

Science Fair

Investigation Project Layout The Scientific Method Learner Resource



Note: this is for the Investigation type of project (experimental or observational study).

Step 1: The Initial Question

Look around you. Look outside. Take a walk and observe the environment. What do you wonder about? Are there any questions about the world you want to ask? This is the perfect opportunity to find your own answers. Once you have formulated some kind of question, conduct research to form the overview or big idea. Brainstorm some possibilities and narrow it down to one specific question that will provide the basis for the purpose of the experiment.

An example question: "Do sunflowers need sunlight to survive?"

Step 2: Determining the Variables

- Determine the controlled variable(s) (these must remain the same).
- Determine the independent variable (this variable gets manipulated).
- Determine the dependent variable (this variable responds to the manipulation).

Using the example question above, examples variables would be:

- Controlled variables: the type of sunflower, and the amount of water it receives
- Independent variable: the amount of sunlight the sunflower receives
- Dependent variable: how much the sunflower grows

Step 3: A Hypothesis

Now that you are curious about something, make a prediction or an educated guess from what you know and have researched about so far! Write a hypothesis that follows the format, "**If...then...because...**" using the variables you found in step 2. Be sure to include why you think this will happen; be specific.

An example hypothesis: "**IF** I measure how long a sunflower receives sunlight in a day **THEN** I will see that the sunflower will grow faster over time when it receives more sunlight **BECAUSE** the sunflower is receiving more nutrients via the sun."

Step 4: Materials

So you've got a game plan, your next step is to make a list of what you need to gather in order to carry out your experiment. Ask your guardians or educators for help if you cannot get something on your own. Some things to consider are what kind of materials do you need and how much do they cost? If you can get them from home or borrow them from school, make sure you ask for permission. Your guardians or educators might also know other adults that have access to some of these materials at a cheaper cost or even for free. Check community resources that may also have them lying around as donations or left-overs (community recycling centre, Goodwill, etc.).

For the sunflower example, you would need: specific type of sunflowers, pots, water, soil, and something like boxes that fold over the flowers so that you can

control the amount of sunlight the sunflowers receive.

Be sure to include amounts with units! Don't forget to include measurement tools if you used any (i.e. ruler, measuring cup).

Step 5: Procedure

List the specific and detailed steps that you will follow. This is the planning stage and crucial for your own experiment, but it also exists so that anyone can repeat the exact experiment. During the experiment, you may make many changes to your original plan; if so, make sure you re-visit your written procedure and make the necessary edits. Remember, you want to be able to prove your discovery to other scientists. Seeing is believing, so a curious person must experience the same answers you received. Make sure you number each step, and use your own words with no personal pronouns and in the past tense!

You want to record everything, and be precise in your procedure such as for the sunflower example: the amount of sunlight and for how long, how much water the plants received, how long sunlight was allowed for each plant (if any), and what was used to block out sunlight. Remember, in science nothing is considered proven until more than one scientist is able to produce the same results from the experiment. If you make a big discovery, you will want to make sure it can be duplicated once it is published.

Include all safety protocol that should be followed when conducting your experiment too!

Step 6: Observations

During the experiment, pay close attention to the details. It is important to record all of the data in a log book. This log book should be similar to an informal journal entailing all of the steps and observations you make from the moment to ask yourself the initial question until the time you stop your experiment. The observations should be presented nicely in table format when necessary.

Step 7: The Big Conclusion

You have finally arrived at the end of your experiment! But wait, you're not completely done! Now what? What do the final results mean? What did you find out about the experiment or learn from it?

For example: If you found out that "sunflowers cannot survive without sunlight.", could this perhaps lead to another experiment to find out if other plants are able to survive without sunlight? If so, the judges may like to hear your future plans as well. It shows your genuine interest in your topic and your desire to continue to study it.

Interpret and organize the results from your experiment in graphs and charts so that it is easily comprehensible. Present the information on a display board. Prepare a presentation for the audience and judges. You've just made a discovery about the world we live in; blow the audience away with your creativity and knowledge! It is your time to share your hard work and present yourself as a new, young Scientist! Be enthusiastic, professional, and above of all, have fun!