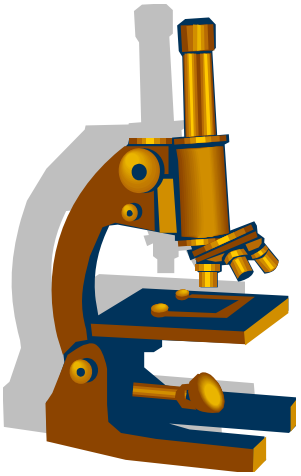
FLORIDA ASSOCIATION OF CHRISTIAN COLLEGES & SCHOOLS

INTERNATIONAL ASSOCIATION OF CHRISTIAN COLLEGES & SCHOOLS

Science Fair

Rules & Regulations 2020



Science Fair Manual

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I. Getting started

Probably one of the most difficult steps in the project is the choice of a topic. The following areas of competition are:

Category 1: Biological Sciences

- Medicine & Health
- Genetics & Cytology
- Microbiology & Biotechnology
- Botany
- Zoology
- Marine Biology

Category 2: Physical Sciences

- Forces and Motion
- Astronomy
- Chemistry
- Alternative Sources of Energy
- Robotics
- Technology
- National Security & Safety
- Geology
- Oceanography
- Meteorology
- Environment

A. Choose a topic of personal interest.
B. Choose a problem within that topic that has enough material to conduct research.
C. Choose a problem within that topic that can be investigated within your time frame and financial constraints.
D. Decide if you will use the *Scientific Method* to investigate and collect data, or the *Engineering Design Process* (8th grade and up only) to solve the problem and build a prototype.

There are six steps to the scientific method:

1. **Ask a Question:** The scientific method starts when you ask a question about something that you observe: Who, What, Where, When or How? This is called the Problem. A good Problem/Question must be observable, measureable, and repeatable.

2. **Do Background Research:** Use the library and internet to research information we already know about your topic. Also, you can interview professionals that will give you helpful information. You are educating yourself to make a solid hypothesis to test.

3. **Construct a hypothesis:** A hypothesis is a proposed explanation made on the basis of your background research. The hypothesis is formatted using an "if-then" statement.
"If _____ [I do this] _____, then _____ [this] _____ will happen."
"If _____ [this is true, like a scientific law] _____, then _____ [this] _____ will happen."

4. **Test the Hypothesis by Doing an Experiment:** An experiment tests whether the hypothesis can be proven to be true or false. You will make a list of materials needed, and identify steps to be taken in your procedure. You must identify one factor or variable that is changed, while keeping all other conditions the same. The group that experiences the changed factor is called the 'Experimental Variable Group', and the group that does not experience the factor is the 'Control Group'. The data of these two groups will be compared. Experiments should be repeated 3-5 times to confirm the results are accurate, and not a chance occurrence. You will then average the data of repeated experiments.

5. **Analyze the Data and Graph the Results:** The averaged data must be presented in a bar graph, line graph, or pie chart for comparison. A summary should be written of the results as compared in the graphs.

6. **Draw a Conclusion:** There are two options for the conclusion – based on the results, one can either reject or accept the hypothesis. You must answer the original problem/question. You must apply the information learned from the investigation, and how the project could be improved or continued.

There are 7 steps to the engineering design process:

1. **Identify the Problem:** State the challenge problem in the form of a question. Example: How can I design a _____ that will _____?

2. **Identify Criteria and Constraints:** Specify design requirements, or criteria.

3. **Brainstorm Possible Solutions:** Sketch your ideas to solve the problem. These sketches should be brief and use rudimentary labels to show the basic mechanics of the item.

4. **Explore Possibilities:** Discuss the ideas with teachers and field professionals. Determine the pros and cons of each design idea.

5. **Select an Approach:** Identify a design that best appears to solve the problem and create a statement that describes why this solution was chosen. Include criteria and constraints.

6. **Build a Model or Prototype:** List materials and isometric drawings. Construct a full-size or scale model based on the drawings.

7. **Refine the Design:** Examine and evaluate the prototype based on the criteria and constraints listed previously. Identify any problems and pose additional solutions.

II. Four major parts of the science fair project (value of each score)

A. Research Paper

Research is conducted first in order to educate the student in the topic he/she has chosen for an experiment. All resource information must be recorded in the journal. The information gathered will be presented in a research paper. Middle School students will write a 5 paragraph paper, while high school students will write a 3-5 page paper. The research paper will count for 20% of the total score.

B. The Journal

This includes your Bibliography/Resource List, Title, Problem/Question, Purpose, Research Statement, Hypothesis (or Criteria & Constraints & Approach in Engineer Design), Materials list, and Procedure steps (or Drawings in Engineer Design).

This is called The Investigative Plan and is recorded in a journal or log book.
The journal will count for 20% of the total score.

C. The Experiment or Prototype

This is probably the most important part of the project. The data collected and the graphed results, or an evaluation of a prototype in the case of engineering design, are to be recorded in the journal/log book. Your final conclusion is also written in the journal.
The experiment or prototype will count for 40% of the total score.

D. The Display

The final aspect of the project is the display. This includes a 3-sided science fair display board (32"-36" tall). The display visibly communicates the process followed and the findings achieved.
The display will count for 20% of the total score.

III. The Research Paper

The research paper presents the information the student has gathered, demonstrating the student's knowledge in the area to be investigated. The paper must be typed, double-spaced, 12 font (times new roman, arial, or calibri) using MLA format.

- There must be a title page or cover page that includes the Title of the project in a large font, a picture or clip art reflecting the project's topic, and the student's information in a smaller font. (student name, school name, city, grade, area of competition) – all centered on the page.
- Next, there must be an outline showing the main points discussed in the body of the paper. This is required only for high school.
- There must be an abstract that briefly describes the paper. It should precede the main body and is to be on a separate sheet of paper. It needs to be between 25 and 150 words.
- The paper must begin with an introduction paragraph that has a thesis sentence and main points addressed in the paper.
- There must be a body of 3 paragraphs for middle school, or 5 paragraphs or more for high school. Each paragraph must have a topic sentence.
- The paper ends with a conclusion paragraph of the research information which should flow into the problem to be investigated. The conclusion should end with the question.
- The paper must be 5 paragraphs for middle school and 3-5 pages for high school.
- The last page of the paper should have a Bibliography list or Sources cited list.
  Middle school must have a minimum of 4 sources, and high school must have a minimum of 6 sources.

IV. The Journal or Log Book

- The journal is a composition notebook which contains all relative information collected from the beginning to end of the project.
- The journal should be recorded in pen and written legibly. If a mistake or change in data or information is required, then simply strike through with a single line and then record

the correct information. If necessary, make a note in the margin of the reason for the strike through.

- The journal should be a thorough record of the student's thoughts, adjustments, sketches, findings, and conclusions.
- <u>It should be divided into three major portions:</u> 1. Research (bibliography, research rough draft and notes), 2. Investigative Plan (title, question, purpose, research statement, hypothesis or criteria/approach, materials, and procedure or drawings), and 3. Experiment (data, result graphs, and conclusion).

V. The experiment or prototype

- The experiment is an investigation to test the hypothesis.
- It involves a *control,* or standard, to which the *factor (variable)*, or changed condition, can be measured against.
- The experiment requires a large population tested, or a series of repetition in order to *verify* the results. Several simultaneous experiments using the same controls are acceptable.
- The data (measurements, observations) must be recorded on a data table in the journal. Indicate units of measurement, take pictures to show sequence or changes, and average repeated tests. Date your work!
- Identify the control group, and the experimental group (with the factor/variable) in the experiment.
- The experiment should reflect careful attention to detail and demonstrate scientific thinking.

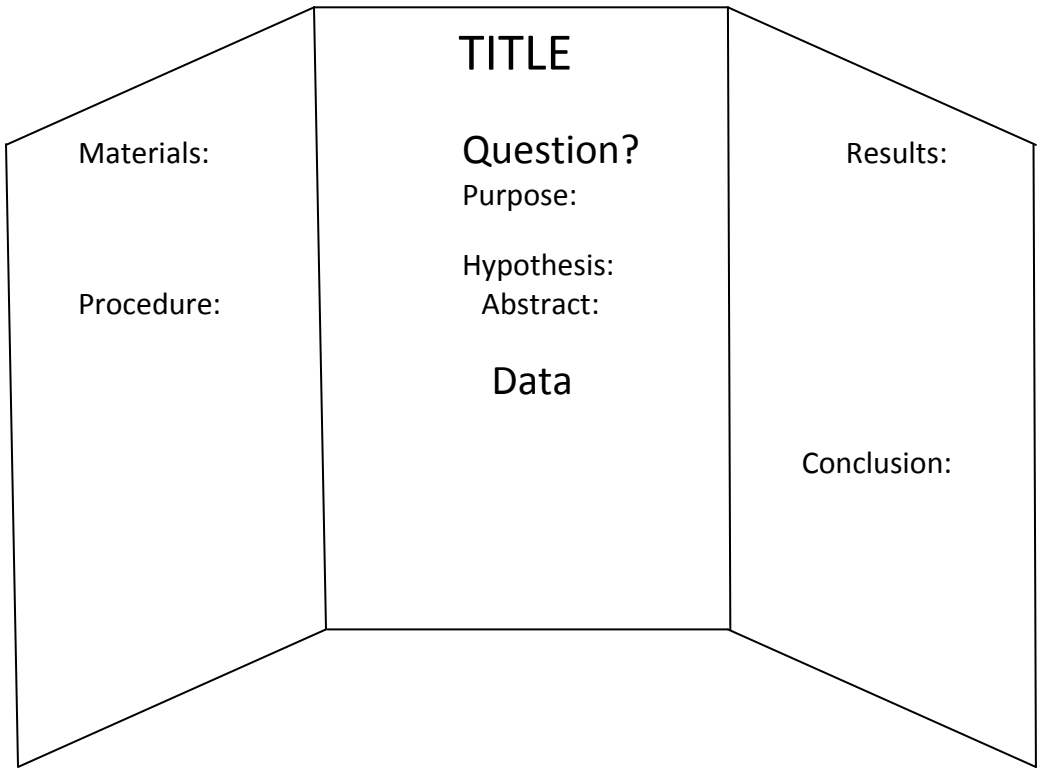
- A *prototype* is a model used to solve a problem in an Engineering Design Project.

VI. The display

- One display per student will be permitted. The work must be that of the student with limited assistance from teachers, parents, or professionals.
- A student may not submit an identical repetition of a previous year's project. However, a student may exhibit a project based on previous work, provided progress is demonstrated. The previous research paper and log book must be a part of the current display in order to show progression and further investigation.
- The display will include a 3-sided board that is no taller than 46", no wider than 48", and a maximum depth of 30".
    - All information must be typed or printed in a professional appearance and must include the following:
    - Title (can be a title board)
    - Subtitles
    - Problem/Question
    - Purpose
    - Hypothesis (If…then statement)

- Abstract
- Materials (bulleted list)
- Procedure (numbered steps)
- Data (table, charts, pictures)
- Results (analyzed data in graphs)
- Conclusion (compare data and results to the hypothesis, answer the question, apply the information with benefit or profit, suggest further study, etc)
- The research paper will be displayed on the table in a clear report folder
- The journal/log book will be displayed on the table (student name must appear on the front with grade and area of competition)
- The project identification card – a 3x5 card will be mounted in the front, upper right corner of the display board which will include the following:
    - Student name
    - School
    - City
    - Grade
    - Area of competition

- A display of the actual experiment or a prototype (engineering design) can be presented with the 3-sided board. If it is larger than the above dimensions, then the student must complete a Request to Submit form, indicating the purpose and dimensions of the display.
- Experiments involving any living animal or biological cultures must be completely contained.
- No firearms, explosives, or flammable substances of any kind will be displayed.



Science Fair Entry Form

Student Name: _____ Date: _____

School: _____ City: _____

Grade: _____ Science Teacher: _____

Area of Competition: (Biological Sciences or Physical Sciences)

_____

Project Information

Title: _____

Question: _____

_____

_____

Display: _____ height (in.) _____ width (in.) _____ depth (in.)

☐ My experiment display or prototype will fit in front of my display board.

☐ My experiment or prototype is larger than the display dimensions and I will require a Request to Submit.

☐ I have a research paper and a journal/log book to submit with my display.

I verify that my project is my work, and I have followed the guidelines in this manual.

_____ _____

Student Signature Date

Request to Submit

Student Name: _____

Area of competition: _____

Title of Project: _____

Request for display of the described experiment or prototype: (please describe below)

_____
_____
_____
_____
_____

Dimensions:

_____

_____ _____
Student Signature Date

☐ Approved

☐ Not approved

_____ _____
Official Signature Date