NVCA Science Fair Project Rules and How-To's

Science Fair Rules

Aw! You mean there are rules? Of course, there are, silly, this is made by adults!

1. Number one rule… think safety first before you start. Make sure you have recruited your adult to help you.
2. Never eat or drink during an experiment and always keep your work area clean.
3. Wear protective goggles when doing any experiment that could lead to eye injury.
4. Do not touch, taste, or inhale chemicals or chemical solutions.
5. Respect all life forms. Do not perform an experiment that will harm an animal.
6. All experiments should be supervised by an adult!
7. Always wash your hands after doing the experiment, especially if you have been handling chemicals or animals.
8. Dispose of waste properly.
9. Any project that involves drugs, firearms, or explosives are not permitted.
10. Any project that breaks school policy, and/or local, state or federal laws are not permitted.
11. Use safety on the internet! Never write to anyone without an adult knowing about it. Be sure to let an adult know about what websites you will be visiting or have them help you search.
12. If there are dangerous aspects of your experiment, like using sharp tools or experimenting with electricity, please have an adult help you or have them do the dangerous parts. That is what adults are for, so use them correctly. (Besides, it makes them feel important!)
13. Only one student per entry, you cannot work in a team of two until you get to high school, sorry.
14. Adults can help, in fact we want them to get involved. They can help gather materials, supervise your experiment, and even help build the display. They just can't be with you during the judging. And you have to do the work, not them.
15. Experiments are recommended over collections and models. You will not score very high unless you do an experiment, so save the models and collections for a class project.
16. You cannot bring the materials of your experiment for the display or perform the experiment live. You will only be judged on your presentation and board. You can however, mount things on your board in a type of 3D display but remember that your board must be able to stand by itself, so don't get carried away. If you do mount things on the board, try not to mount something expensive that you bought and make sure you have things mounted securely so they do not fall off. YOU MAY NOT MOUNT ANY FOOD OR ORGANIC MATERIALS!

17. Displays must be on display boards or can be made with cardboard. They can be no longer than 100cm in height, 180 cm in length and 75cm deep. They must stand alone. See the display making page if you need a diagram.
18. No recording or transmitting devices are permitted.
19. Respect all adults involved in the fair… especially the judges!
20. All decisions of the judges and science fair committee are final.
21. Top scoring projects in grades 5-6, 7-8, and 9-12 are eligible for entry in the Arizona State Science Fair. If you do win, you are responsible for maintaining your presentation board and getting yourself and the board to the state competition. We can help getting you registered and NVCA will pay the entry fee.

How to Pick a Project

All great projects start with great questions but before you get started on a great question you need to pick a subject or topic that you like.

- Life Sciences
  - This category deals with all animal, plant and human body questions that you might have and want to do an experiment about. Remember that it is against Science Fair Rules to intentionally hurt an animal during an experiment. If you are dealing with animals, please let an adult assist you. It is okay to do experiment on plants, as long as they don't belong to someone else, like don't do an experiment on your mom's rose bushes unless you ask her first.
- Chemistry
  - Chemistry projects involve anything related to chemical reactions such as acids and bases, oxidation and reduction (rust), states of matter (solid, liquid, and gas), and chemical reaction changes. These are the science experiments that may have bubbling and oozing going on, like figuring out what is an acid and what is a base. It is a perfect category to try to mix things together to see what will happen. Again, if you are experimenting with possibly dangerous things, you need to recruit an adult to help you out. This can be a tricky topic to explore. Remember that there must be changes that can be observed and quantified with variables that can change and be kept constant. Chemical reactions can be pretty cool and fun to work with.
- Earth and Environmental Sciences
  - This category is really awesome because it covers all sorts of topics that deal with the Earth or objects in space. This includes studying weather, Geology (which is the study of everything that makes up the Earth, like rocks, fossils, volcanoes, etc..), and the study of all that is in space, including the stars, our sun and our planets. Unfortunately, this topic is also where most kids mess up and do a collection or model project instead of an "Experiment," so be careful!

- Physics
    - If you like trying to figure out how things work, then this is the category for you! It includes topics about motion, energy, electricity, magnetism, sound, light, or anything else that you might question, “How does it work and what if I do this to it, will it still work?” But remember, you always need to ask an adult first (and always make sure there is one of those adults with you when you try it.)

There are a multitude of websites that offer ideas for projects. Just keep in mind that you want to choose a project that provides you with measurable results.

It is also important that you choose an age-appropriate project. If you are in grades K-5, choose a project that has words that you have been taught. Students in grades 6-8 should choose a project that expands on a topic they have already learned. High school students should choose a project that forces them to research and find out something new.

Research Your Topic

So, you’ve picked your category and you’ve chosen a topic. You even wrote a question for your project, made a tentative plan, and turned in your form to your teacher.

It is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs. YOU READ! READ about your topic. READ articles from the internet. Take note of any new science words you learn and use them. It makes you sound more like a real scientist. Keep Track of all the books and articles you read. You’ll need that list for later.

References go at the very end of your Science Fair project but are easier to put together while you do your research. We suggest that you use a reference generator, such as BibMe (http://www.bibme.org/) to create your full references. APA style is generally used for Science Fair. Create your references page while you complete your research, it will be faster. Here’s the basic format: Author Last Name, First Name Initial. (Date) Title of Article. Where Published. Publisher. Retrieved from: URL -- Direct statements or quotes from sources require an in-text citation. They usually go at the end of the sentence or statement you used. Example: (Author Last Name, Year). For grades K-5, you can have a handwritten list if that is easier

YOU DISCUSS! Talk about it with your parents. Talk about it with your teachers. Talk about it with experts like Veterinarians, Doctors, Weathermen or others who work with the things you are studying. Sometimes websites will give you e-mail addresses to experts who can answer questions…. But again, do not write to anyone on the internet without letting an adult supervise it. Then when you think that you can’t possibly learn anymore and the information just keeps repeating itself, you are ready to move on.

Forming a Hypothesis

Now it is the time to predict what you think will happen if you test your problem. This type of smart guess or prediction is what real scientists call a **hypothesis**. So how do you begin? Well, just answer this very simple question: What do you think will be the result of your experiment? Example Problem: Which Paper Towel is more absorbent? Example Hypothesis: I think Brand X will be more absorbent because it's a more popular brand, it is thicker and the people I interviewed said that the more expensive brands would work better (This hypothesis not only predicts what will happen in the experiment, but also shows that the "Scientist" used research to back up his prediction.)

The Experiment

Now we have come to the good part. The part that all scientists cannot wait to get to, the experiment. Designing an experiment is really cool because you get to use your imagination to come up with a test for your problem, and most of all, you get to prove (or disprove) your Hypothesis. Now Science Fair Rules state that you cannot perform your experiment live, so you will have to take plenty of pictures as you go through these seven very simple steps.

1. Gather up your materials: What will you need to perform your experiment? The safest way to do this is get that adult you recruited to help you get the stuff you need. Oh, did we mention to take pictures or draw pictures of your materials. This will come in handy when you are making your board display.
2. Write a procedure. A procedure is a list of steps that you did to perform an experiment. Why do you need to write it down? Well, it's like giving someone a recipe to your favorite food. If they want to try it, they can follow your steps to test if it's true. Scientists do this so that people will believe that they did the experiment and also to let other people test what they found out.
3. Identify your variables. The variables are any factors that can change in an experiment. Remember that when you are testing your experiment you should only test one variable at a time to get accurate results. In other words, if you want to test the affect that water has on plant growth, then all the plants you test should be in the same conditions, these are called controlled variables: same type of dirt, same type of plant, same type of location, same amount of sunlight, etc. The only variable you would change from plant to plant would be the amount of water it received. This is called the independent or manipulated variable. The independent variable is the factor you are testing. The results of the test that you do are called the dependent or responding variables. The responding variable is what happens because of your test. Knowing what your variables are is very important because if you do not know them you won't be able to collect your data or read your results.
4. TEST, TEST, TEST. Remember that the judges expect your results to be consistent to be a good experiment, in other words, when you cook from a recipe you expect the

outcomes to be the same if you followed the directions (or procedure) step by step. So that means you need to do the experiment more than once in order to test it properly. We recommend three times or more. More is better! Do not forget to take pictures of the science project being done and the results.

5. Collect your data. This means write down or record the results of the experiment every time you test it. Be sure to organize it in a way that it is easy to read the results. Most scientists use tables, graphs, and other organizers to show their results. Organizing makes the results easy to read, and much easier to recognize patterns that might be occurring in your results. (Besides, it impresses the judges when you use them.) But do not make a graph or table because we asked you to, use it to benefit your project and to help you make sense of the results. There is nothing worse than having graphs and tables that have nothing to do with answering the question of a science project.
6. **Keep a science journal**: A science journal is a type of science diary that you can keep especially if your experiment is taking place over a long period of time. **The science journal is required.** We suggest you do that if your experiment is over a period of a week or more. In your journal you can record observations, collect research, draw and diagram pictures and jot down any additional questions you might have for later. x Have the right tools to do the job: make sure you have the stuff you need to take accurate measurements like rulers, meter tapes, thermometers, graduated cylinders or measuring cups that measure volume. The recommended standard of measurement in science is metric so if you can keep your measurements in meters, liters, Celsius, grams, etc,

   Tables, charts and diagrams are generally the way a good scientist like you would keep track of your experiment trials. Remember you are testing at least 3 times or more. A table is organized in columns and rows and always has labels or headings telling what the columns or rows mean. You will probably need a row for every time you did the experiment and a column telling what the independent variable was (what you tested) and the responding variable (the result that happened because of the independent variable)

   Be accurate and neat! When you are writing your tables and charts, please make sure that you record your data in the correct column or row, that you write neatly, and most of all that you record your data as soon as you collect it so you don't forget what happened. Sometimes an experiment might be hard to explain with just a table, so if you have to, draw and label a diagram (or picture) to explain what happened, it is recommended that you do.

   Use the right graph for your experiment. There is nothing worse than a bad graph. There are all types of graph designs, but these seem to be easy to use for science fair experiments.

- Pie graphs are good to use if you are showing percentages of groups. Remember that you can't have more than 100% and all the pieces need to add up to 100%. This type of graph is great if you are doing surveys.
- Bar graphs are good to use if you are comparing amounts of things because the bars show those amounts in an easy-to-read way. This way the judges will be able to tell your results at a glance. Usually, the bars go up and down. The x axis (or horizontal axis) is where you label what is being measured, (like plant A, B, C and D) and the y axis (or vertical axis) is labeled to show the unit being measured (in this case it would be centimeters that the plant grew).
- Line graphs are good to use if you are showing how changes occurred in your experiments over time. In this particular case you would be using the x axis to show the time increments (minutes, hours, days, weeks, months) and then you would use the Y axis to show what you were measuring at that point in time.

Write a Conclusion

Tell us what happened. Was your hypothesis right or wrong or neither? Were you successful? Would you change anything about the experiment or are you curious about something else now that you have completed your experiment. And most of all, tell what you learned from doing this. It is OK for your hypothesis to not be right. That is how science goes. A scientist would then revise the hypothesis and begin testing again. And then repeat it again and again and again….

Understand its application. Write about how this experiment can be used in a real-life situation. Why was it important to know about it?6

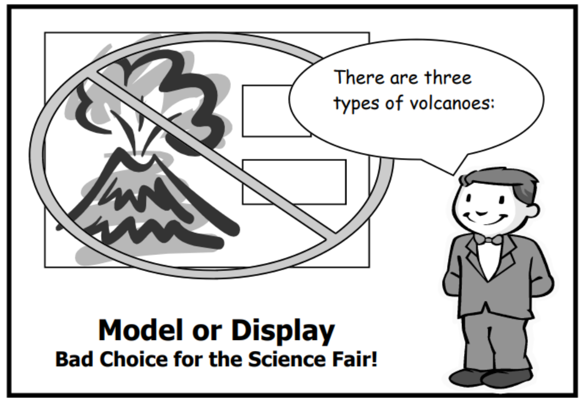
Poster Set-Up

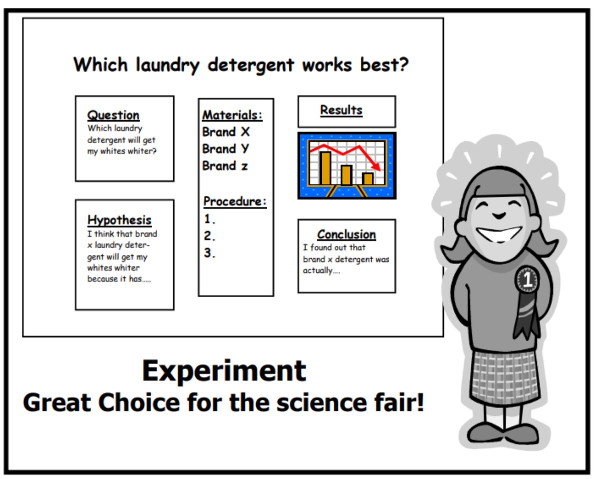
Projects should be presented on a tri-fold presentation board or something similar. The poster should be free-standing and will be placed on a table.

Any accompanying materials need to fit within the area of the poster.

Models that do not actually show any experimental data are not going to be scored highly (unless you are in K or grade 1).

Avoid this!





Conversely, an experiment shows lots of information. It shows the hypothesis, materials, procedure, data, conclusion, and references.

Do this!

There are a lot of resources available online showing how to make the poster. It is generally best to provide your information in order. You do not want a reader or judge to have to work hard to find the information to put it in order. There is no one perfect way to make the poster but be creative without confusion. The poster itself will be judged on the ability of the judge to find the necessary information and cleanliness.

Do not forget to bring your journal! Place it in front of the poster so it can be easily referenced.

Presentation

If you choose to be present for judging, consider the following points. (Presentation is not part of the grade for the project.)

- Introduce yourself and tell why or how you chose your topic.
- Use notecards if needed, but do not read directly from the board.
- Point to the board when explaining your data, so that judges can see it more clearly.
- Show your creative approach to this particular experiment.
- It is OK to say "I don't know" to a question. It is better to say, "That sounds like a good idea for my further research." Present to multiple people so you can be ready.

Above all else, have fun! Science is fun (sometimes frustrating and challenging but always fun!)! Unless you are in grades 6-8, you are doing the project because you want to. Remember that.

Work a little every day or every couple of days. Do not try to complete the project in an evening. It is easier that way.

There are people in the world (like Dr. Krull) that LOVE science fairs and want to help. Find them (or her) if you are struggling but do not quit.

Project # ____________________

2023 NVCA Science Fair Judging Rubric

Grades K-8

Note to Judge

- A score of 1 represents on or below grade level, incomplete, or inaccurate work.
- A score of 2 represents on grade level, complete, and accurate work.
- A score of 3 represents above grade level, complete, accurate, AND superior work.
- A score can exceed 32 if any 3's are given.

	No Evidence	Evident but Incomplete or Inaccurate	Evident, Complete, & Accurate		Superior Example
Question & Hypothesis					
1. Presented a testable question or problem statement that could be answered with an experiment	0	1	2		3
2. Proposed a hypothesis that gives a testable answer to the question or solution to the problem	0	1	2		3
Variables & Research					
3. Journal is present and shows stepwise progression	0	1	2		3
4. Correctly identified one independent/manipulate variable and one dependent/responding variable	0	1	2		3
5. Evidence of grade-appropriate background research.	0	1	2		3
Procedures					
6. Procedures are described in sufficient detail to allow replication by another person	0	1	2		3
7. Evidence of a thorough experiment with proper controls	0	1	2		3
8. Experiment was repeated with (minimum of 3 trials)	0	1	2		3
9. Age appropriate and appropriate tools/equipment used to collect data	0	1	2		3
Data and Conclusion					
10. Data presented is relevant to the question	0	1	2		3
11. Data displayed is an age-appropriate table or graph with correct, appropriate labels	0	1	2		3
12. Data is used to answer the question or to evaluate the hypothesis	0	1	2		3
13. Conclusion was supported with experimental evidence (No penalty for inconclusive data)	0	1	2		3
Overall Project					
14. The project is presented in a manner that makes purpose, procedure, and results clear	0	1	2		3
15. Included age-appropriate visual components to provide a detailed description of the project	0	1	2		3
16. Student displayed creativity in the question, approach, technique and/or the explanation	0	1	2		3

Total Score __________/32

Project # ____________________

2023 NVCA Science Fair Judging Rubric

Grades 9-12

Note to Judge

- A score of 1 represents on or below grade level, incomplete, or inaccurate work.
- A score of 2 represents on grade level, complete, and accurate work.
- A score of 3 represents above grade level, complete, accurate, AND superior work.
- A score can exceed 34 if any 3's are given.

	No Evidence	Evident but Incomplete or Inaccurate	Evident, Complete, & Accurate		Superior Example
Question & Hypothesis					
1. Presented a testable question or problem statement that could be answered with an experiment	0	1	2		3
2. Proposed a hypothesis that gives a testable answer to the question or solution to the problem	0	1	2		3
3. Abstract is present and accurate	0	1	2		3
Variables & Research					
4. Journal is present and shows stepwise progression	0	1	2		3
5. Correctly identified one independent/manipulate variable and one dependent/responding variable	0	1	2		3
6. Evidence of grade-appropriate background research.	0	1	2		3
Procedures					
7. Procedures are described in sufficient detail to allow replication by another person	0	1	2		3
8. Evidence of a thorough experiment with proper controls	0	1	2		3
9. Experiment was repeated with (minimum of 3 trials)	0	1	2		3
10. Age appropriate and appropriate tools/equipment used to collect data	0	1	2		3
Data and Conclusion					
11. Data presented is relevant to the question	0	1	2		3
12. Data displayed is an age-appropriate table or graph with correct, appropriate labels	0	1	2		3
13. Data is used to answer the question or to evaluate the hypothesis	0	1	2		3
14. Conclusion was supported with experimental evidence (No penalty for inconclusive data)	0	1	2		3
Overall Project					
15. The project is presented in a manner that makes purpose, procedure, and results clear	0	1	2		3
16. Included age-appropriate visual components to provide a detailed description of the project	0	1	2		3
17. Student displayed creativity in the question, approach, technique and/or the explanation	0	1	2		3

Total Score __________/34