

## Experiment (Research) Plan

The experiment plan (also called a Research Plan) is a formal plan that you will write to explain how you are going to test your hypothesis in answering your Science Fair problem. Please use the experiment plan worksheet (on page 3 of this document) to help you plan your experiment. Page 2 of this document are the county requirements for Experiment Plans. Please read it thoroughly!

- The plan should be written in 12 point Times New Roman font and singled spaced. There is no definite length of the plan; you just need all the parts listed.

The plan must have the following parts in the following order:

1. **Research Question or Problem statement** (This should be in the form of a question – i.e. “What effect does the color of a bird feeder have on the number of times a hummingbird visits?”)
2. **Rationale** - What is the motivation/reasoning for your project? Include a brief synopsis of the background that supports your research problem and explain why this research is important scientifically and if applicable, explain any societal impact of your research.
3. **Hypothesis** - “If...., then...because....”  
(i.e. “If I set outside two different colors of bird feeders, red and yellow, then there will be more hummingbird visits to the red feeder because hummingbirds can easily see the color red.”)
4. **Variables** – List your independent (test) variable(s) [remember, if you test more than one independent variable, each MUST be tested separately!], your constants or controlled variable(s), and your dependent (outcome) variable(s).
5. **Materials** - You must list all materials you will be using in your experiment. You should be specific about the amount of each material you feel you will need. Use SI units (meters, liters, grams...not inches, feet, pounds, etc.)  
(i.e. Two bird feeders, identical in size.  
1 can of red spray paint and 1 can of yellow spray paint to paint the bird feeders.  
2 cups of bird seed – one cup for each bird feeder.)
6. **Experimental set-** You must have a detailed step-by-step procedure to explain exactly how you will perform your experiment. How many repeated trials will you conduct (more is better)? How will you control your constants/controlled variables? How will you observe, measure and record changes in your dependent variable? These instructions should be so precise that someone else could REPLICATE your experiment by reading your procedures. No paragraphs please. List your steps in numerical order.
7. **Safety concerns-** You must write a paragraph on how you will handle materials safely and what precautions you will use to ensure your safety. This includes scissors and anything that could be considered even a minor safety hazard.
8. **References-** You must list the references that you cited in your background report on your research plan in the same format. You may copy and paste your references from your background report as long as they are in the correct format. Don’t forget to include the required source:

"Rules for All Projects." *Student Science*. N.p., n.d. Web. 4 Sept. 2014.

<<https://student.societyforscience.org/node/2369?pid=321>>.

# Experimental (Research) Plan Instructions

The Research Plan/Project Summary is a succinct detailing of the rationale, research question(s), methodology, and risk assessment of your research project and should be completed before the start of your experimentation. Any changes you make to your study should be added to the final document.

The research plan for ALL projects should include the following:

- a. What is the **RATIONALE** for your project? Include a brief synopsis of the background that supports your research problem and explain why this research is important scientifically and if applicable, explain any societal impact of your research.
- b. State your **HYPOTHESIS(ES), RESEARCH QUESTION(S), ENGINEERING GOAL(S), EXPECTED OUTCOMES**. How is this based on the rationale described above?
- c. Describe in detail your **RESEARCH METHODS AND CONCLUSIONS**.
  - **Procedures:** Detail all procedures and experimental design including methods for data collection. Describe only your project. Do not include work done by mentor or others.
  - **Risk and Safety:** Identify any potential risks and safety precautions needed.
  - **Data Analysis:** Describe the procedures you will use to analyze the data/results that answer research questions or hypotheses.
- d. **Bibliography:** List at least five (5) major references (e.g. science journal articles, books, internet sites) from your literature review. If you plan to use vertebrate animals, one of these references must be an animal care reference.

Items 1–4 below are subject-specific guidelines for additional items to be included in your research plan/project summary as applicable.

## 1. Human participants research:

- **Participants.** Describe who will participate in your study (age range, gender, racial/ethnic composition). Identify any vulnerable populations (minors, pregnant women, prisoners, mentally disabled or economically disadvantaged).
- Recruitment. Where will you find your participants? How will they be invited to participate?
- Methods. What will participants be asked to do? Will you use any surveys, questionnaires or tests? What is the frequency and length of time involved for each subject?
- Risk Assessment
  - ◊ Risks. What are the risks or potential discomforts (physical, psychological, time involved, social, legal, etc.) to participants?  
How will you minimize the risks?
  - ◊ Benefits. List any benefits to society or each participant.
- **Protection of Privacy.** Will any identifiable information (e.g., names, telephone numbers, birth dates, email addresses) be collected? Will data be confidential or anonymous? If anonymous, describe how the data will be collected anonymously. If not anonymous, what procedures are in place for safeguarding confidentiality? Where will the data be stored? Who will have access to the data? What will you do with the data at the end of the study?
- **Informed Consent Process.** Describe how you will inform participants about the purpose of the study, what they will be asked to do, that their participation is voluntary and they have the right to stop at any time.

## 2. Vertebrate animal research:

- Briefly discuss potential **ALTERNATIVES** to vertebrate animal use and present a detailed justification for use of vertebrate animals
- Explain potential impact or contribution this research may have
- Detail all procedures to be used
  - ◊ Include methods used to minimize potential discomfort, distress, pain and injury to the animals during the course of experimentation
  - ◊ Detailed chemical concentrations and drug dosages
- Detail animal numbers, species, strain, sex, age, source, etc.
  - ◊ Include justification of the numbers planned for the research
- Describe housing and oversight of daily care
- Discuss disposition of the animals at the termination of the study

## 3. Potentially hazardous biological agents research:

- Describe Biosafety Level Assessment process and resultant BSL determination
- Give source of agent, source of specific cell line, etc.
- Detail safety precautions
- Discuss methods of disposal

## 4. Hazardous chemicals, activities & devices:

- Describe Risk Assessment process and results
- Detail chemical concentrations and drug dosages
- Describe safety precautions and procedures to minimize risk
- Discuss methods of disposal

## Experimental Plan

1. Problem
2. Rationale
3. Hypothesis
4. Variables
5. Materials
  - 1.
  - 2.
  - 3.
  - 4.
  - 5.
  6. etc.
6. Experimental Set/Procedures
  - 1.
  - 2.
  - 3.
  - 4.
  - 5.
  - 6.
  - 7.
  - 8.
  - 9.
  10. etc.
7. Safety Concerns and Precautions
8. References