

WHAT GOES INTO THE ISEF RESEARCH PLAN?

Overview

Per official ISEF rules, your Research Plan is “a succinct detailing of the rationale, research questions, methodology, and risk assessment of your project” completed before experimentation. You will share this document with Amy, Danielle, and your Adult Sponsor on Google Docs. You have to complete this and have it shared for review in order to receive approval to do your project.

Use the checklist below as your research plan outline. Each of the sections listed below are required in the research plan. The pages following give a more in-depth explanation of each section.



Include each of these sections - use these as headings:

- Title**
- Student Name(s)**
- Adult Sponsor**
- Rationale**
- Hypothesis & Research Question OR Engineering Goal & Expected Outcomes**
- Materials**
- Procedure**
- Data Analysis & List**
- Risk Assessment**
- Bibliography**

Title

For the time being, you will want to create a title of your ISEF project based on your topic of interest, and the study you are performing. You can change it later. As your project evolves, you may be interested in developing a more descriptive or creative, eye-catching title for the judges. You might even end up creating your title after you finish the rest of your plan. Make it concise and descriptive: "Innies vs. outies: the effect of bellybutton type on lint accumulation." If your study is about a certain area or grouping (species, age group, etc.), name that in the title.

Student(s) Name(s)

Include your name, and the name(s) of your partner(s) and your school.

Adult Sponsor

Name your Adult Sponsor and their title, if any (Mr., Ms., Dr., etc.)

I. Rationale

Based on what you have learned from your background research, identify why your ISEF topic and project idea are important and valid. How can this research project make an impact on the world? The rationale isn't your list of background research notes – it's a brief critical analysis of what you found in your background research and a lead-in to what you are proposing to research. It starts with a general description of the topic and ends with a specific statement about what you are going to research. It includes three main components according to the 2015-2016 Intel ISEF rule book:

1. A brief synopsis of the background that supports your research problem WITH IN-LINE CITATIONS.
2. An explanation of why this research is important scientifically
3. An explanation of the impact of this research on the world/human society.

It's important in this section to cite the sources of the information you use. For example, if you state a research finding about adult sleep requirements that you found in a paper by Smith, written in 1999, it might look something like this, "The length of sleep time required for adequate mental function in adults over 21 years of age averages 8.5 hours per night (Smith, 1999)." The full citation for each article goes in your bibliography, with all the details required for APA-style citations.

II. Research Question, III. Hypothesis (FOR EXPERIMENTAL PROJECTS)

Your **Research Question** is a broad query that shows what you were first wondering about. Your **Hypothesis** is an specific prediction - an educated guess - about the outcome of your experiment, based on background research and the variables to be tested. At this level, it is commonly written in the format If/Then/Because:

"If [X happens to the independent variable], **then** [Y will result with the dependent variable], **because...**[an explanation for the effect predicted, supported by background research]."

For example:

II. Research Question - Does the size of a person's bellybutton affect how much lint accumulates there?

III. Hypothesis: If each person's bellybutton lint is collected and weighed, then there will be more lint in deeper bellybuttons compared to less-deep ones, because research has shown that particle accumulation is proportional to cavity size.

II. Engineering Goal and III. Design Criteria / Expected Outcomes (FOR ENGINEERING PROJECTS)

A well crafted Engineering Goal clearly outlines exactly what you will be designing, and will help guide you toward a successful engineering plan. From your general topic, you will want to identify key terms using Background Research to come up with your specific goals and the Expected Outcomes of that goal. Understanding how your "global" topic relates to local concerns or studies will help you to further narrow your topic. From there, you can identify what others have built, and how they did it, and this will help direct you to the type of study you wish to accomplish.

For example:

II. Engineering Goal: To reduce the accumulation of bellybutton lint among various bellybutton sizes and types.

III. Design Criteria / Expected Outcomes

- The device I design and build will cost less than \$3 to make, be lighter than 28 grams, stay securely and comfortably in the bellybutton for up to 12 hours, adjust to different bellybutton sizes, and be made of hypoallergenic material.
- It is expected that this device will reduce bellybutton lint accumulation by >90% and lead to better personal hygiene.

Materials

In order to carry out the hands-on phase of your project, it's likely that you will need to gather supplies and equipment. Even when performing a Behavioral study with human participants, you may have surveys or tests you'll need to print and distribute. Every ISEF project requires some form of materials. In this section of your Research Plan, it is important to consider everything you may need to successfully complete your experiment, so you can be fully prepared.

- This section should be written in a list/bullet-point format
- Breaking down your experiment into phases will help to determine all the materials you will need (e.g. prepping pots with soil, planting, monitoring plants/growth period, etc)
- If you determine a need for specialized equipment, be sure to include it in this section so we can help you access this, or connect with a facility that may have it

Procedure

In this section, list the steps you will follow to carry out your experiment. In order to write your procedure, it's important to consider several factors, including the amount of time it will take to complete your project, the amount of data you'd like to collect, and ways in which you will maintain a controlled experiment for the most valuable data set. The experimental design you have already drawn in your logbook should represent a general outline of your procedure.

Data Analysis & List

In this section, list your variables (IV and DV, controls) that you will be measuring. Explain how you will compare these variables. Thinking now about the type of data you will be collecting will help prepare you for the best types of analysis. Use this example data list to help you craft your own (design what's needed to fit your project - this is just an example!):

Treatment One	Height (meters)	Width (meters)	Color (qualitative)	Mass (kilograms)
Sample 1				
Sample 2				
Sample 3				
Sample 4				
Sample 5				
Sample 6				
Sample 7				

Treatment Two	Height (meters)	Width (meters)	Color (qualitative)	Mass (kilograms)
Sample 1				
Sample 2				
Sample 3				
Sample 4				
Sample 5				
Sample 6				
Sample 7				

Risk Assessment

For each ISEF project, a very critical piece of your Research Plan is the “Risk Assessment”. With any experiment, it’s important to make considerations for your safety and the safety of your test subjects and the environment. It is your responsibility to 1) identify hazards associated with your project and 2) explain how you will either prevent these hazards or protect yourself and others from them. **If you have humans, animals or microbes in your project, you will get an important Supplemental Packet in the ISEF office at school to help you write an approvable Risk Assessment.**

Bibliography

In this section, you will include APA-formatted citations for the resources from your background research. You need a minimum of 5 citations. It is important for every scientist to acknowledge where they gathered the information necessary to fully develop their investigation. It is not appropriate to simply include anecdotal information. Feel free to utilize online tools such as citationmachine.net to create properly-formatted citations for each resource type you use.