Awesome Scientific Research Projects…Step-by-Step

Selecting a project often appears to be a difficult task. Fortunately, projects do not need to be highly complex in order to be successful. When choosing your subject, pick a question that interests you since you may be working on it for a while. If you are more interested in building something that can solve a problem, read ***Awesome Engineering Projects…Step-by-Step***. If you need ideas for science projects, here are some suggestions!

Check out this website – http://www.sciencebuddies.org
Read the highly recommended book "Painless Science Projects" by Faith Hickman Brynie. This book takes you through all the stages of a successful science project including topic selection. You may order this book from the following website -
http://www.amazon.com/exec/obidos/ASIN/0764105957/synopsyschamp-20/002-8506707-1997616

Good scientists use a ***process*** called the ***scientific method*** to study things they see in the world around them. What follows are the steps you need to follow. FIRST, get yourself a sturdy ***project notebook***. It doesn't need to be fancy, just something you can use to record what you do for several weeks or months and then display with your project at your local, regional, state, and/or international competitions.

1 **OBSERVE**. Look at the world around you. Find subjects that interest you and start to formulate questions about them. Narrow the questions down to something you might be able to investigate in a few months.

2 **DO (LITERATURE) RESEARCH**. Find out everything that is known about the subject you have selected. Write notes in your notebook. Be sure to list your reference sources (where you found the information) as you will need this information for your reference list/bibliography later.

3 **BASED ON YOUR RESEARCH, ORGANIZE EVERYTHING YOU HAVE DISCOVERED IN YOUR PROJECT NOTEBOOK AND THEN FORMULATE A HYPOTHESIS**. This is more than a guess: knowing certain things are true, you then predict what might happen if you change something. Your experiment, when successful, will allow you to determine if your hypothesis was correct or not.

4 **DISCUSS YOUR IDEAS/PLANS WITH YOUR TEACHER**. You may discover that what you plan to do costs thousands of dollars, needs equipment you don't have, or will take several years to complete. Your teacher may have suggestions to help you. Now comes the difficult part.

5 **BASED ON WHAT YOU KNOW, NOW DESIGN AN EXPERIMENT TO TEST YOUR HYPOTHESIS**. Your research plan will describe how you plan to do your experiment, changing only one variable at a time and keeping all the other parameters the same. You will need to have a control so that you can compare the results of your experiment with something where nothing was changed. Make sure that you have more than one seed/plant/animal in each of the control and experimental groups (e.g. more than one concentration of chemical you are testing, more than one time point, more than one kind of plant, etc.).

6 **IF YOU ARE HAVING A DIFFICULT TIME GENERATING A CONTROL, MAKE SURE THAT YOU DON'T HAVE AN ENGINEERING PROJECT**. Engineering Projects have a goal instead of a hypothesis, and don't have a control. Still struggling? Maybe your project is a demonstration (not something you'll want to compete with) or product testing (only acceptable for Junior Division projects; grades 6-8).

7 **IDENTIFY ANY SRC/IRB/IACUC PRE-APPROVAL REQUIREMENTS FOR YOUR PROJECT**. Consult the flowchart contained within ***Research Projects: From Idea to Exhibit to Competition: A Student, Parent, & Teacher Guide*** as well as the Intel ISEF Rules for Pre-College Research available on our website http://stemed.unm.edu and the Science Service website http://www.sciserv.org/isef.

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STOP! You are probably excited about getting started, but first you need to fill out the Intel ISEF Forms 1, 1A, Research Plan, and 1B as well as any additional forms required for special projects (those that need SRC/IRB/IACUC pre-approval). Make sure you have all the appropriate signatures/approvals before you start.

IMPORTANT! If you checked any of the boxes in #4 on Form 1, ***you must get SRC/IRB/IACUC pre-approval BEFORE you begin unless you are doing the experiment at a Registered Research Institution***. In this case, make sure that the University or company has given approval and that the professor or researcher in charge fills out the necessary paperwork and dates them before you begin work. If the project has been reviewed and approved by a Registered Research Institution, please make sure you have a copy of the approval on the RRI's letterhead. ***No matter what, your project must follow all ISEF Rules for Pre-College Research. Make sure your mentor is made aware of those rules.*** You also need to decide if you are going to submit a research paper to the Junior Academy of Science for the annual Paper Competition.

8 **ONCE YOU HAVE RECEIVED APPROVAL FROM THE REGISTERED RESEARCH INSTITUTION OR FROM AN SRC/IRB/IACUC, YOU MAY BEGIN YOUR EXPERIMENT.** Carry out your experiment as outlined in your research plan. If things don't go as planned and you need to make changes to the research plan, make sure that the SRC pre-approves those changes as well.

9 **RECORD IN YOUR PROJECT NOTEBOOK ALL YOUR EXPERIMENTS, HOW YOU DID THEM, THE RESULTS AND ANY ANALYSIS YOU PERFORMED.** The information should be detailed enough so that another person could repeat your experiment using your project notebook as a guide. You should also repeat your experiment – real data is reproducible. Graph your results. Include photographs or drawings of your experimental set up if you can.
EVALUATE THE RESULTS OF YOUR EXPERIMENT. If possible, draw conclusions from your data. Did the

10 results cause you to ask more questions? If there is time, you may wish to do more experiments; if not, you can put your ideas into the "Future Research" category on your project board. ***Winning projects very often use statistics to analyze the data***.

PREPARE THE RESULTS OF YOUR EXPERIMENT.

11 Review the Display & Safety Rules for the current fair year. These are available in the ISEF Rules for Pre-College Research and can be accessed on our website http://stemed.unm.edu.

PREPARE AND BRING YOUR ABSTRACT(s).

12 Remember, you will need to bring 10-20 copies of your abstract along with your project notebook, project board, and any display items when you set up for competition(s).

FOR MORE INFORMATION & RESOURCES…

ISEF Rules for Pre-College Research
http://stemed.unm.edu

Click on the Rules & Forms button in the Science Fair pull down menu.

Choosing a Topic for Your Project
http://www.sciencebuddies.com

Putting Your Board Together
http://school.discovery.com/sciencefaircentral/scifairstudio/handbook/display.html
http://www.scifair.org/articles/display.shtml
http://www.showboard.com

Presenting Your Project to the Judges
http://school.discovery.com/sciencefaircentral/scifairstudio/handbook/presandeval.html

General Science Fair/Research Project Support
http://stemed.unm.edu *(click on Links to Resources under Science Fair button)*
http://www.sciencebuddies.com
http://www.scifair.org/
http://www.scienceproject.com/
http://www.amasci.com/scifair/chem.html
http://www.energyquest.ca.gov/projects/advice.html
http://www.nexusresearchgroup.com/science_fair/sci_fair2.htm
http://www.nwmissouri.edu/library/courses/education2/sciencefair.htm