# Challenger Elementary School Science Fair

Grades K-5 Informational Packet

# Challenger Elementary Science Fair Packet for K-5 Students

**What is a Science Fair Project?** A science fair project is a presentation of an experiment, a demonstration, a collection of scientific items, or an invention. It shows the efforts of a student's investigation and provides a way for the student to "show-off" what they have learned. Whatever the project, find something your child finds interesting and understands. They will need to be able to explain their science project to our judges, so it should be an age-appropriate topic and problem.

We would like to invite you to work along with your child as he or she selects, investigates, and reports on an appropriate area of science. With your interest and encouragement, your child can develop the skills and attitude he or she needs to make the project a valuable experience. **Guide your child, but let the final project reflect your child's individual effort and design.**

A successful science fair project does not have to be expensive, time consuming, or complicated. However, it does require some planning and careful thought. Projects become frustrating to students and parents when they are left to the last minute and are overly complex. You can't rush good science!

To help you and your scientist in-training prepare, we have included guidelines and resources. These guidelines will offer some helpful hints for how to create a successful project. Students are highly encouraged to utilize the scientific method in their investigations, outlined in this packet.

Fifth grade top award winners advance to compete in the Annual North Alabama Regional Science and Engineering Fair. NARSEF requires that projects exemplify the scientific method. Therefore, the more experience students have in using the scientific method, the better. Collections and inventions may certainly utilize the scientific method with some careful planning. While we hope to nurture the practice of the scientific method, the priority is for students to participate at the most appropriate level.

**What will you find in this packet?**

1. Rules for the science fair
2. Description of science fair categories
3. Preparing a science fair project
4. Tips for a great science fair project
5. Science fair project schedule and checklist 6. Judging projects
7. Resources

Let the investigating, questioning, experimenting, and analyzing begin!

# Challenger Elementary Science Fair Rules

1. Students may enter a project individually or as a part of a group (no more than 2 students, 5th grade only).
2. No open flames, dangerous or illegal chemicals, explosives, or live animals permitted.
3. No growing bacteria of any kind.
4. Experiments that harm animals are not permitted.
5. Exhibits must be self-standing and no larger than 36" wide/high x 24" deep.
6. Students are responsible for supplying all items needed for their display—including extension cords, etc. The school supplies tables only. Please provide notice of special needs (electrical outlet, extra space, etc.) **January 27, 2020.** We will do our best to accommodate.
7. Challenger Elementary is following the rules and regulations of the North Alabama Regional Science and Engineering Fair. Selected/Winning students (5thgraders) from the Challenger Elementary science fair will have the opportunity to participate in the regional fair at UAH. More information about NARSEF is available at https://sites.google.com/a/uah.edu/narsef/home. Please note that students competing in the NARSEF will have an additional registration form, which will require the writing of a synopsis of the project. Registration forms will be made available to the qualifying students.

## Science Fair Categories

- **Behavioral and Social Sciences (BEHA)** The science or study of the thought processes and behavior of humans and other animals in their interactions with the environment studied through observational and experimental methods.

- **Earth and Environmental Sciences (EAEV)** Studies of the environment and its effect on organisms/systems, including investigations of biological processes such as growth and life span, as well as studies of Earth systems and their evolution.

- **Engineering Mechanics (ENMC)** Studies that focus on the science and engineering that involve movement or structure. The movement can be by the apparatus or the movement can affect the apparatus.

- **Physics and Astronomy (PHYS)** Physics is the science of matter and energy and of interactions between the two. Astronomy is the study of anything in the universe beyond the Earth.

# Preparing a Science Fair Project

THE SCIENTIFIC METHOD
The scientific method is a way to ask and answer scientific questions by making observations and doing experiments.

**Area of Science:** To begin, you need to pick an area of science in which you are interested. These include: behavioral and social sciences, biological science, environmental science, and physical science.

**Scientific Problem Solving Process:** After deciding on an area of interest, use the following scientific problem solving process (steps 1-6 below) that will prepare you and guide you through your experiment and project preparation. Be sure to log or record everything that you do into a journal or bound notebook.

1. Purpose, Problem, or Question: The purpose shows that the project intends to solve some problem from which others can learn or benefit. The problem statement or question should be clearly written and easy to understand.
2. Research or Background Information: Once the purpose has been stated, begin researching the topic. Be thorough and record all information in your journal. Check out library sources such as science books and magazines. Learn from past studies on some experiments that have already been done. Seek out experts and technology sources on your project subject.
3. Hypothesis: The hypothesis is your prediction as to what will happen as a result of the experiment. Predicting the expected results of this scientific study is based on consistent conditions, exact measurements, and thorough research.

   **"If _____[I do this] _____, then _____[this]_____ will happen."**

   In other words, ***you don't simply "guess."*** You're not taking a shot in the dark. You're not pulling your statement out of thin air. Instead, you make ***an "educated guess"*** based on what you already know and what you have already learned from your research.

4. Experiment or Procedure: The experiment is to test the hypothesis for correctness. There are four parts to the experiment: Write a materials and equipment list you will need- Write a step-by-step process you are going to follow - Identify the experimental variable that is going to change and the control variables (or unchanged variables) Conduct the experiment

As you do the experiment, collect the data you observe by writing them in your journal or notebook. Pay attention to correctness in measuring and observations. Do the experiment at least 3 times, always keeping the conditions of the experiment the same. Be sure to gather enough data to make a conclusion.

5. Analysis or Results: The analysis is deciding what the data means. This can be done by asking the following questions: - What happened? - What steps were important? - How do the outcomes compare to the hypothesis? - What observations during the experiment were expected or unexpected? - What does the data mean? - What are the first-thought conclusions?

   The best way to display the data is to put it as a graph or a chart. A graph is a "picture" of your results. In a scientific investigation, the experimental variable is always written at the bottom of the graph (horizontal axis). The information that you collected by measuring, weighing, or timing is recorded up and down on the left side of the graph (vertical axis).

6. Conclusion: The conclusion is the summary of your experiment. It would answer questions such as: - Did the results confirm or conflict with the hypothesis? - What was learned from the experiment?- Are there any suggestions or new questions to investigate?- In what way was this investigation important? - Is there anything that could be changed to make it a better experiment next time?

**Presentation or display board:** When you are finished with the scientific problem solving process (steps 1-6 above) you need to create a display for your project so your ideas can be shown to judges. The display should have these things or qualities:

• It should be physically sound and durably constructed, and able to stand by itself

• It should show all the steps (1-6) of the problem solving process.

• It should be neat, edited, and easy to follow. Student name and grade level should be on the board.

• Your journal is to be in the front of the display.

• The items you used and the results of the experiment may be placed in front of the board as long as they follow the fair guidelines.

**Oral Presentation:** Since it is likely that you will be discussing your project with a judge, practice a short oral presentation before going to the fair. Know these things:

- What scientific information you learned in your research - What you did at each step in the scientific problem solving process - What you learned from your project
- What new questions you have- What you would change if you did the experiment again

Try to answer the questions the best you can, but don't dwell on answers you don't know.

**Thoroughness:** These are the things that judges will look for as they look and listen to you and your project:

Goals met in your project
- Creativity in your purpose and approach - Clarity
- Appropriate methods used
- Appropriate equipment used
- Appropriate for grade level
- Knowledge of the subject
- Understanding of your project
- Enthusiasm
- Individual effort shown
- Complete journal

# Tips for a Great Science Fair Project

**1. Work on something you are interested in.** You don't need to know all about your topic when you start. That is the whole idea of doing research. Good projects are ones that you have fun with.

**2. Start early.** This gives you more time for research and to polish your presentation.

**3. Get lots of help**. There are many people that can help you with your project: teachers, mentors, and parents. They can't do your project for you, but they can teach you about all sorts of things including how to use tools needed for your research. Visit Science Buddies website at www.sciencebuddies.com

**4. Make a plan.** It takes time to learn and do research. Use the enclosed checklist to help you keep track of what comes next.

**5. Keep a project data book**. A project data book is your most treasured piece of work. Accurate and detailed notes make a logical and winning project. Good notes show consistency and thoroughness to the judges and will help you when writing your research paper.

**6. Write a good hypothesis.** Consider the following tips for thinking about and writing a good hypothesis.

• ***The question comes first.*** Before you make a hypothesis, you have to clearly identify the question you are interested in studying.

• ***A hypothesis is a statement, not a question.*** Your hypothesis is not the scientific question in your project. The hypothesis is an educated, testable prediction about what will happen.

• ***Make it clear.*** A good hypothesis is written in clear and simple language. Reading your hypothesis should tell a teacher or judge exactly what you thought was going to happen when you started your project.

• ***Keep the variables in mind.*** A good hypothesis defines the variables in easy-to- measure terms, like who the participants are, what changes during the testing, and what the effect of the changes will be.

• ***Make sure your hypothesis is "testable."*** To prove or disprove your hypothesis, you need to be able to do an experiment and take measurements or make observations to see how two things (your variables) are related. You should also be able to repeat your experiment over and over again, if necessary. To create a "testable" hypothesis make sure you have done all of these things:

- Thought about what experiments you will need to carry out to do the test.

- Identified the variables in the project.
- Included the independent and dependent variables in the hypothesis statement.

(This helps ensure that your statement is *specific* enough.)

• ***Do your research.*** You may find many studies similar to yours have already been conducted. What you learn from available research and data can help you shape your project and hypothesis.
• ***Don't bite off more than you can chew!*** Answering some scientific questions can involve more than one experiment, each with its own hypothesis. **Make sure your hypothesis is a specific statement relating to a single experiment.**

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**Putting it in Action**

To help demonstrate the above principles and techniques for developing and writing solid, specific, and testable hypotheses, consider the following ***good*** and ***bad*** examples.

**Good Hypothesis**

***When there is less oxygen in the water, rainbow trout suffer more lice.*** This hypothesis is good because it is testable, simple, written as a statement, and establishes the participants (*trout*), variables (*oxygen in water, and numbers of lice*), and predicts effect (*as oxygen levels go down, the numbers of lice go up*).

***Aphid-infected plants that are exposed to ladybugs will have fewer aphids after a week than aphid-infected plants which are left untreated.*** This hypothesis gives a clear indication of what is to be tested (*the ability of ladybugs to curb an aphid infestation*), is a manageable size for a single experiment, mentions the independent variable (*ladybugs*) and the dependent variable (*number of aphids*), and predicts the effect (*exposure to ladybugs reduces the number of aphids*).

**Poor Hypothesis**

***Our universe is surrounded by another, larger universe, with which we can have absolutely no contact.*** This statement may or may not be true, but it is not a scientific hypothesis. By its very nature, **it is not testable**. There are no observations that a scientist can make to tell whether or not the hypothesis is correct. This statement is speculation, not a hypothesis. ***Ladybugs are a good natural pesticide for treating aphid infected plants.***

This statement is not "bite size." Whether or not something is a "good natural pesticide" is too vague for a science fair project. There is no clear indication of what will be measured to evaluate the prediction.

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**7. Create an appealing visual display.** You want to attract and inform. Make it easy for interested spectators and judges to assess your study and the results you have obtained. Make the most of your space using clear and concise displays. Make headings stand out and draw graphs and diagrams clearly and label them correctly. But any display you assemble must follow our Safety and Display guidelines.

- **A Good Title.** Your title is an extremely important attention-grabber. A good title should simply and accurately present your research. The title should make the casual observer want to know more.
- **Take Photographs.** Many projects involve elements that may not be safely exhibited at the fair but are an important part of the project. You might want to take photographs of important parts/phases of your experiment to use in your display. Photographs or other visual images of human test subjects must have informed consent.
- **Be Organized.** Make sure your display is logically presented and easy to read. A glance should permit anyone (particularly the judges) to locate quickly the title, experiments, results, and conclusions. When you arrange your display, imagine that you are seeing it for the first time.
- **Eye-Catching.** Make your display stand out. Use neat, colorful headings, charts, and graphs to present your project. Home-built equipment, construction paper, and colored markers are excellent for project displays. Pay special attention to the labeling of graphs, charts, diagrams, and tables. Each item must have a descriptive title. Anyone should be able to understand the visuals without further explanation.
- **Correctly Presented & Well Constructed.** Be sure to adhere to size limitations and safety rules when preparing your display. Display all required forms for your project. Make sure your display is sturdy, as it must remain intact for quite a while.

**Do your best on all project aspects.** Great research does not make a great project if you do not present it well. Aspects of the project like writing a paper or making a presentation board may not be at the top of your list of interesting things to do, but they are all needed to make a great project. You will find it easier and more fun as you become better at doing these chores.

**Science Fair Project Schedule and Checklist**

Name: _____ Homeroom: _____

Project: _____

| Student Initials | Date Due | Topic | Teacher Initials |
|---|---|---|---|
| | 12/5 | Proposal Due – Decide on a topic, Develop question/solution | |
| | 12/12 | Final prediction and Hypothesis, Background research | |
| | 1/9 | Rough Draft Planning, Materials/Procedures Due, Procedure check (Bring in science notebook components, including data) | |
| | 1/16 | Preliminary results, rough draft of data, observations, conclusion with graphs & charts due, prepare project display | |
| | 1/23 | Final copy of procedures, results, data, conclusion due, prepare oral presentation | |
| | 1/29 | **All projects Due – ALL PARTS**<br><br>Question/problem, prediction/hypothesis, planning, materials/procedure, data/observations, results/conclusions, next steps/new questions | |

1/30 Challenger Science Fair!!

A sample rubric follows:

## Judging Projects

| **Criteria** | **EXCELLENT** | **GOOD** | **DEVELOPING** |
|---|---|---|---|
| **Question** | Original research and idea. | Unique perspective on a traditional project. | Tried and true experiment. |
| **Hypothesis** | Thoroughly developed with "I think...because.." | Sufficiently developed. | Not yet or Partially developed. |
| **Procedures and Organization** | Easy to follow sequence of the Scientific Method. Good log/journal. Includes observations, data collection and changes to project. | Easy to follow sequence of Scientific Method and/or has few lapses in sequence. | More difficult to follow scientific method. Had to rely more on oral presentation vs display board. |
| **Investigation Trials** | Experiment was performed more than 2 times or sample size great. | Experiment was performed 2 times and/or sample size adequate. | Experiment was performed 1 time or incompletely. |
| **Analysis** | Data is clearly presented and directly relates to hypothesis/question. | Data is reasonably presented and shows good/some relationship to hypothesis/question. | Data not present or incomplete. |
| **Evaluation and Conclusion** | Logical conclusion has been drawn from the data collected and answers the hypothesis/question and/or raises a new hypothesis/question. | A reasonable conclusion has been drawn from the data collected. | No conclusion or the conclusion drawn is doesn't relate to the data collected. |
| **Judge's Signature and comments:** | | | |

For your reference, we are providing a link to the rubric used for 5th grade. Projects submitted by 5th graders will be judged with the NARSEF rubric as they are required to demonstrate understanding of the scientific method. The rubric may be viewed at this link:

http://student.societyforscience.org/judging-criteria-intel-isef?pid=284

## Resources

NARSEF provides many tools to assist students in preparing their projects. Please visit their website. https://sites.google.com/a/uah.edu/narsef/home

Determining the project often requires the most time. Often the best projects stem from a student's personal interests. Review the scientific method and begin looking for the questions that may be investigated scientifically.
The library has many books on project ideas.

Helpful websites:

http://school.discoveryeducation.com/sciencefaircentral/

http://www.sciencebuddies.org (Has helpful questionnaire for students)

http://www.exploratorium.edu/snacks/

http://www.education.com