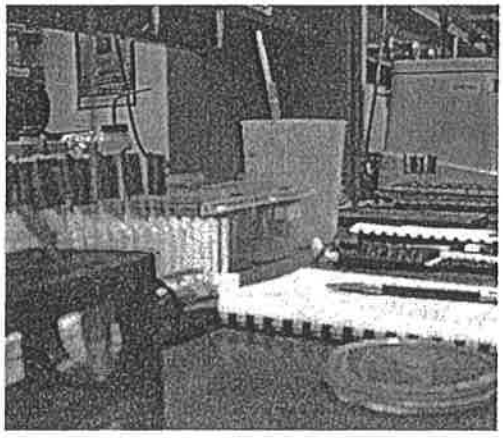
1.0 WHY DO A SCIENCE FAIR PROJECT?

What do market analysts, forensic crime technicians, and backyard gardeners have in common? They all apply the inquiry process to the research necessary in their careers. Most professions have common skills that are required for success, such as critical and creative thinking involving gaining, applying, and communicating knowledge. Working collaboratively and contributing are common themes in education, science, and technology. These common themes involve habits of mind such as curiosity, open-mindedness balanced with skepticism, a sense of stewardship and care, respect for evidence, and persistence. All these skills and themes are integral parts of doing a science fair project and help to prepare you for a changing technological world.

Working on a science fair project requires using the skills gained in Social Studies, English, Math, Technology, the Arts, and the Sciences, making a science fair project an interdisciplinary activity. Science fair projects provide opportunities to collaborate with many teachers, especially in Math and English, and implement cross-curriculum, or team leadership and cooperation.

A science fair project allows you to pose your own question and answer it. Doing a science fair project involves developing and "owning" the question; researching literature; forming a hypothesis; designing an experiment; gathering and organizing the data; analyzing, graphing, and discussing the data; making a conclusion; writing the literary and research reports; and making an oral and visual presentation. Therefore, you develop and apply skills in literary and laboratory research, statistical analysis, and public speaking, while gaining a sense of empowerment and building self-esteem. Because science fair projects are actually cross-curriculum projects that train you for real-life problem solving, the science fair project integrates all aspects of your education and helps to prepare you for real-world job assignments. Having completed a science fair project, you will have the skills necessary to design future investigations in a variety of different fields. A science fair project may become the impetus for a future career.

Science fair projects are fun and filled with self-discovery. When beginning the process, you may feel overwhelmed at its enormity, however you will experience tremendous growth and fulfillment as you progress through the steps and are evaluated by peers, teachers, and judges. This experience builds self-confidence and often enables you to present ideas to others in various situations, such as college and job interviews.



2.0 WHAT IS A SCIENCE FAIR PROJECT?

A science fair project is simply your independent research of a science topic using the scientific method. All work and ideas are yours, giving you "ownership" of the research problem and results. By doing a science fair project, you will find yourself doing the job of a practicing, professional scientist; giving you a taste of how the body of knowledge we call science is accumulated.

2.1 STEPS TO DOING A SCIENCE FAIR PROJECT

1. Get a bound notebook to use as a logbook and number the pages.
2. Select a topic.
3. Narrow the topic to a specific problem, stated as a research question, with a single variable.
4. Conduct a literature review of the topic and problem and write a draft of the research report.
5. Form a hypothesis or state the purpose of the research.
6. Develop a research plan/experimental design.
7. Apply for approval. Fill out appropriate forms and get signatures of approval.
8. Write the research report.
9. Collect materials and equipment. Make a lab schedule.
10. Conduct the experiment. Record the quantitative and qualitative data.
11. Analyze data, applying appropriate statistics.
12. Repeat your experiment, as necessary, to thoroughly explore the problem.
13. Form a conclusion.
14. Write the laboratory report.
15. Write the abstract.
16. Create the visual display.
17. Make an oral presentation of the project to teacher and/or classmates.
18. Review and polish presentation and display for the science fair.

2.2 STEPS TO DOING AN ENGINEERING PROJECT AND SOME COMPUTER PROJECTS

Engineering Projects differ from most research projects. For an engineering project you still need to have a log and do a literature search. However, the steps in the project might be as follows:

1. Define a need.
2. Develop the design criteria.
3. Do a literature search to see what has already been done.
4. Prepare preliminary designs or algorithm (flow chart).
5. Build a prototype or write program.
6. Test the prototype/program.
7. Retest and redesign, as necessary.

THE ENGINEERING PROJECT GOAL is to build a device or design a system to solve a problem.

THE COMPUTER PROJECT GOAL is to solve a problem by writing a computer program or designing a computer system.

3.0 SELECTING A TOPIC

There are several factors that need to be considered when selecting a topic. Often, the simplest of projects present the greatest challenges to an imaginative and intelligent student.

Consider the following guidelines when selecting the topic of your research project:

Choose a topic that interests you.

- A hobby such as music, gardening, or model rocketry, might give you something to investigate.
- Sometimes your interest in a sport can provide ideas for a science fair project.
- Magazine or newspaper articles on science-related events can spark your interest.
- Find out if there is a sizable amount of information and equipment available pertaining to the selected topic.
- Science-based websites may inspire ideas.

Determine if the project is feasible.

- Can the project be completed within the amount of time allowed? Have you considered the time needed for retrials or repeats of the experiment? For example, in plant projects, you will need a large sample of plants ready to go in two- or three-week intervals.
- Are there environmental concerns? For example, is it the right time of year to make your observations or collect samples?
- Do you have adequate laboratory resources or natural resources, or both, to carry out your investigation?
- What is the cost of completing the project? Is it within your budget? Do you need special equipment beyond what is available? How will you get it? Have you budgeted for retrials?
- Is the design of the experiment adequate? Are the effects measurable in an objective way?
- Does the project conform to **ALL** state or federal laws pertaining to scientific research? (See the current MSSEF Manual, Forms, and Safety Regulations)

DO YOU HAVE ENOUGH INFORMATION?

Information Sources
Before deciding on a topic, check these sources of information:

- Libraries (school, public, and college)
- Previous projects you or others have done
- Students who have already completed science fair projects (see MSSEF abstract booklets)
- Local college or scientific institution support (for information, equipment, and facilities)
- Local research firms
- Verifiable Internet Sources

Finding Ideas for Projects
You may find ideas for a science fair project from many varied sources, such as those listed here:

- Science books
- Science lab manuals
- Science fair books
- Encyclopedias
- Science periodicals
- Science teachers
- Newspaper
- Educational TV
- Science museums
- Professionals
- Consumer Reports

Complete the necessary documentation for your project.

- Some documentation will require paperwork completed both ***before*** and ***after*** experimentation for all projects.

- If you chose to work with any of the materials or organisms listed below, you will need to obtain approval from the MSSEF Scientific Review Committee (SRC) ***before*** experimentation begins.
  - **Potentially Hazardous Biological Agents** (microorganisms, rDNA, human and vertebrate animal tissue, blood, body fluids, etc.)
  - **Vertebrate Animals**
  - **Human Subjects**
  - **Hazardous Chemicals, Activities or Devices**
  - **Controlled Substances**

Obtaining approval involves additional certifications, permissions, and other paperwork. This work is necessary for your protection, the protection of the environment, and certifies that you have treated animals, including humans, properly, and have adhered to the laws of your local town, state and the nation. Are you willing to complete this additional paperwork in order to work in restricted areas?

If you are continuing a project, document new and different research (e.g., testing a new variable requiring a new hypothesis).

- Repeating previous experiments or increasing sample sizes are not acceptable continuation projects.
- A Student Checklist (1A), Research Plan, Form 1, Form 1B and Continuation Form (7) need to be completed for each year's work of a continuing research project before experimentation begins.
- If you plan to work on your project over the summer, you must complete your Student Checklist and Research Plan and any other required forms, and have your school approve your paperwork before the school year ends. If you are attending a summer institute or science-training program you must have a teacher, a qualified scientist, and the MSSEF Scientific Review Committee approve the research plan before the actual training at the institute or program begins. Again, your next year's science teacher must approve your paperwork before school ends!
- Do not discard ANY of your certification forms from previous years' work when continuing a research project. You will be required to submit these forms along with the current year's forms when registering for the fair.
- Use a new logbook to mark the beginning of your continuation project. Judges are asked to evaluate your project on the merits of research completed during the current year and not on material presented at previous science fairs.

Science Fair Topic Approval Form

Name: _____ **Hour #:**_____

Brainstorms(ideas from observations):

Topic to be studied: _____

Problem stated as a question:

Specific *observations* that will be made (QUALITATIVE):

***Numerical data* that can be collected (QUANTITATIVE):**

Instrument(s) that you will use to collect data:

Variable(s):

Control Group OR Controlled Variables:

Sample Size:

Trials:

Difficulty Level of Project: 1 2 3 4 5

APPROVED **NOT APPROVED**