

"MAKE LIFE YOUR LAB"



HIGH SCHOOL HANDBOOK



Suggested Timeline

October:

- Begin brainstorming project ideas and choose a Science Fair question.
- Register for the High School Fair at <http://csdscience.weebly.com/high-school-science-fair.html> by the end of October.
- Complete research about your topic.

November:

- Accept invitation to the Digital High School Science Fair folder in CSD Docs.
- Write your Hypothesis and determine the materials that will be required.
- Design the experiment, including procedures.
- **FILL OUT ISEF PAPERWORK** at <http://isefa.herokuapp.com/login>. ISEF paperwork is required, and must be filled out PRIOR TO ANY EXPERIMENTATION. The ISEF paperwork is to ensure safety of students throughout the science fair process.

December:

- Begin experimentation and data collection.
- Keep a detailed science notebook throughout the experimentation process.

January:

- Analyze experimental data, graph data.
- Write conclusions based on research data and experimental data.
- Include some statistical analysis, which may include regression lines, statistical significance, etc.

One week before Fair:

- Create and upload a Google Slide presentation about your project for high school judging to your CSD Docs Digital Fair folder. Students who qualify to advance to the district fair in February will be required to create a display board about their project.
- Upload your laboratory notebook, either as a google doc, or a PDF to your Digital High School Science Fair folder.
- Use the Google Slides presentation guidelines found in your Google Folder for guidance.

After the Fair:

- Finalists will be publicized online and notified if they will be advancing onto the district science fair by the end of January.



Help from SLVSEF

The Salt Lake Valley Science and Engineering Fair offers the following support to science fair participants:

- Publishes project abstracts from former SLVSEF participants
- Help finding a lab
- Help finding a mentor
- Provides a scientific review committee to pre-approve ISEF paperwork for 9th-12th grade students prior to experimentation. If you have student projects that you feel may qualify to compete in the SLVSEF fair, please make sure that you have them use the scientific review committee that SLVSEF offers.

Please visit www.slvsef.org for information.



ISEF Paperwork

ISEF Forms:

Canyons School District requires that all students grade 9-12 fill out the appropriate ISEF paperwork, before their experimentation begins. You can find the ISEF paperwork at <http://isefa.herokuapp.com/login>

Scientific Review Committee:

The SLVSEF (Salt Lake Valley Science and Engineering Fair) Scientific Review Committee (SRC) is a group of adults knowledgeable about regulations concerning experimentation.

Beginning in the fall of 2009, the SRC will begin evaluating all senior division projects **before experimentation may begin**. The SLVSEF SRC will also review the documentation for these projects shortly before competition to ensure that students have followed all applicable rules and that the project is eligible to compete. Senior division projects using regulated research institutions or involving human subjects, vertebrate animals, potentially hazardous biological agents, and DEA-controlled substances will require additional forms and evaluation.

The SLVSEF SRC will pay special attention to the following items:

- ✓ Evidence of proper supervision
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Evaluation Rubric

Pts.	Evaluation Criteria	Excellent 17-20 points	Good 13-16 points	Fair 9-12 points	Poor 0-8 points
20 score	<p>Science Project:</p> <ul style="list-style-type: none"> • Objectives • Hypothesis (<i>question</i>) • Use of Resources* <i>*jr/sr projects only</i> <p>Engineering Project:</p> <ul style="list-style-type: none"> • Problem Statement (<i>design criteria</i>) 	<p>-- Clearly stated & well-written – Appropriate for grade level & original – Creative approach to problem solving</p> <p>I. Testable, clear, bounded hypothesis</p> <p>– A comprehensive, correctly formatted bibliography was included & footnotes are present in text and display – Student(s) used full resources available (e.g. labs, advisors, experts, scientific periodicals & texts, internet)</p> <p>A. Clear, original problem statement that meets potential users' needs B. Clearly defined design criteria and goals</p>	<p>– Lacking in 1 area: clarity, appropriate level, or creativity</p> <p>I. Hypothesis present, but not completely testable</p> <p>– Incomplete citations – Used most available resources – Most internet resources are scientific & reputable</p> <p>A. Statement is not original B. Goals/criteria are measurable but vague</p>	<p>– Lacking in 2 areas: clarity, appropriate level, and/or creativity</p> <p>I. Hypothesis incomplete or not testable</p> <p>– Minimal effort on citing sources – Used some available resources – Some internet resources are scientific & reputable</p> <p>A. Incomplete statement B. Goals/criteria are poorly defined/not measurable</p>	<p>-- Poorly conceived or lacking in all 3 areas</p> <p>I. Hypothesis missing or poorly defined</p> <p>– No sources or citations – Project suffered as a result of not using available resources – Internet resources are not scientific or reputable</p> <p>A. Statement missing or poorly defined B. Goals/criteria missing</p>
20 score	<p>Science Project:</p> <ul style="list-style-type: none"> • Design & Procedures <p><i>Experimental design & implementation (hypothesis testing)</i></p> <p>Engineering Project:</p> <ul style="list-style-type: none"> • Engineering process (<i>design & prototype</i>) 	<p>I. Exemplary, creative plan to support / refute hypothesis with valid testing II. Sequential experimental procedures are quantitatively and/or qualitatively listed, and connect hypothesis, data & results III. Procedures are logical and repeatable IV. Sample sizes, number of trials are sufficient. Valid control group. V. All other variables are carefully controlled</p> <p>A. Design goals & approach clearly stated & reproducible, alternatives considered B. Design creative, schematics / software provided (as applicable), well labeled C. Assembly details or set-up instructions for device are clearly laid out D. Photos provided or prototype on display E. Materials used in appropriate ways</p>	<p>I. Sufficient plan to support / refute hypothesis with all other criteria met, or II. Exemplary plan and 3 of 4 other criteria for excellence met, or III. Some improvements needed throughout</p> <p>A. 3-4 of 5 criteria required for excellence are met or B. Some improvements could be made</p>	<p>I. Sufficient plan with 3 of 4 other criteria for excellence met, or II. Exemplary plan and 2 of 4 other criteria for excellence met, or III. Major improvements needed throughout</p> <p>A. 1-2 of 5 criteria required for excellence are met or B. Existing information is incomplete, or needs major improvement</p>	<p>I. Sufficient plan with 1-2 of 4 other criteria for excellence met, or II. Plan information is unclear / missing / insufficient, or III. Criteria II-V are lacking or grossly deficient</p> <p>A. Description of design & implementation not included or inadequate to show how design works and/or if design meets requirements B. No engineering. Project was merely tinkering.</p>
20 score	<p>Science Project:</p> <ul style="list-style-type: none"> • Data & Results (<i>experimentation</i>) • Documentation* <i>*jr/sr projects only</i> <p>Engineering Project:</p> <ul style="list-style-type: none"> • Problem Solution (<i>testing and redesign</i>) 	<p>I. Experiments run are appropriate for hypothesis being tested II. Sufficient data. Repetition of experiments III. Correct & appropriate statistical tests run</p> <p>– Clearly written, complete and clear – Procedures are easy to follow – Comments, observations included – Records include dates, signatures</p> <p>A. Measures of performance/improvement have been made (including cost) B. Functionality is fully tested & validated C. Records on testing are included D. Prototype was redesigned or potential design improvements were identified</p>	<p>I. 2 of the 3 criteria for excellence met II. Some improvements could be made</p> <p>– 3 of 4 standards for excellence were met or – Some improvements could be made</p> <p>A. Final design works but has not been fully tested B. No advantage over original C. Some improvements could be made</p>	<p>I. 1 of the 3 criteria for excellence met II. Major improvements required</p> <p>– 2 of 4 standards for excellence were met or – Major improvements required</p> <p>A. Final design does not meet end user's needs B. No improvement over original C. Major improvements required</p>	<p>I. Incorrect experiments and data analysis for hypothesis II. Insufficient data</p> <p>– 1 of the standards for excellence were met or – No notebook or missing</p> <p>A. Little or no testing B. No records C. No redesigns</p>
20 score	<p>Science Project:</p> <ul style="list-style-type: none"> • Discussion & Conclusions <p>Engineering Project:</p> <ul style="list-style-type: none"> • Evaluation 	<p>I. Status of the hypothesis is correctly and logically addressed, and stated in an unbiased manner (confirmed / refuted) II. Completeness of work and validity of conclusions are substantiated III. Discussion is insightful, demonstrates clear understanding of research project, broader subject & suggested new work</p> <p>A. Significance, relevance, applications, utility, cost effectiveness, improvements, benefits and performance addressed</p>	<p>I. 2 of 3 criteria for excellence met, or II. Some improvements could be made</p> <p>A. Some evaluation areas not addressed</p>	<p>I. 1 of 3 criteria for excellence met or II. Overall information is lacking in quality and perspective</p> <p>A. Many evaluation areas not addressed</p>	<p>I. No discussion / conclusions provided</p> <p>A. No evaluation areas addressed</p>
20 score	<p>Science+Engineering:</p> <ul style="list-style-type: none"> • Interview • Display 	<p>Exemplary understanding... – Research findings / design results – Ability to interpret graphs, statistics, etc... – Related background information – Project rational, details & validity</p> <p>Exemplary display... – Creativity, clarity, logic, interpretability, construction, writing, graphics, grammar – All information directly relates to project</p>	<p>Good understanding... – Research findings – Ability to interpret graphs, statistics, etc. – Related background information</p> <p>Good display – Most information is appropriate, organized and easily accessible.</p>	<p>Fair understanding... – Research findings – Ability to interpret graphs, statistics, etc... – Related background information</p> <p>Fair display ... – Some information is appropriate, organized and easily accessible.</p>	<p>Poor understanding... – Cannot answer questions adequately and precisely – Does not incorporate display into interview – Unfamiliar with related background information</p> <p>Poor display... – Confusing, unorganized, incorrect or inappropriate information</p>



Projects often done by students

Projects should be experiments, NOT demonstrations and should reflect the student's own work and ideas. As an experiment the project is a collection and analysis of data. The following list outlines topics that are commonly seen at science fairs and ARE NOT necessarily unique ideas or projects. If your student does a similar project, make sure it is well thought out with a lot of data and multiple trials and has a creative twist.

1. Effect of music/talking on plants
2. Effect of light/dark/colored lights on plants
3. Effects of different liquids on plants
4. Effect of soda/coffee/etc. on teeth
5. Effect of running/jumping/music/video games on blood pressure, etc.
6. Strength/absorbency of paper towels
7. Which is better? Brand wars (popcorn, soaps, fertilizers, batters, etc.)
8. Basic maze running
9. Effect of color on memory/emotion/mood/etc.
10. Effect of color on food taste
11. Optical illusions
12. How music effects learning
13. Color choices of gold fish
14. Fingerprints and Heredity
15. Hovercraft design
16. Colonizing bacteria from doorknobs, hands, places around school
17. Mentos and Coke



Quality Project Abstracts

[Biochemistry] How Factors Influence The Effectiveness Of The Lactase Enzyme

The purpose of this experiment was to determine the efficiency of the lactase enzyme, with varying concentrations and temperatures of lactose. In depth the purpose was to see if the performance of the lactase enzyme would change if the temperature was changed or if there were less or more concentrations of the lactase enzyme used. To determine if the performance would change, glucose test strips were used to determine the concentration of glucose in the milk. Lactase enzymes break down milk sugar (lactose) into glucose, making it digestible for people with lactose intolerance. To do this experiment glucose test strips were used to determine the level of glucose for lactose-free soymilk, 1% milk, 2% milk, and whole milk (4% milk), before and after putting in lactase enzyme tablets. The main purpose of this project was the exploration of an enzyme function. Testing the effect of concentration of lactase enzyme and effect of temperature can show the characteristics of an enzyme. But, the big picture of this project was linked to lactose intolerance. What can possibly be done to help all the people around the world that have lactose intolerance? What can make lactase enzyme be more effective? People who have trouble digesting food containing dairy products can take a lactase enzyme tablet or drop to help increase their tolerance of lactose based food. This experiment shows that taking a certain amount of a lactase enzyme or taking a lactase caplet at a specific temperature can help the effectiveness of it.

[Cellular & Molecular Biology] The Effects Of Sulforaphane On Dna Damage In Zebrafish

Ultraviolet radiation (UVR) is the leading environmental cause of skin cancer, the most common cancer in the world. One of the ways that UVR leads to skin cancer is by causing oxidative stress that results in mutations in DNA. It is currently unknown whether sulforaphane, an antioxidant derived from broccoli sprouts, can reduce DNA damage from UVR. The hypothesis underlying this project is that if zebrafish embryos are pre-treated with sulforaphane before they are exposed to UVR, then they will be protected against the UV damage as measured by cell death and DNA damage. Cell death was measured by acridine orange staining of whole embryos followed by fluorescence microscopy. DNA damage was determined by Southwestern blot analysis utilizing an antibody directed against DNA cyclobutane pyrimidine dimers (CPDs). A zebrafish UVR assay was developed by evaluating multiple UVR doses and time courses of treatment. Once optimized, a sulforaphane dose-response treatment course revealed that embryos pretreated with 10-60 micromolar sulforaphane (prior to 30 minutes of UV exposure after 4 hours) had less cell death than non-treated controls. The DNA damage assay did not work well on the zebrafish DNA and possible reasons for this failure are explored.

[Computer Science] Improving Genetic Algorithms

The project examines the application of biology to genetic algorithms, especially the importance of mutation scaling in a genetic algorithm. Genetic algorithms are computer simulations of a population which migrate towards a general solution. The idea comes from the Darwinian theory of evolution in which a population evolves so that each individual has a better chance of surviving in the environment. Genetic algorithms are usually applied to problems which have complex solutions, or a ridiculously large search space. I wrote an algorithm that tested the effects of mutation scaling, and tested it against an algorithm that did not utilize mutation scaling, making changes for optimization. I found that mutation scaling is a promising way of drastically increasing the efficiency of a genetic algorithm, made more efficient by changing other variables in the algorithm as well. The theory of mutation scaling worked well in many diverse population spaces, suggesting that continued research into this area is promising.

[Environmental Sciences] The Albedo Of Ice And Soot

My project, "The Albedo of Ice and Soot" determines whether various concentrations of ash and coal dust coating the surface of ice causes that ice to melt more quickly in the presence of sunlight. I did this experiment to investigate if the deposition of air pollution can increase the loss of ice and snow pack.

[Medicine & Health Sciences] Dance Vs. Soccer: Comparison Of Hamstring To Quadricep Strength Ratios In Young Female Dancers And Soccer Players Using Surface Electromyography

Non-contact anterior cruciate ligament injuries occur at a 2-8 times higher rate in female athletes vs. male athletes. Female characteristics that are thought to contribute to this are: 1. greater Q- angle from pelvis to knee, 2. narrower femoral codylar notch, and 3. lower hamstring to quadricep strength ratio resulting in quadricep muscle dominance and decreased dynamic stability at the knee. In our experiment, we wanted to compare the HS/Quad strength ratio between female dancers (who have a low incidence of ACL injuries) and female soccer players (who have a much higher incidence of ACL injuries), hypothesizing that the dancers would demonstrate a stronger HS/Quad strength ratio than the soccer players. Our test subjects consisted of 11 female soccer players from Park City Soccer Club and 14 dancers from Park City Dance Academy, all between ages of 11-15 yrs. Using 2 leads from our surface electromyography equipment, we simultaneously tested muscle activity of both the hamstrings and quadriceps muscle groups during 3 consecutive repetitions of a single leg squat. Then, using the averages recorded by our sEMG program of the strength generated by these muscle groups (measured in microvolts), we calculated the HS/Quad strength ratios of each participant.



Guidelines and Safety

***Failure to abide by the guidelines will result in disqualification.**

1. Individual projects must be the work of a single student.
2. Team projects must consist of no more than 3 participants.
3. All work presented must be the student's work.
4. Parents can be guides. Adults can supervise the investigation, but not take part except in cases of safety.
5. Parents should not participate in the preparation of the presentation, except to help collect materials and act as an audience for practice.
6. Students must cite research, using the rules that the teacher provides.
7. Students must keep dated, step-by-step log book recordings of the project including all references, procedures, dates, and other relevant materials.
8. Students may have procedures performed by a scientist or other person(s) that he/she did not perform. Credit must be given to the scientist or any other person performing any part of the student's research, collection of data, experimentation, analysis of data, etc.
9. Students should not work with hazardous, controlled, or regulated substances.
10. Students should not experiment on vertebrates (animals with backbones).
11. Students should never grow bacteria at home. All bacteria should be contained in a laboratory, where colonies can be properly disposed of.
12. Students should not employ any procedures that would place them in danger.



Science Fair Categories

1. Animal Science (AS)
2. Behavioral & Social Sciences (BSS)
3. Biochemistry (BC)
4. Cellular & Molecular Biology (CMB)
5. Chemistry (C)
6. Computer Science (CS)
7. Earth & Planetary Science (EPS)
8. Energy & Transportation (ET)
9. Engineering: Electrical & Mechanical (EEM)
10. Engineering: Materials & Bioengineering (EMB)
11. Environmental Management (EM)
12. Environmental Sciences (ES)
13. Mathematical Sciences (MS)
14. Medicine & Health Sciences (MHS)
15. Microbiology (MB)
16. Physics & Astronomy (PA)
17. Plant Sciences (PS)



My Timeline

Determine dates out a timeline to ensure that your project is complete by the deadline.

Due Dates:

- _____ Purchase a science fair log book or create a digital log book in Google Docs
- _____ Select a topic and an experimental question
- _____ Complete your research report
- _____ Write a bibliography
- _____ Form a hypothesis
- _____ Determine independent/dependent/and constant variables
- _____ Design your experiment
- _____ Complete ISEF Paperwork (9-12th grade only)
- _____ Observe and collect data
- _____ Make a visual representation (graph) of your data
- _____ Review and analyze data to determine a conclusion
- _____ Upload Google Slide Presentation & Lab Notebook to CANVAS



Science Fair Log Book

A science log book is a hand-written/typed, start to finish, dated record of all the work done on your project, and is the most valuable part of your science fair project. It will need to be neat and easy to read, as you'll need all the information to synthesize a conclusion, and it will also be displayed at the science fair with your display board.

Things that should be included:

- ✓ Brainstorm lists of potential topics, ideas, areas of interest, etc.
- ✓ The topic you chose and why
- ✓ Project title and problem statement
- ✓ Research notes from literature pertaining to the project, including references and citation
- ✓ Questions you have as you're researching
- ✓ Identification of variables
- ✓ hypothesis, materials list, procedure
- ✓ Data tables and data summary
- ✓ Pictures that were taken, or drawings that you did
- ✓ Graphs
- ✓ Observations (similar to a diary)
- ✓ Thoughts and reflections

Notebook Tips:

- ✓ Don't remove any pages. Simply put a line through errors
- ✓ All pages should be numbered before any data is entered
- ✓ All entries should be dated
- ✓ Each new entry should begin on a separate page
- ✓ Use more than one notebook if necessary
- ✓ Don't put rough drafts of the research paper in the notebook



Selecting a Topic:

One of the most difficult parts of a science project is to select a topic of interest, and a question to research. Begin by writing a list of things you're interested in, and then think of possible questions for those topics that might make for interesting projects. When determining your topic and question, please consider the guidelines and safety requirements:

- ✓ Individual projects must be the work of a single student.
- ✓ Team projects must consist of no more than 3 participants.
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- ✓ Parents can be guides. Adults can supervise the investigation, but not take part except in cases of safety.
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*If you need to conduct your experiment in a laboratory, or need a mentor to help you complete your experiment, visit www.slvsef.org.



Research

Once you have decided what topic you'd like to research, you can begin to do research on your topic. Find out everything you possibly can on the topic, and as you're researching, write down any ideas you might have for what specific question you'd like to do your experiment on.

You are expected to find information from at least 5 sources. Make sure to gather all information that will be required to create a bibliography as you are researching.

Seek out advice from professionals, go to the library, read books, find magazine articles, look through published studies, etc. Pioneer library, which can be accessed through uen.org is a great place to find published literature on many topics.

Write a background summary in your log book which includes:

- ✓ historical background - important people and their findings
- ✓ factual summary - major terms and definitions, and an explanation of any science concepts needed to understand your experiment
- ✓ summary of importance - what is important or significant to mankind about this topic? Why is this experiment worth doing?

Record information for each source that you will need when writing a bibliography.



Writing a Bibliography

- Write a bibliography for all the sources you used in your research

A bibliography is a list of all the sources you looked at when writing your report. Sources are listed in alphabetical order by the author's last name or by the title, if no author is given. It is to be double-spaced and the second line of each listing should be indented one-half inch. The bibliography is the last page of your written report. Below are examples showing how to write a citation for several different types of sources.

Magazine: Author's last name, first name. "Article Title." Magazine Title. Date:
Page numbers.

Newspaper: Author's last name, First name. "Article Title." Newspaper name. Date:
Page.

Interview: Interviewee's last name, First name. Personal Interview. Data.

Book: Author's last name, First name. Title. Place of publication: Publisher,
Copyright date.

Internet: Author's last name, First name. "Document Title." Title of Site. Date of
Document. Address. Date of access.



Problem Statement & Variables

Identify your variables:

✓ In your experiment you will be altering one variable. Lets say you are interested in skateboards, and want to know if altering the shape of your skateboard will help with performance of some tricks. The shape of your skateboard is what you will alter. At the same time, you must keep other variables constant, like the number of wheels on the skateboard, the type of trick you'll be doing, the rider of the skateboard, etc. When you think you know what variables may be involved, think about ways to change one at a time. This will help you determine your problem statement.

✓ The one condition that you choose to manipulate or alter in your experiment is called the **independent variable** (shape of the skateboard). What you will observe and measure in your experiment is your **dependent variable** (trick performance). Conditions that you will keep the same throughout your experiment are called **constants**(type of trick, rider of the skateboard, etc). Choose your variables carefully.

write your problem statement in the form of a question:

✓ “What is the effect of (the independent variable) on the (dependent variable) of/in (your object or system you are studying)? ”



Procedure & Materials

A procedure is a step-by-step list of what you are going to do in your experiment. It must be so specific that someone else could repeat your experiment in exactly the same way you did.

Write your procedure.

- ✓ Number each step and give very specific instructions
- ✓ All methods need to be explained in detail (like how to use a certain piece of machinery, etc.)
- ✓ Begin each sentence with a verb (fold, aim, collect, conduct)
- ✓ Write in the third person, do not use I, me, we, etc.
- ✓ All measurements should be in the metric system
- ✓ Repeat your experiment at least 3 times to ensure accuracy and obtain average results
- ✓ Be sure you have a control

Write a list of all the materials you will need in order to perform your experiment.

- ✓ Have your parents sign your list of materials in your log book to acknowledge they approve of the equipment you will be using.
- ✓ Check with your science teacher if you need any special equipment or supplies.



Complete ISEF Paperwork

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Data Collection & Experimentation

Before beginning the actual experiment, you will need to design a data table for recording your observations, measurements, etc.

Create your data. Make sure it includes:

- ✓ Have a title describing the data that will be collected
- ✓ Each change of the independent variable should be a column heading, and each row is a trial or sample
- ✓ Make sure you include metric units

Collect your data! Don't take any shortcuts that might produce errors in your data. Repeat your experiment and run enough trials until you are sure you have enough data to allow you to form a reliable conclusion. Tips:

- ✓ Take photographs of your materials, and of anything else you might think be important to help determine the results of your experiment.
- ✓ Record all measurement on your data table in your log book.
- ✓ Calculate the average result for all your trials.
- ✓ Your data should also include written observations of what you noticed during the experiment:
 - ✓ What did you see happening?
 - ✓ What was unexpected?
 - ✓ What problems did you encounter?
- ✓ Keep careful notes of everything you do, and of everything that happens, as they will be helpful when determining your conclusion.



Graph & Data Summary

A graph is a visual display of your averaged data.

- Determine which type of graph you will use to appropriately display your data.
 - ✓ Line Graph: Use when tracking changes over short or long periods of time
 - ✓ Pie Chart: Use when comparing parts of a whole
 - ✓ Bar Graph: Use when comparing things between different groups
 - ✓ Scatter Plot: Use when determining relationships between two different things.
- Appropriately label your graph:
 - ✓ Title your graph
 - ✓ Label the independent variable on the x-axis (horizontal axis) with its unit of measurement.
 - ✓ Label the dependent variable on the y-axis (vertical axis) with its unit of measurement
 - ✓ Use an appropriate number scale by determining what the smallest and largest data points are
- Plot your data
- Write a statement describing any trends you see in your graph



Conclusion

A conclusion is a reaction to the hypothesis and a connection between the results of the study and the background information that was gathered. It also discusses why the results of the study are significant or important.

Write your conclusion, which should include:

- ✓ Restating your hypothesis, and whether it was or was not supported
- ✓ Explain how your results support or do not support your hypothesis
- ✓ If your hypothesis was not supported, explain why you think this may have happened
- ✓ tell how your results and your conclusion relate to facts in your background information
- ✓ Describe how your findings are significant or important
- ✓ Describe what you might do differently next time
- ✓ Discuss any difficulties or problems you had during the experiment
- ✓ What sources of error could have affected your results
- ✓ What new questions occurred to you while doing the experiment



Components of Experimental Report

Your formal report should present in detail your purpose, the process, and any findings from your experiment. This is required for all secondary projects.

Your report should include:

- Title Page
- Table of Contents
- Acknowledgements (if needed)
- SLVSEF paperwork (7th - 8th) or ISEF paperwork (9th - 12th)
- Background information
- Method of Investigation
 - Problem statement
 - Variables
 - Materials
 - Procedure
- Results
 - Data tables
 - Observations
 - Graphs
 - Summary of results
- Conclusion and Scientific worth
- Bibliography
- Appendices (if needed)



Format of Experimental Report

- Neatly typed on 8.5" by 11" white, unlined paper
- 1" margins except for a 1.5" left margin
- Numbered pages
- Section titled underlined or in bold
- Double space between sections
- Writing style is clear, concise, and objective
- Proper sentence and paragraph structures
- Correct grammar and spelling
- All writing is in the third person
- Underline or italicize scientific names
- Correct bibliography form
- Finished report in folder or report cover



Submitting My Work for the Digital High School Fair

- Once you've registered to participate in the high school science fair, you'll be invited to the Digital Science Fair Google Doc folder.
- You will be required to submit 2 items through Google Docs:
 - Google Slide (powerpoint) presentation.
 - Please follow the Google Slide Guidelines found in your folder.
 - Lab Notebook.
 - Lab Notebooks can be scanned and loaded as a PDF, or can be created in a Google Docs.