2018-2019

Centennial Hills
Science Fair Project Guide
(Grades K - 4)

Math, Science, and Technology play an important role in CASLV's mission. For this reason, all students will complete a science fair project this year. Your task is to research, design, and conduct your own science fair project. In February, the best projects from each class will be evaluated by a group of judges to select the winning projects in each grade. Those projects will go on to UNLV to represent Coral Academy in the Southern Nevada Regional Science Fair!

This packet will serve as your Science Fair Project Journal for grades K-4.

At the end of the project, you must turn in:

1) This packet
2) The final draft of your Science Fair Report
3) Your Display Board.

Name: _____

Grade: _____

Teacher: _____

2018-2019 CASLV - Elementary School Topic Guidelines

1. **NO VERTEBRATE PROJECTS WILL BE ALLOWED**. A vertebrate is an animal that contains a backbone. PEOPLE are VERTEBRATES. Therefore, no projects involving people will be accepted. This includes memory tests and gender surveys. Other vertebrates include fish, birds, reptiles, amphibians, and all other mammals.

2. Invertebrates are acceptable such as worms, insects and mollusks **where no injury to the animals are involved**.

3. **NO MODELS** will be accepted such as solar systems or volcanoes.

4. **NO INVENTIONS** will be accepted. Although there is a category for this as part of the UNLV sponsored event, for CASLV, students are to focus on experiments and the scientific method.

5. **Use of Petri Dishes** - Per UNLV College of Science, our regional Science Fair host: “Using Petri dishes or cell culture dishes can be dangerous and harmful to participants and those around the if not handled in the correct manner or supervised by a qualified individual. Projects that involve the use of Petri dishes will NOT be allowed at the Beal Bank USA Southern Nevada Regional Science & Engineering Fair unless a medical doctor or another adult with a Ph.D. in the sciences supervises the student and his or her project.” Reference: https://www.unlv.edu/sciences/schools

2018-2019 CASLV Science Fair Project Planner

This planner is to inform you with the due date of each section. Teachers may grade sections per their discretion.

✓	Due Dates	TASKS
STEP 1 (PROJECT QUESTION)		
	Due Date ***Friday, October 26, 2018*** Refer to pages 8-9	Identify the problem.
		Write project question.
		Get approval from your teacher.
STEP 2 (PROJECT RESEARCH)		
	Due Date ***Friday, November 9, 2018*** Refer to pages 10-12	Research your problem.
		Record Facts
		Cite Sources
STEP 3 (PROJECT HYPOTHESIS)		
	Due Date ***Friday, November 16, 2018*** Refer to page 13	List variables
		Write Hypothesis.
		Get approval from your teacher.
STEP 4 (PROJECT DEVELOPMENT)		
	Due Date ***Friday, November 30, 2018*** Refer to pages 14-15	Write out material List.
		Write out experiment procedure.

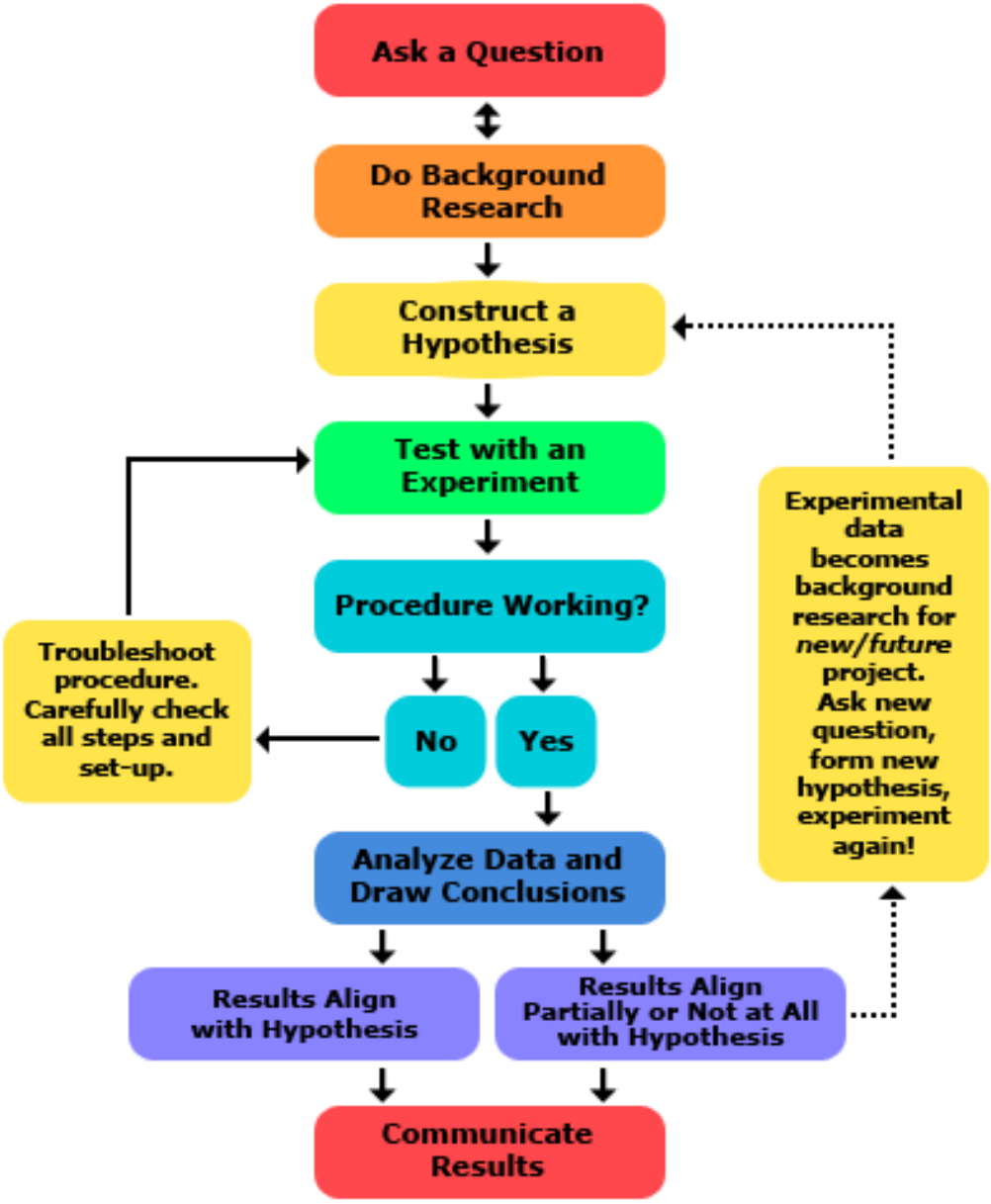
STEP 5 (PROJECT EXPERIMENT)		
	Due Date ***Friday, December 14, 2018*** Refer to pages 16-22	Conduct Experiment 1st time and record data
		Make observations
		Conduct Experiment 2nd time and record data
		Make observations
		Conduct Experiment 3rd time and record data
		Make observations
STEP 6 (PROJECT RESULTS)		
	Due Date ***Friday, December 21, 2018*** Refer to pages 23-25	Determine the results of your experiment
		Create a table, chart, or graph of the data.
		Draw conclusions.
STEP 7 (RESEARCH PAPER)		
	Due Date ***Friday, January 25, 2019***, Refer to pages 26	Rough Draft of Final Research Paper
		Teacher Approval of Rough Draft
	Due Date ***Friday, January 25, 2019***, Refer to page 27	Abstract writing
	Due Date ***Friday, February 1, 2019*** Refer to pages 28-39	Final Research Paper Final Draft
STEP 8 (DISPLAY BOARD)		
	Due Date ***Friday, February 8, 2019*** Refer to pages 30-32	Make the project display.

2018-2019 Science Fair Logbook Rubric

The following rubric is being graded by section as you complete each task in this packet. Once the project is completed there will be 2 separate rubrics for the completed Science Fair projects: Research Report, and Display Board. **Teachers may grade sections per their discretion.**

	4	3	2	1	Score
State a Problem/Create Testable Question & Get Approval from Your Teacher.	Independently identified a question which must be: original, can investigated by a science experiment, is measurable & specific.	Independently identified an question that could be investigated by an experiment.	The student identified a problem but did not write it in question form.	Identified a question that could not be tested/investigated or one that did not merit investigation.	
Background Research	Four or more facts were recorded in the student's own words.Three or more sources were cited correctly.	Four facts were recorded in the student's own words. Three sources were cited correctly.	Four facts were not recorded in the student's own words OR three sources were cited incorrectly.	Not enough facts were recorded AND sources were not cited correctly.	
Hypothesis	The hypothesis is original and must contain the if/then/because statement supporting dependent/independent variables & relates back to your original problem.	The hypothesis must contain the following: if/then/because statement supporting dependent/independe nt variables & relates back to your original problem.	The hypothesis is missing one component listed.	Hypothesis is written incorrectly.	
Materials/ Procedures	Materials are listed numerically and procedures are listed chronologically.	Materials and procedures are listed but formatted incorrectly.	Either materials or procedures are missing.	No materials or procedures are listed.	
Experiment	Experiment tests the hypothesis and must have at least three trials.	Experiments tests the hypothesis and has at least two trials.	Experiments tests the hypothesis and has one trial.	The experiment doesn't test the hypothesis.	
Results/ Data	Provided detailed written analysis of results. Provided an accurate, easy-to-follow chart or graph with labels to illustrate the procedure or the results of the experiment.	Provided analysis of results. Provided an accurate chart or graph with labels to illustrate the procedure or the results of the experiment.	Provided limited analysis of results. Provided a chart or graph, but was unclear and difficult to follow.	Did not provide a chart or graph OR the chart or graph was incomplete.	
Final Report	Formal Research Report Rubric will be used.				
Project/ Display	Please see separate Project Board Score Sheet				

Steps of the Scientific Method



From Science Buddies: https://www.sciencebuddies.org/science-fair-projects/science-fair/steps-of-the-scientific-method?gclid=EAIaIQobChMIyvf90M_A3QIVFoTICh3_MQukEAAYASAAEgJUrfD_BwE

Types of Science Fair Projects

Demonstration

Most scientific demonstrations are simple laboratory demonstrations intended to demonstrate physical principles, often in a surprising or entertaining way. They are carried out in schools and universities, and sometimes in public demonstrations in popular science lectures and TV programs aimed at the general public. Many scientific demonstrations are chosen for their combination of educational merit and entertainment value, which is often provided by dramatic phenomena such as explosions.
Example: YouTube versions of Mentos & Diet Soda exploding soda bottles, or glow in the dark slime.

Investigation

An investigation is observing or studying the natural world, without interference or manipulation.

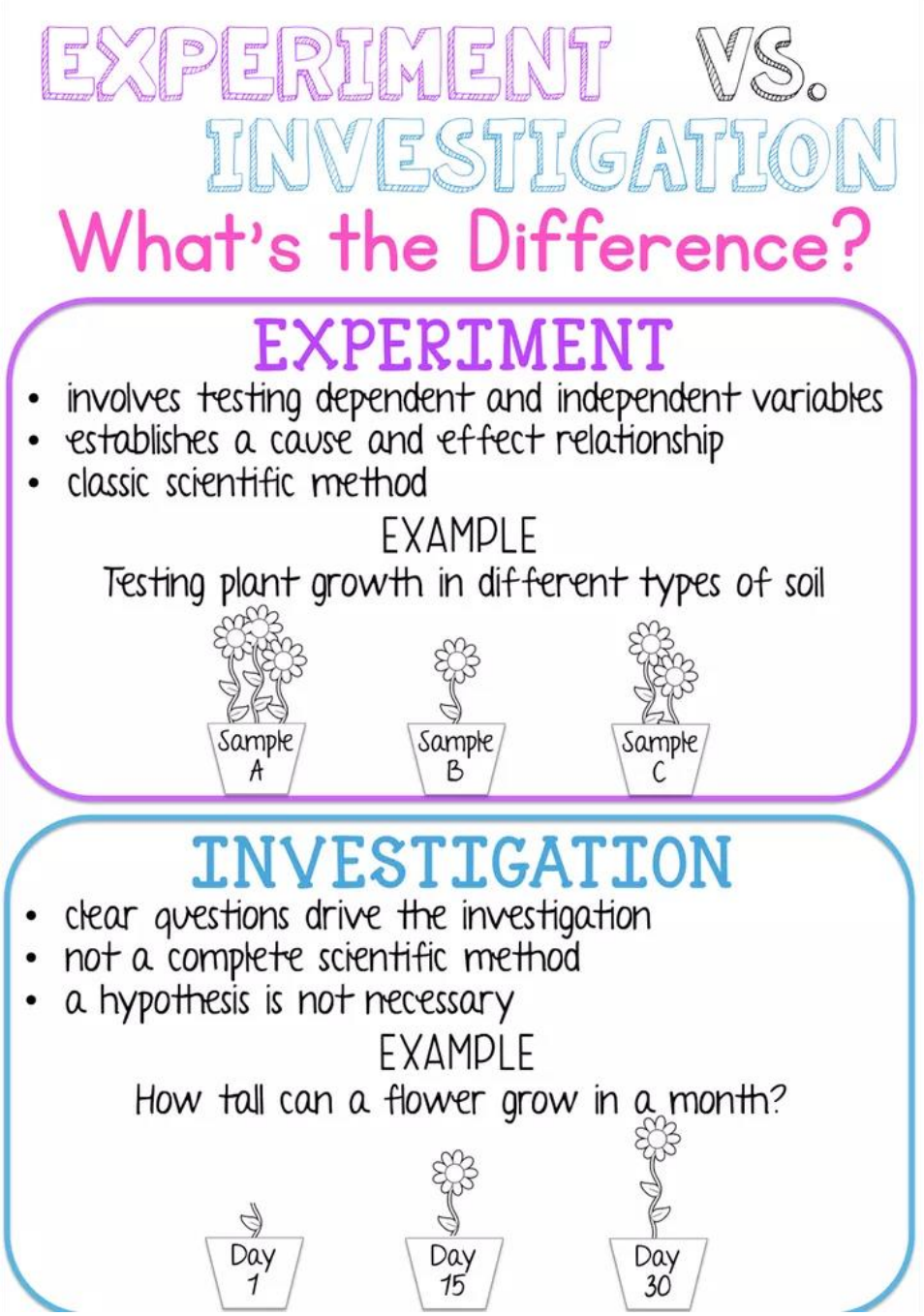
An **investigation** is observing or studying the natural world, without interference or manipulation, and an **experiment** is an **investigation** that involves variables (independent/manipulated and dependent/outcome) and establishes cause-and-effect relationships (Schwartz, 2007).

An inference is an idea that is formed from facts or evidence.
- Facts are indisputable ideas.
- Evidence is proof that supports an idea.
- An inference is NOT a fact. It is a thoughtful idea that may or may not be true. It is not based on personal beliefs or assumptions.

The Process of Making Inferences
- Making inferences is an important scientific practice.
- Scientists ask questions about the natural world. Scientists make inferences to answer those questions.
- Scientists uses observations to support their inferences. They use information about the natural world to make a case for why they believe their inference answers questions about the natural world.
- Sometimes scientists conduct experiments to see if their inference is true. An inference that can be tested and proven or disproven is called a hypothesis.

Experiment

An experiment is a procedure carried out to support, refute, or validate a hypothesis. Experiments provide insight into cause-and-effect by demonstrating what outcome occurs when a particular factor is manipulated. Experiments vary greatly in goal and scale, but always rely on repeatable procedure and logical analysis of the results.This is the most common type of project, where you use the scientific method to propose and test a hypothesis. After you accept or reject the hypothesis, you draw conclusions about what you observed.
Example: Determining whether or not a cereal contains the amount of iron per serving listed on the box.



Created by Melissa Mazure of Learning Lab Resources - http://learninglabresources.com/2014/09/science-experiment-vs-investigation-whats-the-difference.html

Project Question

Think of a Question. Your question will drive your entire project. Make sure that your question is something that can be measured, tested, and answered by following the scientific process. You may use the project question for your project title.
Brainstorm some possible questions that you are interested in learning more about.

Make Your Topic Specific
A specific topic only alters one thing.
Examples:

- Space: How does the phase of the moon affect the tides?
- Animals: Does the length of an animal training session make a difference?
- Weather: Does weather affect test scores?
- Plants: What is the best soil for plant growth?
- Electricity: Which type of battery generates the most electricity?
- Rocks: What happens when rocks freeze and thaw?

Make Your Topic Measurable
Can your topic be measured with a tool or observed using your senses?
Make Your Topic Testable
Questions that we ask in science must be TESTABLE. This means that we can create an experiment so that we can TEST our question. Asking WHY questions should really be avoided. Here's an example of how you might reword your question to make it testable.

ORIGINAL QUESTION: "Why does bubble gum lose its flavor?" (Not testable.)
REVISED: "Which brand of bubble gum has flavor that lasts longest?" (Testable!)

STEP 1

Once you have decided on your project question, write it on the lines below and then get approval from your teacher to begin your project.

_____

_____

_____

_____

_____

_____

Is your topic:

- ❑ **Original?**
- ❑ **Able to be investigated by an experiment?**
- ❑ **Measurable?**
- ❑ **Specific?**

_____**Teacher Approval**

Project Research

You've picked a topic & written a problem question. Now it is time to research your problem as much as possible. Becoming an expert at your topic is what real scientists do in real labs.
Here are some tips for conducting research:

- Look for general information about your topic/question.
- Find others who have already experimented about a similar problem (prior research).
- Try to find information that applies directly to your question.

(You need at least 3 sources!)

Research Notes

You will need to find four facts about your topic. These facts will be used to write your final paper. It is recommended that you write the research portion of your paper while conducting this research. (Amount of paragraphs, detail of facts, and conventions required will increase according to grade level.)

Grades K-1	One paragraph total (minimum)
Grades 2-3	Two paragraphs total (minimum)
Grade 4	One paragraph per fact

Prior knowledge of the topic. (What did you already know?)

STEP 2

Fact 1 (Written in your own words)

Fact 2 (Written in your own words)

Fact 3 (Written in your own words)

Fact 4 (Written in your own words)

Citing Evidence

Locate the information about your science fair project using the following resources (books, magazines, internet websites, interviewing an expert, etc.) Feel free to add more if needed. Use MLA format for citations.

Source #1: _____. (_____)._____
Author (Last, First) or Company Name Date Title of book or website

_____
Book publisher or web address

Source #2: _____. (_____)._____
Author (Last, First) or Company Name Date Title of book or website

_____
Book publisher or web address

Source #3: _____. (_____)._____
Author (Last, First) or Company Name Date Title of book or website

_____
Book publisher or web address

Source #4: _____. (_____)._____
Author (Last, First) or Company Name Date Title of book or website

_____
Book publisher or web address

For help with citations:
http://www.citationmachine.net/mla/cite-a-website

Project Hypothesis

Variables *Fill in the table with the appropriate information from your own experiment.*		
Independent Variable *(What will you be changing in the experiment. Note: There should only be one item listed here)*	**Dependent Variables** *(What will you be measuring or observing)*	**Controlled Variables** *(What will you be keeping the same during the experiment)*

An "If… then…because" statement in a hypothesis tells the readers what you believe will happen in an investigation when something is changed, so you can see the effect of the change.

- **IF**…tells the readers what will be changed. This is the *manipulated* (independent) *variable* in the investigation.
- **THEN**… tells the reader what will happen because of the change (manipulated variable) described in the If… statement. This is the *responding* (dependent) *variable* in the investigation.
- **BECAUSE**… tells the reader how you know this will occur. It should be based on something you have experienced, or perhaps something you infer.

Your Hypothesis *(Fill in the blanks with the appropriate information from your own experiment.)*
If (Independent Variable) _____ Then (Dependent Variable)_____ Because _____

_____**Teacher Approval**

Project Development - Materials List

List all materials needed to complete the experiment. Be specific about type, size, brand, etc.

STEP 4

Project Development - Procedure

Write out each step of your experiment. Remember to number each step and clearly explain what to do. Other scientists should be able to follow the same steps and get similar results.

Project Experiment

Conduct your experiment 3 TIMES.

Scientists conduct an experiment many times in order to get the most accurate data, so make sure you also conduct your experiment at least 3 times.
During your experiment you will collect data and make observations. After you have completed the experiment each time write down the data and observations below.

You will need to:

- Collect Data --- you will need to collect numerical data; that means you need to take measurements during the experiment. Measurements can be temperature, distance, height, etc. Creating a chart is a helpful way to organize your data. You will analyze the data later to determine the results of your experiment.

- Make Observations --- as you conduct your experiment you will use your senses (sight, smell, touch, etc.) and write down any observations you make during the process.

STEP 5

Data (1st time)

STEP 5

Observations (1st time)

STEP 5

Data (2nd time)

STEP 5

Observations (2nd time)

STEP 5

Data (3rd time)

STEP 5

Observations (3rd time)

Project Results

Now it is time to review your data and observations to find out what happened during the experiment.

Write out the results of each test in the experiment in paragraph form using complete sentences. Make sure that you include the numerical data (measurements) as well as any other important observations that you made.

STEP 6

Think about the best way to show your data: bar graph, line graph, chart, etc. and then create a table or a graph below. This visual will help you analyze your data for trends.

Draw Conclusions

Analyze the results and determine how the results helps you answer your project question. Write your answer in a complete sentence using the question to begin your answer. You also need to tell whether your hypothesis was supported or if the results contradict the hypothesis. If it was not supported, explain why you think so. End this paragraph by saying how you would change or improve your experiment in the future.

Answer to your project question:

Did the results support or contradict the hypothesis (yes or no)?

Explain.

How would you improve or change the experiment?

Final Research Report

At this point, you are in the home stretch. Except for writing the abstract, preparing your science fair project final report will just entail pulling together the information you have already collected into one large document.

- Your final report will include these sections:
  - Title page (include your name, the title of your project, and your teacher's name).
  - Abstract. An abstract is an abbreviated version of your final report and summarizes all the information in the report, including the results of your experiment and your conclusions (from Step 7).
  - Table of contents.
  - Question, variables, and hypothesis (from Steps 1 and 3).
  - Background research. This is the project research you wrote before you started your experiment (from Step 2).
  - Materials list (from Step 4).
  - Experimental procedure (from Step 4).
  - Data analysis and discussion. This section is a summary of what you found out in your experiment, focusing on your observations, data table, and graph(s); make sure to include data tables and graphs in this section (from Steps 5 and 6).
  - Conclusions (from step 6).
  - Ideas for future research (from Step 6).
  - Bibliography in MLA format (from Step 2).

- Write the abstract section last, even though it will be one of the first sections of your final report.
- Your final report will be several pages long, but don't be overwhelmed! Most of the sections are made up of information that you have already written. You just need to type it up or rewrite it neatly by hand.
- Save your document often! You do not want to work hard getting something written the perfect way, only to have your computer crash and the information lost. Frequent file saving could save you a lot of trouble!
- Remember to do a spelling and grammar check. Also, have a few people proofread your final report. They may have some helpful comments!

Project Abstract

The abstract is a short version of your science fair final report. It should be no more than 250 words. Most of the information you will put in your abstract is already written, you will need to copy it over. You must have the following five components in your abstract:

- Introduction
- Project Question
- Procedures
- Results
- Conclusions

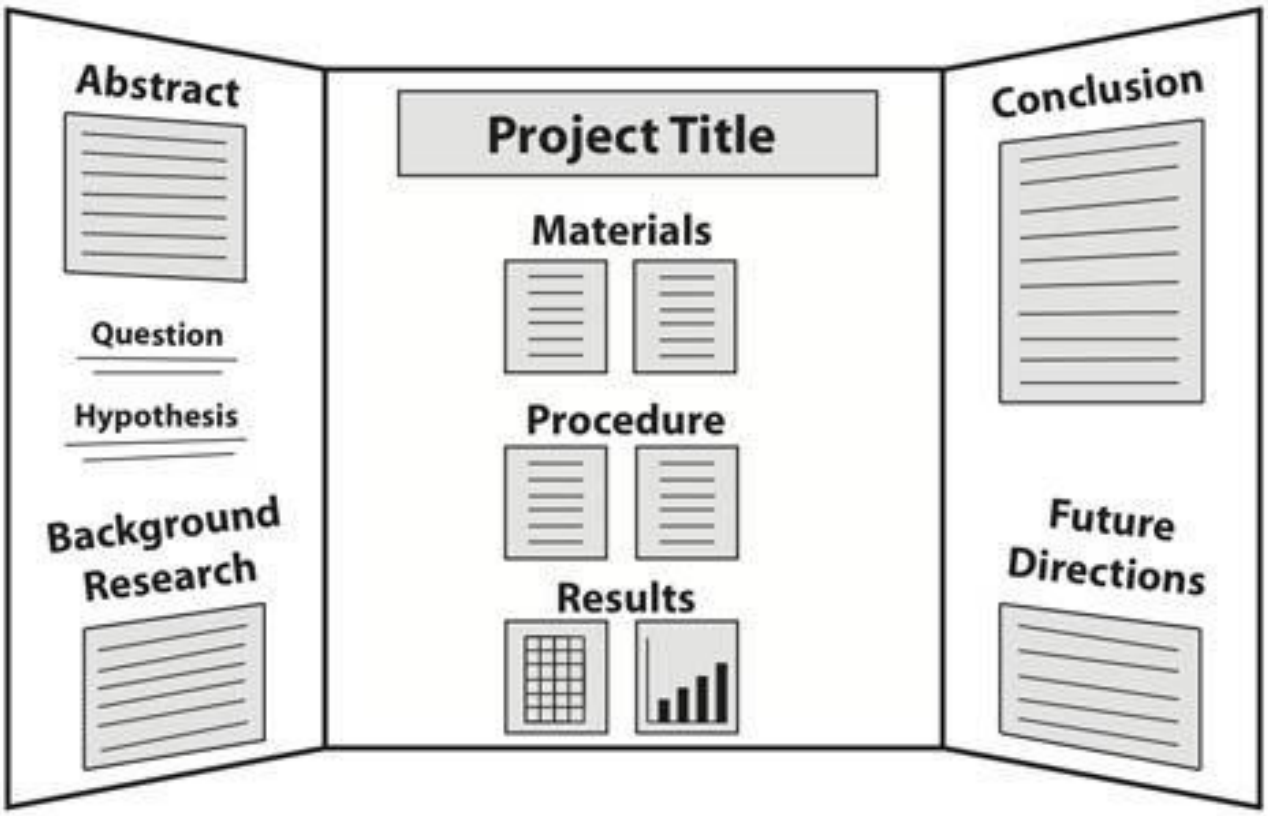
The only new thing you will need to write is the **Introduction**. This is where you describe the purpose for doing this experiment or project. Tell why people should care about the work you did. How does your experiment give us new science information? Can this information be used to improve our lives? If so, how? This is where you want to interest the reader in your project and motivate them to read the rest of it.

Final Research Report Rubric

	4	3	2	1	Score
Abstract	The abstract includes a summary of the project, the results of the experiment, and a conclusion.	The abstract may be missing the summary, results, or conclusion.	The abstract only includes one of the following: summary, results, or conclusion.	No abstract is included.	
Introduction {Question asked, hypothesis}	Report clearly outlined a testable question and why they chose their topic. Includes an original, plausible hypothesis.Writing was easy to follow and organized.	Report outlined a testable question, why they chose their topic, and a hypothesis but student needed a little direction to expand upon their writing	Report introduction only outlined the question that was being tested.Did not offer hypothesis.	Introduction did not include any information about the topic, the question, or the hypothesis.	
Background {research and background knowledge}	Includes several facts gathered from research about the project topic. Discusses several different points of prior knowledge and the reader is able to gain more information about the topic as a result of this paragraph	Explanation paragraph includes facts about the project topic, but doesn't offer any prior knowledge or other points that were discovered through research or the experiment.	Report only includes minimal facts that were evident of research.	Little or no research was conducted, therefore, no (or one) facts were included.	
Materials & Procedures	Includes listed materials and step-by-step procedures in sentence form. Procedures are explained in a way that someone would be able to replicate the experiment with ease.	Includes listed materials and step-by-step procedures in sentence form. Procedures are a little difficult to follow, which would make it difficult for someone to pick up and replicate.	Materials and procedures are listed, but they are not in sentence form.	Materials and procedures are scattered, difficult to follow or missing from the project report.	
Conclusion	Report includes a strong conclusion that describes the outcome of the experiment, answers the original questions, and compares the results to the initial hypothesis. Conclusion is easy to follow and understand.	Report includes a strong conclusion that describes the outcome of the experiment and answers the original question.	Report includes a conclusion that states the outcome of the experiment. The original question was not addressed in the conclusion and is a little difficult to follow and understand.	Report is missing the outcome of the experiment and the original question was not answered.	

The Display Board

- Your science fair display represents a **summary** of all the work that you have done.
- It must include **labeled sections** called: **Question, Hypothesis, Methods (experiment materials and procedures), Results (data and analysis), Conclusion, and Abstract.**
    - Additional sections can be included if desired (such as background research)
- It must be on a 3 panel **folding display board,** 48" by 36" Corrugated Board (can be purchased from an office supply store, Wal-Mart, Target, etc.) See "Student's Science Project Display Guidelines & Rules" for more info.
- The **text** on the board should be **computer printed** or very carefully hand written.
- The **titles** could also be letters purchased from a craft store.
- The board should be **colorful, neat, and organized** so it attracts the attention of viewers but does not confuse them.
- The board should include **graphs or charts** of your data.
- The board should include **pictures** of your experiment if possible, avoid student's faces in the pictures.
- **IMPORTANT:** BEFORE YOU GLUE/PASTE/STENCIL/WRITE anything on your board, lay everything out and see if it fits well. Make any changes you need to before it's too late!
- Additional guidelines can be found here: https://www.unlv.edu/sites/default/files/24/science-display.pdf



Science Fair Display Checklist

After you have completed your display board, take time to complete this checklist yourself to be sure you have everything included on your display board. Then add or revise any areas that you did not check off as being complete. After you have made any changes to your board, have your parent complete the checklist as a final review of your work before turning it in at school.

Display Board Checklist	Self	Parent
1. Overall appearance is neat and attractive.		
2. All necessary parts are included and labeled **(Problem, Hypothesis, Materials, Procedure, Results, Conclusion, and Abstract).**		
3. My display board has a short and catchy title.		
4. All of the words on my display board are spelled correctly.		
5. I have used proper grammar and punctuation.		
6. My procedures are written in clear sequential order.		
7. My procedure shows that I conducted repeated trials (at least 3) or used an adequate sample size, if necessary.		
8. I have identified my independent, dependent and control variables.		
9. All necessary parts are included on my chart (title, labels, and units) and it is neatly drawn and filled in with appropriate data.		
10. I have the correct type of graph that displays my data from my chart and the graph includes all the necessary parts (title, axes, increments, labels, and scale). A key is present if necessary.		
11. I included a written explanation of my chart, graph and any other observations I made.		
12. My conclusion includes the answer to the original problem, accuracy of my hypothesis, what I learned supported with data, and any problems and real world applications.		

Score Sheet for Science Fair Project

Checked boxes indicate something is complete.

Overall Appearance and Organization of Display Board _____**/7 points**

☐ All parts of project are included and clearly labeled
☐ All parts are in the correct sequential order
☐ Display board is neat and attractive
☐ There are very few or no spelling errors
☐ Good grammar was used throughout the writing
☐ Any photographs used have captions
☐ Any drawings included have labels and titles

Problem _____**/3 points**

☐ Problem led to an investigation, not a report, demonstration or model
☐ Problem is clearly written in the form of a question
☐ A creative approach to problem-solving was used to formulate the problem

Hypothesis _____**/3 points**

☐ Hypothesis must state a possible outcome of the experiment
☐ Hypothesis must include an explanation or reason for the prediction
☐ Background information is present showing research was done

Materials _____**/2 points**

☐ All materials used in the experiment are listed
☐ All materials list the quantity needed

Procedures _____**/3 points**

☐ All steps for the procedure are accurately stated and in sequential order
☐ Procedures indicate that repeated trials (at least 3) were conducted
☐ The independent, dependent and control variables are accurately identified

Results- Graphic representation _____**/3 points**

☐ Data is present in the form of a table or chart
☐ An appropriate type of graph is accurately constructed
☐ If a graph is not possible- journal entries or other visual display of results is present

Results- Written Explanation _____**/2 points**

☐ Explanation analyzes and summarizes the data to note patterns and trends
☐ Explanation interprets the graph

Conclusion _____**/4 points**

☐ Conclusion answers original problem asked
☐ A statement reflecting whether or not the hypothesis was supported is included
☐ Supporting data is used
☐ Any problems with the experiment, changes for the future or addition research questions are mentioned as life application connections are made

Total Score _____ Grade _____