖ It is best to guide and answer their questions with questions. You may know the answer, but help them discover it themselves. For example, you may want to show them which paragraph in the book to re-read rather than giving them the answer.
- ❖ Although neatness is good, it’s not the main focus. A 6-year-old can make the data chart with a little help. They should do that part while you operate the hot glue gun.
- ❖ The project does not have to look store bought. It needs to be made by them, so that they truly get better every year they participate.
- ❖ Encourage your child’s artistic side with the display. For example, you can show how the use of color and shapes can be used to show the importance of a part of the display.
- ❖ If you allow your child to use web sites for research; verify the site is “correct” and then let them use the research found there. *Remember:*
 - o Anyone can create a web site; this does not mean its information is correct!
 - o Make sure the web site is run by a large, recognized group such as a college or organization.
 - o DOT “org”, “gov” or “edu” are generally trustworthy for accuracy of content.

Where to Purchase Science Fair Materials

HOME DEPOT

www.homedepot.com

LOWE'S

www.lowes.com

MICHAEL'S CRAFTS

www.michaels.com

OFFICE DEPOT

www.officedepot.com

RADIO SHACK

www.radioshack.com

STAPLES

www.staples.com

JOANN'S FABRICS

www.joann.com

WALMART

www.walmart.com

LAKESHORE LEARNING

www.lakeshorelearning.com

CREATING A SCIENCE FAIR INVENTION PROJECT USING THE ENGINEERING DESIGN PROCESS

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. PRELIMINARY 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

- Draft Plan: Make a plan and explain it. Draw a diagram and label the parts of your diagram. Use symbols to label the parts.
- 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.
- Build: Build your invention according to your “plan.”
- Obstacles: Keep a log of difficulties you run into and how you address them.

V. TEST & IMPROVE

- Test: See if it works! A data log of when and how you tested. Evaluate the results.
- 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!
- Re-Test: See if it works better! Add the new data to your data log to show the change.

VI. CONCLUSION

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

WRITTEN REPORT CONTENT

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.

☆ 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.

<p>STARRED (☆) topics are part of the rubric criteria for judging. The other parts are used only for grading the written report by the teacher.</p>
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☆ PLAN & CREATE

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

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

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

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

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.

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

Re-test: Tell about the results of your improved design. Did the redesign help or not?

☆ CONCLUSION & APPLICATION

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. How what you learned from your project applies to the real world.

SOURCES / BIBLIOGRAPHY

List all sources that you used for researching your topic and writing your paper. You must have at least two sources, and only one may be a website. All encyclopedia sources will be counted as one source. Interviews with experts in your field of study are encouraged.

WRITTEN REPORT FORMAT

- Each line with a box (☐) in front of it begins a new page in the report.
- **Items with a star (☆)** must be included in reports for **Pre-K – 2nd grade** projects. Other sections are optional for Pre-K – 2nd grades.
- **ALL** of the items listed below must be included in reports for **3rd–8th grade** project.
- **ALL** reports must be **typed** – both rough draft and final draft.

☐ ☆ TITLE PAGE

- Title in the *middle of the 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

☐ RESEARCH

☐ ☆ POSSIBLE SOLUTIONS

☐ ☆ PLAN & CREATE

- Draft Plan
- Materials
- Build
- Obstacles

☐ ☆ TEST & IMPROVE

- Test
- Improve
- Re-Test

☐ ☆ CONCLUSION & APPLICATION

☐ ☆ SOURCES / BIBLIOGRAPHY (Go to www.easybib.com for correct formatting in MLA style.)

1. **The original report is in a report cover with 3-hole fasteners and goes inside the report pocket on the display board.**
2. **A COPY should be turned in to your teacher for grading.**
3. **ANOTHER COPY should be kept at home or on the computer.**

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.

DRAWINGS, 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. Graphs and charts must be used in the results section. They may be computer-generated. All graphs and charts must have explanatory titles. Graph axes must be labeled.

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

DISPLAY DIMENSIONS

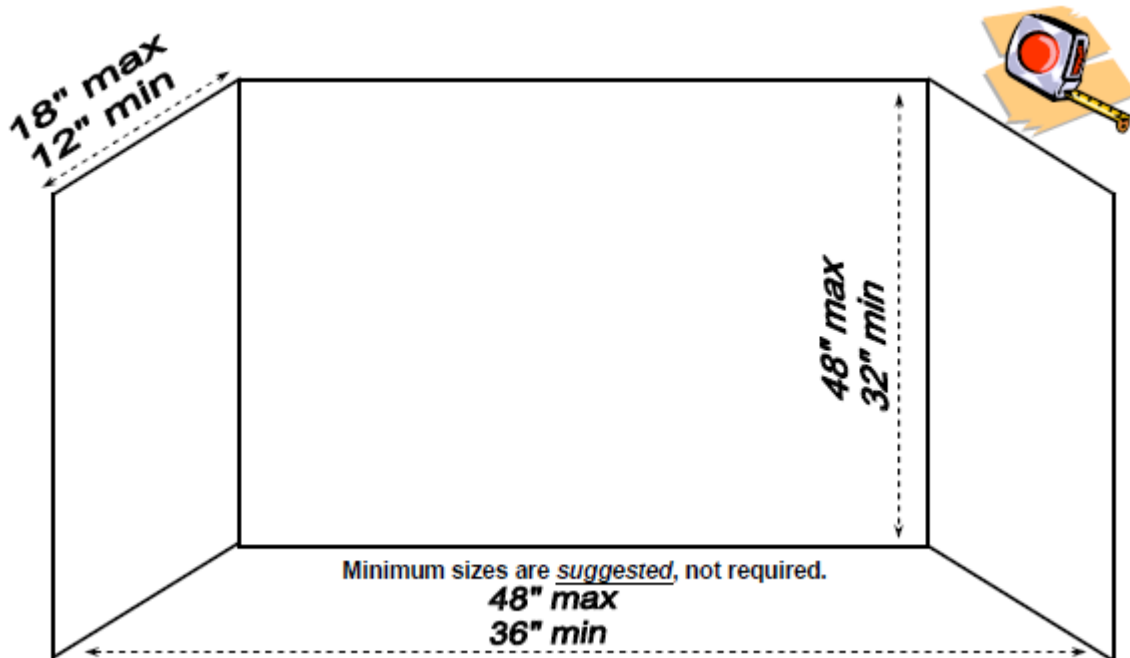
1. When backboard (display portion) is flat, it should be 48 inches wide.
2. Side panels (“wings”) should be 12 to 18 inches.
3. Height should be no more than 48 inches.

REPORT POCKET

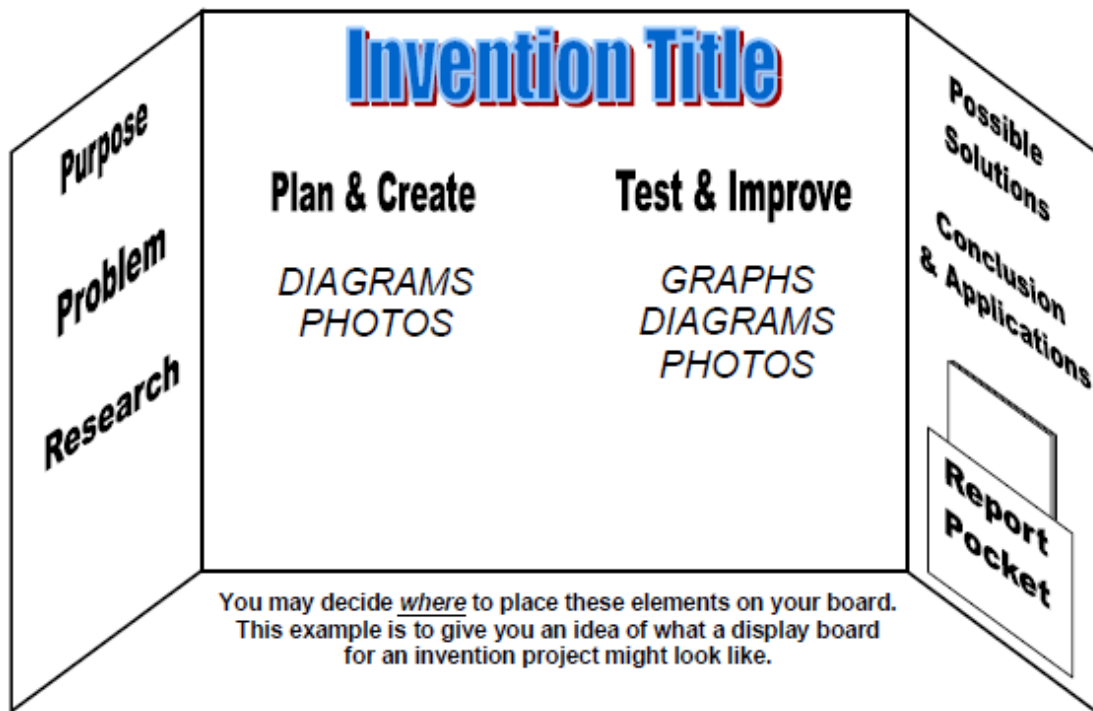
There must be a “pocket” on the display to hold your report.

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.

DISPLAY SIZE & SET-UP



+



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.

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 an extension cords requires special permission.)

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

RUBRIC SCORING GUIDE

	“TRANSLATED”	Advanced Proficient 5 points	Proficient 3 points	Attempted 1point
Problem & Purpose (Double Points) (x2)	Explain the problem you want to solve.	Creatively addresses a practical need some people have.	Addresses a somewhat practical need some people have.	Addresses a practical need to which there is already a common solution.
Research	Research thoroughly. Connect the research to your question.	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.	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	Fails to mention a known similar idea in common use, or material is copied rather than written in the student’s own words.
Possible Solutions	Describe three ideas to solve the problem.	Proposes three or more practical solutions. One or more are very creative. Provides sufficient description for reader to easily understand.	Proposes at least three practical solutions with limited description of each solution.	Proposes three or fewer solutions, some of which may be fanciful. Solution description is unclear or incomplete.
Plan & Create (Double Points) (x2)	For your best idea, make a diagram with labels to show how it works. Describe what was hard and how you got past it.	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.	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.	Provides few details, leaving the reader unclear about how the invention works. Obstacles are not mentioned.
Test & Improve (Double Points) (x2)	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.	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.	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.	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.
Conclusion & Applications	Is your invention strong, easy to use? Will it last? Could people really use it?	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.	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.	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.
Display Presentation	Make your project fun to look at with pictures and colors. Use large, clear lettering. Check grammar and spelling.	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.	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 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.

Rubric for Written Report

<i>COMPONENTS</i>	<i>POSSIBLE POINTS</i>	<i>SCORE</i>
TITLE PAGE: See Written Report Format on page 6 of Student Information Packet.	2	
PURPOSE: In three sentences or less, tell why you did your science project on the topic you chose.	3	
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.	2	
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.	3	
PROBLEM: State the problem in the form of a question. The problem is one sentence long and specific.	5	
RESEARCH: This is where you summarize information that was found by other engineers, designers, and potential users of your invention.	10	
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.	5	
DRAFT PLAN: Describe and explain the details of how your invention will work . Show your diagram (drawing) with the parts labeled, using symbols.	5	
MATERIALS: List and describe the materials you used and briefly tell how and where you obtained them.	5	
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.	5	
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.	10	
IMPROVE: Based on your data, describe changes you made to your invention so that it would work even better.	5	
RE-TEST: Tell about the results of your improved design. Did the redesign help or not?	10	
CONCLUSION & APPLICATION: 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. How what you learned from your project applies to the real world.	5	
SOURCES / BIBLIOGRAPHY: List all sources that you used for researching your topic and writing your paper. You must have at least two sources, and only one may be a website. All encyclopedia sources will be counted as one source. Interviews with experts in your field of study are encouraged. Bibliography is correctly formatted.	5	
PRESENTATION: Entire report is typed (12 pt. font, Arial or Times New Roman), double-spaced, and original copy is placed in a report cover with 3-hole fasteners and goes inside the report pocket on the display board. A COPY should be turned in to your teacher for grading.	10	
CONVENTIONS: Proper grammar and mechanics are used throughout report.	10	
TOTAL	100	