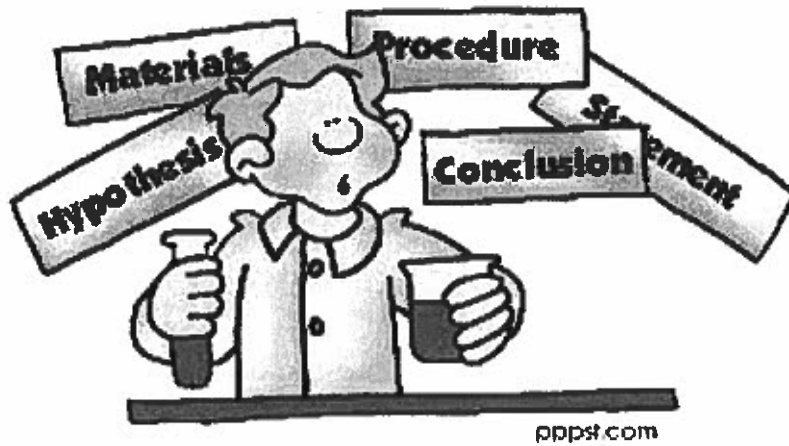


SCIENCE CLUB



NAME _____

COPPER HILLS
SCIENCE CLUB

Welcome to the Copper Hills Science Club! The objective of this club is to guide you in your inquiry into the world of Science. As a part of this club you will conduct an experiment of your choosing and complete a Research Binder and a Display Board. Both items are required to participate in the Copper Hills Science Fair.

In this packet you will find all the information to help you stay organized and attend meetings. Each section has a description of expectations. You must have each section signed off by your parents and one of the Science Advisors. Please be sure to turn materials in on time as no late assignments are accepted. We are excited about this club and look forward to working with all students that share an interest in Science!

Advisor

Elaine Cheney

Schedule of Meetings and Due Dates

*Students must attend a minimum of 3 meetings to be allowed to participate in the Copper Hills Science Club! Students must also be present for the Science Fair!

Dec. 2	Initial Meeting-general information-nothing due!
Dec. 7	Meeting Discussion-Choosing a Topic and Scientific Method
Dec. 9	Experiment Topic and Plan pages due! Must be signed!
Dec. 14	Meeting-Binder Check!
Jan. 11	Check in if help is needed
Feb. 8	Check in if help is needed
March 2	<u>Science Fair Presentations!</u> <u>Final Project, Boards, Binders all due!</u>

Scientific Method of Study

Remember, using the Scientific Method will end with more questions. It is more of a cycle, with steps.

You must document your findings or observations at each step.

The Scientific Method allows you to study and analyze the world around you in a recognized and logical way. It also helps you to share your findings and information with others.



Choosing a Topic

1. Find something that is of interest to you.
2. Think of a question that you would like to try to answer.
3. Be sure the experiment does not need too many supplies.
4. Make sure you have the time each day to journal what you did that day on your experiment.
5. Check to make sure you have enough time to complete.
6. Find a topic that has not already been done, should be new!
7. Remember you must have a question!! Not a statement or a true/false question.
8. Have fun and enjoy your time working on your experiment!! 😊

Notes

Experiment Topic and Plan

Topic or area of study

Question I am attempting to answer

Supplies needed to complete experiment

Plan for conducting experiment

Why is this an area of interest to you?

How does this topic affect the world around us?

Due December 9th at 10:30 meeting!

Student Signature _____

Parent Signature _____

SCIENTIFIC QUESTION AND BACKGROUND RESEARCH SECTION

Scientific question and Materials

1. For this assignment you must formulate a scientific question on your topic. Your "Scientific Question" will become your project title!
2. You need to use "effect" or "affect" in your question.
3. Be specific and precise in describing what you want to ask.
4. This question should well written and typed.
5. A complete list of materials should also be included in this section. Be sure to explain how you plan to use the materials.

Background Research

This section should be a minimum of one page in length. It should be well written using information that you research on the "topic" you have chosen.

1. Be sure to cite evidence from sources you use.
2. Research your supplies. Why did you choose those specific materials over other options?
3. Also include any researched information other scientists might have done on the topic and what was the outcome of their experiment.
4. Be as descriptive as possible, you are the teacher and scientist!

Due March 2, day of Science Fair!

Student Signature _____

Parent Signature _____

HYPOTHESIS AND EXPLANATION SECTION

In this section you will formulate an “educated guess” or prediction as to what you think will happen in the outcome of the experiment. That is what a hypothesis is! Remember the objective of the project is to TEST the hypothesis, NOT to prove it!! The hypothesis is the starting point for your investigation through an experiment.

1. Make a clear statement as to what you think the outcome will be. Begin with- “I believe that...”

2. Your hypothesis Statement should be developed from your “Scientific Question”.

3. Take time to refine your hypothesis so that you can collect relevant data.

4. Explain “why” you believe that will be the outcome. What are you basing your prediction on?

5. Write a clear statement, followed by a well written paragraph on the explanation.

Due March 2, day of Science Fair!

Student Signature _____

Parent Signature _____

RECORDED DATA SECTION

This section is where you record the “process” of actually doing your experiment!

1. Pictures are needed for your display board, so be sure to take photos of the experiment every day!
2. Include any graphs, or charts that were used to record data during your experiment.
3. Write entries each day of your experiment to record as you go!!

Scientific Journal

This section is the “Journal Entries” that were done during your entire experiment. It must include the following information.

1. An organized journal showing dated entries throughout the project (typed or neatly handwritten).
2. Your interpretation of the data. What does that data mean? What is happening in the experiment?
3. Conclusion page at the end of the experiment or project that includes any further research that would be needed. Where would you go next? What can this information be used for?

Analysis of Experiment and Outcome

What conclusions can you come to about the outcome of your experiment?

Would you do anything different if you were to try this again? Why or why not?

What did you learn about the topic doing this experiment?

Explain what you (actually) did to complete your experiment. What were the steps you followed? Sometimes things don't go according to plan and we need to adjust.

What questions do you now have after completion of your experiment?

How did you like learning, using these steps and method?

Due March 2, day of Science Fair!

Student Signature _____

Parent Signature _____

Bibliography Section

It will be necessary to keep a record of all of your resources that you use throughout the experiment and research. This section will include all the sources that you accessed and used, no matter how little. Use www.easybib.com to assist in rules for writing bibliographies from different sources.

1. 4th graders-4 sources
2. 5th graders-5 sources
3. 6th graders-10 sources

Due March 2, day of Science Fair!

Student Signature _____

Parent Signature _____

Name: _____ Room _____

Exploring a Scientific Problem with your Scientific Question

Scientific Inquiry is based on asking scientific questions.

YOU NEED TO USE "EFFECT or AFFECT" in YOUR SCIENTIFIC QUESTION

Affect: (verb) To have an influence on or bring about a change in something, as in "Fertilizer affects plant growth. Written as a question this would be "How does fertilizer affect plant growth?"

Effect: (noun) The result or consequence of an action or influence, as in "The effect of fertilizer on plant growth. Written as a question this would be "What is the effect of fertilizer on plant growth?"

There is a tendency to confuse these two terms. Many students frequently misuse them in their science reports, especially in the titles of science fair projects. Using the words properly demonstrates scientific literacy. "Affect" is a verb and "effect" is a noun. For example an investigation of how fertilizers affect plant growth would reveal the effect of Miracle Gro® on bean plant height. Notice in this sentence that the word "affect" describes how fertilizer might bring about an influence or have an action on plant growth. "Effect" in this sentence describes the result or consequence of the fertilizer. It might help to think of the effect as the end result. Both begin with "e:" effect, end. Think of affect as the action. Both begin with "a:" affect, action.

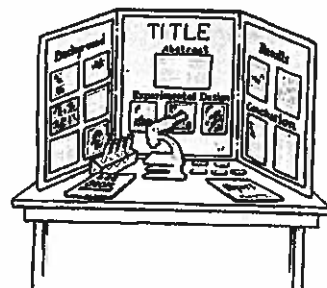
Affect (verb)	<p>Here are a few examples of scientific questions using affect and effect.</p> <p>NOTE: Your scientific question will become your Project Title.</p>	Effect (noun)
How does fertilizer affect plant growth?		What is the effect of fertilizer on plant growth?
How does pH affect fish behavior?		What is the effect of pH on fish behavior?
How does temperature affect reaction rate?		What is the effect of temperature on reaction rates?
How do magnets affect current?		What is the effect of magnets on current?
Which variables affect the period of a pendulum?		What is the effect of variables on the period of a pendulum?

The key to a successful science fair project is asking the right question BEFORE you create your Hypothesis and begin your experiment.

A Classic 4th Grade Science Fair Example

Key Ideas:

- Display the Scientific Method on a 3-sided Board
- Create a Research Binder containing a Scientific Journal
- Take a scientific principle and test ONE single variable.
- Relate topic to a real life application. (Scientific Problem)



Step #1 – Develop a Scientific Question based on a Scientific Problem: Does milk affect plant growth?

- Understand Control Group – Plant & Water
- Experimental Group – ONE single factor of variation

Step # 2 - Background Research - Complete a Literature Review – Download guidelines from Website

1. Asking Questions... What are the “variables” in your plant growth experiment? (Sun, water, soil, temperature, amount of growth space, type of plant, time)
2. What makes plants grow? (Photosynthesis)
3. What is photosynthesis?
4. What “chemicals” are in milk?
5. Which Sources of Research are you going to record in your Research Binder?: (Internet, Books, Magazines, Newspaper, Interview)

BLOCK CH NOTE: What is the number of Required Sources for your grade level?:

- 4th Graders = 4 Sources
- 5th Graders = 5 Sources
- 6th Graders = 10 Sources + one Interview

Step # 3 – Hypothesis Statement & Explanation: “I believe that milk will increase plant growth.”
Hypothesis reasoning for this statement will need to be explained both in the binder and on the board.

Step # 4 - Materials: What will you need?

1. Number of test “Trials” Needed for your experiment?

4 th Graders	5 (One plant per Liquid)
5 th Graders	5 Trials (3-5 Plants per Liquid)
6 th Graders	10 Trials (6-10 Plants per Liquid)
High School	25-50 Trials are required to drown out genetic differences

2. 5 Bean Plants
3. 5 Liquids: Milk, Kool-Aide, Water, Orange Juice, Pepsi
4. 5 plastic cups to be used as Measuring Cup (This will avoid cross-contamination of liquids.)
5. Research Binder to record notes
6. Camera to take photos

Step # 5 - Procedure: Step by Step to isolate all “non-tested” Variables. Test only ONE Single Variable.

1. Limit: All liquids will be refrigerated to avoid bacteria growth.
2. Consistency: "Feed" each plant daily for 20 days.
3. Quantity: Each plant is watered with the same amount of liquid (¼ cup) daily
4. Time: Each plant is watered at the same time of day.
5. Location: Each plant is placed in the same location for sunlight.
6. Space: Each plant is placed in the same size container.
7. Soil: Each plant is planted in the same soil.
8. Observation: **Record** the number of new leaves for each plant **daily**.
9. Observation: **Record** the number of dead leaves for each plant **daily**.
10. Observation: **Record** the height of each plant **daily**.
11. Observation: **Take photos** of each plant **each 3 days**.

Step # 6 - Record Data: Record Data in Binder. This is your observation.

1. Chart: Chart will display the number of new leaves over time.
2. Table: Table will display the number of dead leaves over time.
3. Graph: Graph will display the height of each plant over time.
4. Photos: Photos will show plant growth over time.

Step # 7 - Interpret Data: Ask why and what happened...

- What happened to the plants?
- Why did this happen to the plants?
- What observations did you make? Number of new leaves? Dead leaves?
- Use scientific thought to explain why "things happened" as they did?
- Remember a Scientific Project is a human endeavor. Interpretation and Observation of data.

(Remember the "hearing the knock at the door" example?)

Step # 8 - Conclusion: Explain why the hypothesis was OR was not supported by the data. It is ok if the data does not support your hypothesis. In fact, sometimes it may be better if your data does not support your hypothesis because this leads to further research. The key to the conclusion is an explanation BASED on your FINDINGS AND RESEARCH. A complete explanation of how the conclusion relates to the hypothesis earns "higher points."

Example Conclusion: The information gathered in this experiment suggests that the hypothesis is not supported by the data. The data indicated that Kool-Aide made the plants grow best. I think that milk hindered the plants' photosynthesis. Therefore, I would not use milk to feed plants. However, the plant fed with Kool-Aide also turned red, so other questions remain.

Step # 9 - Further Research: Can you connect this to a real-life application?

I would like to discover why Kool-Aide made plants change color. It might be possible that the sugar content in Kool-Aide assisted in the photosynthesis process of making the plants grow better. **I would have to test this new hypothesis: Kool-Aide changes plant color.** If I could complete this experiment again, I would test a variety of flavors of Kool-Aide. Maybe the combination in the Kool-Aide flavoring has something to do with how sugar, water, and minerals are transported in a vascular plant. If I can figure out how to make plants turn a certain color, than I can use this idea to make plants change color for Holidays, like a florist does for Special Occasions.

Step # 10 - Compete the Construction of a 3 sided Science Fair Board.

"A true science fair project should create more questions than it answers."

Student Name: _____ Teacher _____ Room _____ Grade _____

Block CH



Science Fair Application / Commitment Form

Students need to use this application to apply for Science Fair for Block CH credit.

I will be actively involved in Science Fair by:

Student - Parent - Please Initial each item

_____/_____/_____ Attending Science Fair Meetings & Meeting Deadlines

_____/_____/_____ Conducting an original Science Fair Experiment

_____/_____/_____ Keeping a Science Fair Binder & Journal

_____/_____/_____ Completing an original Science Fair 3-sided Board Project

Student Signature _____ Date _____

Parent/Guardian Signature _____ Date _____

===== Items below will be completed by Advisor to track student progress =====

NOTE: The science fair teacher will retain this form until Copper Hill's Science Fair.

Science Fair Application Turned in on Time Yes / No

Scientific Question Approved Yes / No

Science Fair Timeline followed & Binder Kept Up to Date Yes / No

Science Fair Project & Binder turned in on Time Yes / No

Block CH Credit Given for participating in Science Fair Yes / No

Science Fair Teacher's Signature _____