Parents Guide to Science Projects

Time Management

Break up your child's project into smaller pieces to make the project more manageable. You are given months to do this project so can take it in parts and not feel overwhelmed by the size of the project. Set dates with your students if they teacher does not require any other checkpoints along the way. This will help your student out by not waiting until the last minute. Good projects are done with forethought and planning.

How to Help

As your child works on his or her project, he or she will likely face stumbling blocks. To help, ask questions to help your child figure things out, don't just provide the answers. Open ended question, such as " what else could you try to solve this?" or "What is stopping you from going to the next step?" are the best (Fredericks & Asimov, 2001, p.8). Sometimes just talking it out can help children get unstuck. If not, ask the teacher for help. Respect your child's independence in learning by helping at the right level.

Helping at the Right Level at Every Step

Project Step	Helping at the right Level	Going too far
Ask a Question	• Discussing with your child whether a project idea seems practical	• Picking an idea and project for your child.
Do background research	• Taking your child to the library • Helping your child think of keywords for internet searches	• Doing and Internet search and printing out articles
Construct a hypothesis	• Asking how the hypothesis relates to an experiment the child can do	• Writing the hypothesis yourself
Test the hypothesis by doing an experiment	• Assisting in finding materials • Monitoring safety (you should always observe any steps involving heat or electricity)	• Writing the experiment procedure • Doing the experiment • Telling your child step-by-step what to do
Analyze data and draw	• Asking how your child will record the data in a data table • Reminding your child to tie the data back to the hypothesis and draw a conclusion	• Creating a spreadsheet and making the graphs yourself, even if your child helps type in the values • Announcing the conclusion yourself
Communicate your results	• For the presentation, acting like the audience • Help bring the display board to school	• Writing any of the text on the display board • Determining the color scheme or other graphic elements

Tips for Selecting a Topic

For most students, the hardest part of the science fair project is coming up with an idea and then narrowing down their question. The following list outlines ways that most students follow to select their own project.

Interests & Hobbies
All science projects should be something that the students is interested in and finds exciting. Many really good projects related to students interests and hobbies.

Current Events
Current events and problems facing our society are really hot project ideas each year.

Observations
A lot of good projects come from students observing a questioning the things they see around them.

New Articles, Books and TV Shows
All students will have to do an extensive amount of research regardless of their topic-reading help students come up with ideas.

Class Projects
There are a lot of class projects and experiments that can be taken further…

Parent or Mentor Suggestions
Use the research of others to start another project. Many parents have great ideas – some professors are willing to work with kids and allow them a small part of a larger project.

Getting Help

- Ask your teacher
  - **Money should never be a reason to not do a project.** If this is a concern please let one of us know before it's too late. The week before is too late.
- http://slvsef.org
  - Very helpful, timelines, find a lab, find a mentor, etc.
- Science Buddies
  - While their project guides are really helpful I would watch what projects you use from their site. Just because it is on the site does not make it a good project.

Things NOT To Do!

A list of things that will get you disqualified

Science fair rules may seem pesky, but SLVSEF has rules because we care about students. We aren't trying to stop students' fun; we are trying to keep students, families, and teachers safe. Rules also ensure that projects comply with international, federal, and state laws. SLVSEF are affiliated with the Intel ISEF, so projects must follow all ISEF rules.

The following are not allowed. Doing these things will get a project disqualified. So, do not do them! Bolded items are the most frequent offenders.

Project

− Plagiarism, fabrication of data, or any other form of ethical misconduct.

− A demonstration project. (If your project is simply showing how something works, it is probably a demonstration. Change it into an experiment by selecting and manipulating a variable.)

− Failing to get SRC pre-approval if your project requires it.

− Failing to complete and submit the required forms. Be sure that you get all required signatures, and be certain that your dates are correct. If, for example, a form says you started your project on November 1st, but
you didn't get SRC approval until November 15th, then we have a problem.

− Doing a project involving human subjects without IRB pre-approval.

− Doing a research project that causes more than momentary pain or suffering to vertebrate animals.

− Doing a project designed to kill vertebrate animals.

− Growing microorganisms at home (bacteria, fungi, etc).

− Doing a project designed to engineer bacteria that are resistant to multiple antibiotics.

− Working with a BSL 2 organism in a BSL 1 lab.

− Working with any BSL 3 or 4 organisms.

− Doing a project with hazardous chemicals, activities, or devices without a Designated Supervisor (or a Qualified Scientist, if using a DEA-controlled substance).

Project Display

Resolving problems with your display is usually possible, but it is best to simply avoid violating the display and safety rules. It is probably best to leave most of the things you might want sitting at your display at home. Use pictures instead; it will not negatively affect your judging scores and it will make your life much easier. The only things that you need at your project are your display board, lab book, and research report (if you have one).

The following are not permitted:

− All of your project display, including notebooks, pictures, gadgets, and papers, must fit within these dimensions: no more that 30" deep, 48" wide, and 108" tall (from floor to top).

− No living organisms, taxidermy specimens, preserved animals, human/animal body parts or body fluids are permitted.

− No pictures showing vertebrate animals during laboratory procedures are allowed.

− No food is permitted at your display.

− No raw plant materials, living, dead, or preserved is permitted.

− No chemicals (including water), no hazardous substances or devices, highly flammable material, sharp items, or glass are allowed your display.

The Step-by-Step Process in Detail

Step 1

Science Project Journal

It may seem out of order to start a journal before you know what you are going to do as a project, but think of this as the hard copy of your thoughts. Begin your brainstorming in this journal. Once you have an idea of the question you will be addressing, write down how you will test it, the possibilities for variables, etc. These lists will not only make it easier to pick the best question and variables, but you can also come back to it if something changes or you want to expand your project later.

Science Project Journal – this should be a spiral notebook, composition notebook or some other type of bound journal that keeps all your information together. The project journal will include everything you do on your project.

This journal will seem like a lot of work, but it will make putting your project together much easier. Don't think of it as an assignment, but a way to keep you organized and on track. Write down any thoughts you have about your project, any "weird" things you see, and all the information you can think of to write down!

Below are some suggestions for important information:

A title page with student name, period, beginning and ending project dates

The topic you select and problem statement

Background research

Names of adults who may be able to assist you and the notes you take when talking to them

Your hypothesis, procedure, list of materials

Results of each trial (data)

Conclusion

This should be a detailed journal. Don't cross anything out; you might need to refer to it later. Entries should include the date and the number of days into the experiment that you are. Include all observations – don't assume you'll remember points and details. What might seem unimportant or "wrong" at the time might be an important result later and might actually support your conclusion.

Step 2

Selecting a Topic

Getting started is always the most difficult part of a science fair project. Once you have a topic and a question, the rest of the project is just a matter of following the scientific method.

The easiest way to pick a topic you will stick with is to be answering a question you genuinely want to know the answer to. Remember, you can ask all sorts of people for help; you have teachers, parents, other students, books, and the internet. With all these resources, it should be fairly easy to come up with something you like which you can ask questions about. This comes to the next step: can you ask a TESTABLE question. Keep in mind you don't have a lot of time, and may not have a lot of equipment. Ask

simple questions and then build upon them if you like where you are going with the project. If you aren't sure how you would test your question, or if you would need more advanced equipment than everyday items, ask your teacher.
Remember, you should write this process down in your journal. Look at the world around you it is full of science!

Step 3

Background Research and Information

STEP #1 – REASONS FOR CHOOSING YOUR TOPIC

Now that you have selected a topic, write in your journal in a section that you title "Background
Research" your reason(s) for choosing the topic you chose or the purpose of your investigation.
Also, write in your journal what you already know about your topic.

STEP #2 – INFORMATION RELATED TO YOUR TOPIC

Now that you have selected a topic and question, you'll need to find out what is already known about the subject. You will want to know information about the specifics of your topic as well as different things that could be related to your project.
For example, let's say you are interested in how oil spills affect sea creatures, such as clams. Not only will you want to research the properties of oil and the life cycle of clams, but you may also need to understand a little more about wave patterns, ocean currents and tides. In addition you may also want to research other substances that could affect clam growth or what can be done to prevent or clean up oil spills.
IN YOUR SCIENCE JOURNAL, LIST FIVE OR MORE RESEARCH TOPICS RELATED TO YOUR QUESTION.

STEP #3 -- OFF TO THE LIBRARY

You should consult at least 10 references regarding your project. More is better. Set up a bibliography section in your journal to keep track of your reference sources. See the How to Do a Bibliography page later in this packet. Take notes from at least four of these books or articles in your journal. DO NOT JUST RELY ON THE INTERNET. If you use information from the Internet, make sure it is from a reputable website, such as one connected to a university. Ask the librarian for help in finding science magazine articles and books relating to your topic.

STEP #4 -- FINDING EXPERTS

Make a list in your journal of people that might be able to help you. Talk to your teacher and to experts on your subject. Write letters, make phone calls, do whatever it takes to find out more information regarding your project before you begin experimentation. Take notes in your journal and be sure to record the person's name that you talked to, as well as the date and time.

Step 4

Making Your Hypothesis

After doing background research about your topic and organizing your experimental plan, including understanding your independent and dependent variables, you must make a hypothesis. This is an educated guess about how the experiment will turn out. The hypothesis is normally one sentence (not a question) that states what you *think* the

answer to the problem statement will be based on what you learned in your background research. Remember, you are NOT setting out to **prove** your hypothesis; this is just what your background research leads you to expect.
One way to write your hypothesis in an "If.... then…. " statement. i.e.: If the independent variable is changed, then the dependent variable will change this way...

For example: **If** candy bars in a store are displayed at eye level, **then** they will sell better than those at the bottom of the display case.
Take a stand with your hypothesis; don't be wishy-washy. Don't say "If candy bars in a store are displayed at eye level, then *I think they probably* will sell better than those at the bottom of the display case."

WRITE YOUR HYPOTHESIS BELOW AND IN YOUR PROJECT JOURNAL:
If

_____

_____,
then

_____

___.

Step 5

Writing Your Experimental Procedure
The procedure is the set of steps that you will follow to conduct your experiment. This should be detailed so that another person would be able to do the research following your directions. Leave out obvious instructions like "Gather all the materials."
The steps of the procedure should be in numbered or bulleted form, not in a paragraph. Identify the independent variable, the dependent variables, and the control.
Some important things to keep in mind when designing your experiment are:
Control Group
Most experiments need to have an appropriate "control", which is a standard to test your experimental results against. A control is a trial taken when the independent variable is missing or held constant or at a normal level.
For example, if you're studying the effects of cold air temperatures on tropical house plant growth, you will probably put some of the plants outside for some cold nights. When you take them inside to see how the cold affected their growth, you'll need to have some plants that were not exposed to the cold to compare them to. The plants that did not get exposed to the colder temperatures are considered a "control".
Sample Size
Your experiment will be much better designed if you have several "subjects" in your experiment.
For example, in a plant experiment, be sure to have many plants in the control group and in the experimental group.
Measurements
Explain how you will be measuring your independent and the dependent variables.
Materials
List the materials needed for the experimentation.

Trials
Be sure to allow enough time to do many trials. The experiment should be repeated as many times as possible.
IN YOUR PROJECT JOURNAL, WRITE DOWN THE STEPS OF THE PROCEDURE THAT YOU WILL FOLLOW TO CONDUCT YOUR EXPERIMENT. WRITE THE STEPS IN EITHER NUMBERED OR BULLETED FORM. Be sure to identify your control (if there is one), and your independent and dependent variables. Also include the controlled variables (constants). They can be shown separately from the procedure.

Step 6
Writing Your Abstract
Abstract: *An abstract is a one page, complete summary of your project, including your results.*
It is written after all experimentation is complete. It should include these characteristics: It is 50 – 250 words long. It is typed neatly, single spaced. It uses complete but concise sentences. It is written in the 3rd person (ex. : "The purpose of *this* experiment was to ...." instead of "The purpose of *my* experiment was to....")

These steps will help guide you to a well-written Abstract:
Write a sentence making a broad statement about the topic of the science project.
Write a sentence that focuses more narrowly on the particular project.
Write a couple of sentences that indicates the problem to be solved and the hypothesis that was given.
Write a very brief description of the methods used in the experimentation (NOT list-like as the procedure, rather a quick summary with the key steps mentioned.)
Write a few sentences indicating which variables were explored and compared and if the data gathered supported the hypothesis. These sentences summarize the results of the experiment.
Write a sentence that gives the conclusion of the work and a statement of the direction for future research.
Count the number of words for the sentences you just wrote. If needed, edit your abstract to be within the 50- 250-word count.
Put all the previous sentences in paragraph form.

Step 7
Writing a Bibliography
Giving credit to those who helped you, either through their research, books, or with an interview is very important. It is best to list them in a bibliography, or a comprehensive list of a*ny* books, newspapers, magazines, encyclopedias, online websites, or interviews that you used in your project. This also includes any non-copyrighted photos or drawings that someone else did. Every source that you used should be cited whether you quote them directly or not. Junior High and High school students in making their bibliography should use the APA format. There is a more complete list of APA format examples at www.thewritesource.com

Step 8

Science Project Display Board

Boards should include:

Title

Problem Statement or Question What is it that the experiment is about? What are you investigating and why (what are your goals for the research experiment?)

Background Research – this is a summary of the research that you did on your topic *before* you made a hypothesis. It includes why you chose the topic and what you already knew about the topic.

Hypothesis – a sentence to state what you think the answer to the problem is, based on your background research and prior knowledge

Experimental Procedure – the steps you followed to conduct the experiment, it should be very list-like and to the point. Include a description of the control group and the experimental group, including independent and dependent variables and the controlled variables.

Data and Analysis– the data you collected shown in a data table and graph. You should also include a brief explanation of what your data means. This should also include a summary of the data

Conclusion – this is not a statement to show you've "proven" something. This should include what the results showed and if your hypothesis was supported or not supported by your data. This part of the conclusion is mostly a summary of your analysis in simpler terms. Remember, scientists often conduct experiments where the data does not support the hypothesis. The conclusion should also include your analysis of *why* you got the results you did, what your next steps might be, and what applications your experiment might have.

a. What exactly did you do?
b. What observations did you make and what are your findings?
c. How do they meet or not meet your goals?
d. Are the findings what you expected?
e. Discuss the strategies you attempted in setting and carrying out your work (and how successful they were), your analysis, any unexpected results, errors, possible alternative findings, and explanation.
f. Discuss any revisions that

Abstract – This is something that elementary students need not worry about as much. Junior high students should practice it, and High school students should write a formal abstract. An abstract is a one page **summary** of your experiment, (**250 word maximum**) that includes: a. problem statement (purpose), b. procedure, c. data, d. conclusion

Bibliography – written in proper form

Student Check List

- ☐ Ask the "big question"
- ☐ Get approval from teacher, fill out the forms
- ☐ Research the topic
- ☐ Make the hypothesis
- ☐ Organize and Plan the experiment
- ☐ Conduct the experiment
- ☐ Keep track of data
- ☐ Do more than one trial
- ☐ Analyze the results
- ☐ Make conclusions
- ☐ Create Display board
- ☐ Practice your presentation