OPTIONAL: Nine Weeks Extra Credit Experiment
Due: Last MONDAY of the nine weeks

Each nine weeks students will have the opportunity to complete an extra credit experiment. These experiments will be created by the students, and they will focus on the branch of science that we are working on that nine weeks.

- First Nine Weeks: Life Science (habitats, adaptations, life cycle, food chain/webs/pyramid, body systems)
- Second Nine Weeks: Earth Science (solar system, rocks and the rock cycle, land forms, fast/slow changes to the earth's surface, weather and climate,natural resources, 3Rs)
- Third Nine Weeks: Physical Science (matter, mixtures/solutions, electricity,energy, density, volume, the three states of matter, mass vs weight)
- Fourth Nine Weeks: Student choice

Students will work through the scientific method to design their experiments. The steps to follow are below…..

Project Design:

Students should begin to design their project using the Scientific Method as a guide, and record everything in their notes as they proceed. The following is very important: • This is the student's project. That means that the ideas and the work must be THEIRS—not their parents.

Ask Questions:

Students should think about their areas of interest and questions within that area that might be worth exploring. They should narrow their ideas down to define one question that they want to ask concerning their interests.

Students should formulate a question. As an example, let's say a student is thinking about the environment, and then perhaps about the effects of acid rain on buildings. Since many buildings are made of brick, they decide their question will be: "How does acid rain affect brick buildings?"

Do Some Research:

Getting information from existing sources helps students develop their ideas. Here are some suggestions:

• Students should talk to lots of people, including teachers, parents and friends, or experts in their area of interest. They should read scientific magazines and books, and other written material.

• Students should research the Library and the Internet to see what is currently being done in the area of their question.

• Refer students to the Librarian for help in their research.

• Students should write down your sources ("citations") in their logbook. In our example above, the student should do some research in the library to find information on acidity, acid rain, and the effects of acid rain on the environment, including buildings. Students should record their thoughts, investigations and citations in their notes. Then they are ready to form a Hypothesis.

OPTIONAL: Nine Weeks Extra Credit Experiment
Due: Last MONDAY of the nine weeks

Develop a Hypothesis:
Scientists create hypotheses as early attempts to explain patterns observed in nature or to predict the outcomes of experiments. Students form their hypothesis based on the information that they found in their research. Student's Hypothesis should be age appropriate. A hypothesis consists of a reasonable suggestion of a possible explanation for something students observe, or a correlation between many things they observe. Remember from our previous discussions above, the scientific method requires that students test their hypothesis, and confirm or disprove their hypothesis; if they can't test their hypothesis, then they can't use the Scientific Method. Typical hypotheses are statements, and often they are presented in the form of an "IF-THEN" statement. Using our previous example: • "IF rain water is more acidic, THEN bricks in buildings will fall apart faster;" OR in the alternative, • "IF rain water is less acidic, THEN bricks in buildings will take longer to fall apart;" Don't forget — if the student's results show their hypothesis to be false, that is perfectly acceptable. False hypotheses still give us information. Scientists frequently find their hypothesis is false. The "Hypothesis" should be recorded in the students' notes and included on the final Project Display Board. Now they are ready to think about their methods.

Plan the Methods:
Students should develop methods to test their hypothesis. They should think about their methods in an organized way, and write them so that someone who reads the logbook could repeat the methods. Student's experiment should be age appropriate. Here are some considerations:
• Students should think about the actions that they will take in their experiment, and how they will measure the results of these actions. o In our example, students could decide that their actions will be to use water with different acidities, and see if there are any differences in the effects on brick. o They might want to measure the difference in brick break-up by measuring the weight of the bricks after the treatments.
• Students should determine what their actions will be under "normal" conditions." o In our example, students would make water samples with a neutral pH (about 7.0). o This is called the "control group".
• Students should determine what their actions will be under "changed" conditions." o In our example, they would make up water samples with differing pH. o This group is called the "experimental group." Their actions are the same as under normal conditions: apply water to the brick. The acidity of the water is different in the "experimental group." o The student decides what acidities to use, and how to measure the results of applying this water to the brick. o Students must also decide how often to expose the bricks to acidic water and measure brick break-up over time.
• What tools and materials do they need to use to complete the experiment? In our example, they might need water, vinegar, pH paper, bricks and containers to hold them, and a scale to weigh them.
• The student must decide how to record these measurements in their Science Logbook. They might want to use a table and maybe draw pictures to illustrate their methods.

OPTIONAL: Nine Weeks Extra Credit Experiment
Due: Last MONDAY of the nine weeks

• Remember, students should record the methods that they PLAN to use in their experiment. When they actually perform the experiment, they will write down the methods they actually perform as they perform the experiment.
• Students must decide how they will compare the measurements for the experimental group to the control group. o They should draw a plan for a template to record their data in their notes. o Charts and graphs should be hand-written or drawn directly in the notes.

Test the Hypothesis (the Experiment):
Students should begin the experiment by carefully following their Methods. Student's Testing (experiment) should be age appropriate. They should: • record the dates and time of day of each step, and the acidity used; • record any mistakes or unusual observations; use more detail rather than less detail; illustrate results — take photographs or make drawings of the methods and materials if desired and tape, glue or otherwise fix into their notes; they might want to also use these pictures on their Project Display Board; if so, they need two prints each; record the data or results. Analyze the Results Students should think about the data and what it means. Student's Analysis should be age appropriate. • Do they see differences between the experimental group and the control group for the phenomena measured? • If they didn't get the results they were expecting, is the hypothesis false, or do they need to reexamine the experimental method, the hypothesis or redefine the original question? For example, what if the bricks don't fall apart when treated with acidity? How can they change their methods? • They might want to use visual aids to illustrate the data in the table, such as quick hand-drawn graphs of the data. • These analyses should be recorded in their notes.

Form Conclusions:
After analyzing the data, does the student think that their hypothesis is true or false? Why? Student's Conclusions should be age appropriate. They should record this in their notes and on the Project Display Board.

Write an Abstract:
Students should write a one-paragraph summary of the steps in the project and record this in their on the Project Display Board. Student's Abstract should be age appropriate.

Gather Citations:
Students should gather their Citations from the Logbook so that they can include them on the Project Display Board.

Create the Project Display Board:
They must include on the board the steps that they followed using the Scientific Method: Questions, Research, Hypothesis, Methods, Results, Conclusions, Abstract, and Citations. The display of the completed project does NOT need to be typed. Student's Display should be age appropriate.

OPTIONAL: Nine Weeks Extra Credit Experiment
Due: Last MONDAY of the nine weeks

If students would like more information on how to create an experiment, they may use this link to see some helpful information--
https://www.jpl.nasa.gov/edu/learn/activities/science-fair-project/

Rubric:
Presentation board of experiment…….25 points
Neatness…….25 points
Completion of the Scientific Method……..25 points
Correct spelling, grammar, punctuation…….25 points
Total:.....100 points