Science Fair Guide 2024-2025

Congratulations! You have decided to participate in the **Pennington Traditional School Science Fair.** Here is a guide to help you prepare your science project, so you have a reliable experiment to present it for the **week of January 20th, 2025**, and present it during our **Science Fair Show Case January 28th**, 2025. Good luck!

To do this, you will use all your science skills and your understanding of experimental design.

To complete your project, you will need to:

- ✓ Select a topic and ask a question
- ✓ Do background research
- ✓ Design your experiment
- ✓ Perform your experiment and collect data
- ✓ Graph and describe your data
- ✓ Analyze your data and make conclusions
- ✓ Create a presentation by January 26th and deliver to the school the morning of January 27th
- ✓ Science Fair Setup and judging on January 28th, 2025

Students may work alone or in groups of up to 3 students. All students must attend Pennington Traditional.

Warning! - While groups are allowed, many extra issues can arise when working with a group. Please make sure you and your partners have time to commit to this together and can meet outside of school. Often other activities can get in the way of groups completing their work.

Step #1: **Select a Topic and ask a Question** **(suggested timeline: mid-October)**

This project is a great way to learn something you have always wanted to know! Is there something you have always wondered? Is there a fact you want to check to see if it is true? Is there something that could help others, or improve your own life? Project should be something that you can collect data.
Try to select a topic that you are interested in.

You will do **original research**, meaning this project has not been done before. Try to think of an idea that is all your own. Or you can take an old idea and change it in some meaningful way.

Predict what you think will happen.

Make sure you pick a topic that interests you! Check out these websites for inspiration and good examples:

1,000+ Free Science Fair Projects for Kids | Education.com
DiscoveryEducation.com (log in with Clever)

Please talk to your science teacher about your project before you get started. You may want to turn in step one to them so they can look over your thought process and offer feedback. They can also help you find or refine an idea.

Step #2: **Background Research** **(suggested timeline: finish by the November – 1st Week)**

For this step, you will find out what others have done so far. What projects can you find that are similar to yours? How are they different? Are there any other projects that tried to answer your question in a different way? Are there other projects that used similar methods?

If your ***Dependent Variable*** is difficult to measure, you may want to do research on how other people have measured this Dependent Variable. For example, color is hard to measure exactly and consistently. Your research may find that there are color scales that may help, or there may be an app for that.

If you are using a project that has been done before, you should research that project and explain in your research section what you are changing to make your project different.

Summarize your research and cite your sources.

This step can help you refine your project topic. If your topic changes, that's fine! Just let your teacher know.

STEP #3: Experimental Design Worksheet & Project Approval (suggested timeline: finish by beginning of November, earlier if you have a long-term project such as growing plants)

The attached Experimental Design Worksheet will help you identify all your variables and set up a controlled experiment. If you have trouble filling it out, you can ask your science teacher for help. If you are using animals, humans, or potentially dangerous chemicals, activities or devices, you MUST get a protocol form approved **BEFORE** beginning your experiment.

Don't forget to design a data table! You will not fill in the data until you do the experiment, so the data table should have **blank** boxes at this stage of your project.

STEP #4: Perform Experiment & Collect Data (suggested timeline: begin at the end of November, finish by beginning of January. Be sure to consider your family's plans for Thanksgiving & winter break when planning out your project. You may not be able to work much during vacation.)

Follow your experiment procedure. If you need to make changes, be sure to write them down. You will present your final procedure at the science fair. ** **Remember to get prior approval** if you are using vertebrate animals, humans, or anything potentially dangerous.

If you mess up a trial, or something turns out weird, *do more trials.* You are responsible for collecting good reliable data. It is recommended that projects involving human subjects should have 30 subjects at a minimum, since no two humans are the same. If you are testing using humans, **YOU MUST** have their and parent's permission.

Record your data neatly in your original data table. Your data will be included in your final presentation!

STEP #5: <u>Graph & Describe Your Data</u> (suggested timeline: finish by the beginning of January)

Choose the correct type of graph, and neatly show your data. The graph should be easy to understand and show the overall results. In most cases, you should ***graph averages only***, not each trial.

The results paragraph should describe your data in words. Start with the overall results (averages), then get more specific. ***Explain*** the relationship between the IV and DV. You do not make inferences here, only state the facts.

STEP #6: <u>Analyze Data & Make Conclusions</u> (suggested timeline: finish by the middle of January)

How did your experiment turn out? Did you answer the original question? What can you infer based on your data? Be sure to use specific data in your answer to describe trends and patterns. Remember, unexpected results, or "failed" experiments can sometimes yield the most important and interesting conclusions!

Evaluate your experiment: Was it well designed? How could you make it better? What are the experimental errors?

Evaluate yourself: Describe how you used creativity during various stages of your experiment. What problems did you have to overcome during your experiment? What did you have to figure out or change?

Next steps: What experiment would you try next (related to this one)? Who would be interested in or helped by your results?

STEP #7: <u>Create final presentation and be ready to turn it in on</u> January 21st, 2025

Reporting your findings is a VERY important step in science! This is the part where you get to make your own contribution to the totality of things that humans know and understand!

Create a PowerPoint (you will receive a ppt template that you can work on throughout the process), Canva or other type of presentation with no more than 10 slides. Be sure to include the title of your project, experimental design, materials and procedure, results and conclusion. Do **NOT** include any personal information including your name, school, teacher, or images of anyone's face.

Practice narrating your presentation. At the science fair, qualified judges will listen to you and ask you questions about your project. Be sure you understand the related concepts. Check the judging criteria rubric. Be confident and proud.

You did something that not too many people do. You learned something truly NEW and had fun doing it!

Experimental Design Worksheet

Question:

Title: The effect of _____(IV) on _____(DV). Example Title: The effect of fertilizer on plant growth.

Hypothesis: (If the IV changes…. Then the DV will ….) Must be specific and **measurable**.
Example: If I use nitrogen-based fertilizer for 2 weeks, then a plant will grow 20% taller than a plant without any added fertilizer.

Independent Variable (IV): Dependent Variable (DV):

Control:

Constants:

Materials (list **EVERYTHING** you need, including amounts): Make sure to include the amount of each material and any PPE used in the experiment

Procedure (list the steps so that another scientist could do the same experiment and get the same results).

Data Table (create a data table to record your results. This should be thought out in advance, so you have a place to put your data when you start collecting it.)

Below is an example data table. Design your own data table if this one will not work for you.

Independent Variable (For example: Type of Fertilizer)	Dependent Variable (for example: Plant Height)			Average Dependent Variable
	Trial 1	Trial 2	Trial 3	
Control (For example: No fertilizer)				

If your project uses animals, humans, or anything potentially dangerous, you MUST get prior approval before beginning your experiment.

Judging Criteria

On the day of the science fair, multiple qualified judges will review your project. Following is the judging rubric that will be used to evaluate your project and presentation.

Judging Criteria

Middle Division (Grades 6-8) Science Projects

Criterion	Description	Maximum Points
Experimental Design	The experimental process: • Research Question • Literature Review • Hypothesis • Independent Variable • Dependent Variable • Constants • Control	35
Materials & Procedures	List of materials Procedures	10
Results*	Data Tables Graphs Written Explanation	15
Conclusion	Summary of results/data Sources of error New learnings or questions	10
Creativity*	Innovation and quality of ideas	20
Presentation	• Understanding basic science relevant to the project • Proper interpretation of results • Recognition of limitations of results • Clarity of presentation • For team projects: contributions to and understanding of project by all team members (NA for individual projects)	10
	TOTAL	100

Note. Considerable emphasis is placed on the criteria marked with asterisks (*).

Middle Division (Grades 6-8) Engineering Projects

Criterion	Description	Maximum Points
Research Problem	• Description of a practical need or problem to be solved • Definition of criteria for proposed solution • Explanation of constraints	20
Design and Methodology	• Alternative solutions were explored • Identification of a solution • Development of a prototype/model	30
Execution: Construction and Testing*	• Prototype demonstrates intended design • Prototype has been tested in multiple conditions/trials • Prototype demonstrates completeness	25
Creativity*	• Project demonstrates significant creativity in one or more of the above criteria	15
Presentation	• Understanding basic engineering relevant to the project, proper interpretation, and recognition of limitations of design, clarity of presentation. • For team projects: contributions to and understanding of project by all members (N/A for individual projects)	10
	TOTAL	100

Note. Considerable emphasis is placed on the criteria marked with asterisks (*).

Beyond Pennington Traditional Science Fair

Projects that are eligible to advance to the Prince William - Manassas Regional Science and Engineering Fair will be notified by January 31st and must be registered by the February 6th deadline. The science fair coordinator will email a link to register for regionals if you are selected. You will be advised to create a presentation board or poster or your project at this time.

- Phase 1 of the Regional Fair requires students to record their presentation (no more than 3 minutes) and submit online. Virtual judging will occur on March 16 – 13th students advancing will be notified by March 14th
- If you qualify for Phase 2, you will be invited to present your project in-person on March 22nd, set up will be on March 21st.

Any student interested in submitting their project for acceptance into the Virginia Junior Academy of Science Annual Meeting and Research Symposium is encouraged do so. More information can be found at vjas.org, or by emailing Mrs. Chavez (Chavezlx@pwcs.edu).