
Lesson Title: Conducting an Experiment – Safety, Logbook and Recording Data

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Grade Level: 5th grade

Subject Area: Science

Time Allotted for the Lesson: *Express in number of class meetings and/or number of hours.*

2 hours (1 hour the first day; 20 minutes per day for the next 4 days to make observations/gather data)

Short Description of Lesson: *Write a brief, yet concise, description of what occurs in this lesson (50 words).*

In this lesson, students will understand the importance of planning, selecting, and making note of materials/equipment, proper safety measures, logging all processes, and recording measured/observed data. *Note:* The included experiment requires several days to see results.

Classroom Layout and Grouping of Students: *Where will learning take place? How will the room be organized? How will students be grouped? (whole group, individuals, pairs, small groups, etc).*

Whole group instruction, individuals, small groups (4 students each)

State Curriculum Standards met in this lesson: *Go to the state curriculum standards at <http://www.isbe.net/ils/Default.htm> (use state standards where you are in preparation) and select the grade content/level appropriate standards that are being met in this lesson. Copy and paste below:*

[Science Content Standards for California Public Schools](#) – Investigation and Experimentation (5th Grade)

Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other three strands, students should develop their own questions and perform investigations. Students will:

- f. Select appropriate tools (e.g., thermometers, meter sticks, balances, and graduated cylinders) and make quantitative observations.
 - g. Record data by using appropriate graphic representations (including charts, graphs, and labeled diagrams) and make inferences based on those data.
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National Education Technology Standards for Students (NETS•S) met in this lesson: *Go to the <http://cnets.iste.org/index.html> and select NETS•S 2007 grade level profile (K-2, 3-5, 6-8, 9-12) the appropriate indicator(s) and standard) that are being met in this lesson. Copy and paste below.*

Creativity and Innovation

Students demonstrate creative thinking, construct knowledge, and develop innovative products and processes using technology. Students:

- c. use models and simulations to explore complex systems and issues.

Technology Operations and Concepts

Students demonstrate a sound understanding of technology concepts, systems, and operations. Students:

- a. understand and use technology systems.
 - b. select and use applications effectively and productively.
 - c. troubleshoot systems and applications.
 - d. transfer current knowledge to learning of new technologies.
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Instructional Objective(s): *Each instructional objective [learning outcome] for this lesson should identify the A, B, C and D – Audience, Behavior, Condition, and Degree. (Activities are NOT learning outcomes).*

1. Based on an existing testable hypothesis, students will identify and record at least 3 materials or pieces of equipment sufficient to test the hypothesis.
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2. Students will correctly complete a safety checklist for their experiment with 100% accuracy.
 3. Students will identify at least 3 types of information that should be recorded in a logbook.
 4. Students will state 2 valid reasons why it is important to use a log book during an experiment.
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Materials, Resources and Technology:

List all materials (textbook, other books, maps, crayons, research guides) technology resources (computers, printer, scanner, internet connection, cameras, etc) and web addresses that are needed for this lesson. If you are using copyrighted materials, you must include title, author, date, city and publisher.

Materials and resources needed for this lesson (for each small group of 4 students)

1. Three identical plastic cups
2. 100 mL room-temperature water
3. 100 mL room-temperature Coke
4. 100 mL room-temperature distilled white vinegar
5. Graduated cylinder
6. Thermometer
7. Safety checklist sheet
8. Logbooks (composition book or spiral notebook)
9. Individual student logbooks (for student projects)

Technology resources needed for this lesson

1. Computers with internet access
2. Projector or other classroom display device

Web Addresses needed for this lesson:

Website name (e.g. Yahoo), followed by the site's complete web address (e.g. <http://www.yahoo.com>)

1. EducationCity.com (Infestigation activity): <http://us.educationcity.com/start/>
 2. Interactive Visual – Lab procedures, materials, safety, and logbook:
http://edtech2.boisestate.edu/gudeniusm/506/near_transfer/near_transfer.htm
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Student's Present level of Performance and Knowledge: *Do the students have the adequate knowledge to complete the lesson successfully? What pre-requisite skills must the students have to complete the lesson content? Include technology skills.*

Students must be able to use basic web browser navigation techniques and to write complete sentence responses to prompts/questions. Students must also have selected a testable hypothesis and identified variables and testing procedures for their own experiment.

Instructional Procedures

Lesson Set:

How will you open the lesson to motivate the students? How will you relate this lesson to previous learning & to real life experiences, to explain the importance of the learning to the students? (requires student involvement)

Introduce (and review) steps in conducting an experiment by having students go use the "Infestigation" activity at EducationCity.com (under 5th Grade→Science Activities); like Discovery Education, this is a paid subscription-based site. The activity can be performed independently, in pairs (2 per computer) or, if computers are not available, you can go through the steps as a whole class, prompting for assistance from students.

Techniques and Activities:

*List the step-by-step activities in sequential order as they occur in the lesson. They clearly identify what is to take place in the lesson. Within the procedures a variety of classroom **teaching strategies (methods)** are identified. **Student centered activities** are included as well as **guided practice** of the learning is included.*

1. Introduce the lab activity to students; remind them that you have already designed the lab procedures (make sure each lab group has a copy of the procedures)
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2. Ask students "Is there anything else we need to do? Or can we just get started pouring since we know how the lab is supposed to be set up?" The answer, of course, is safety. Hand each student a "Safety checklist" of questions to ask themselves about their experiment, the materials they are using, and the potential hazards to themselves and/or property. In this example, vinegar would hurt if splashed into an eye, so it is best to wear lab goggles. Also, vinegar or Coke could ruin clothing, so it would be a good idea to wear a lab coat or apron.
 3. Students follow procedure to "set up" all trial/experiment groups simultaneously. Knowing that evaporation only occurs over time and possibly affected by temperature, set the cups in a secure and warm location (outside for the day if warmer outside; indoors if cool outside.) Remind students to record any information that might be important – including air temperature – in their logbooks. Be sure to bring in cups at the end of the school day to secure them indoors if necessary.
 4. For the next 3 days, perform measurements on each of the trials (each different liquid) to see how much, if any, has evaporated. Students can pour the contents of the cup into a graduated cylinder, mark the volume noted on the cylinder, and return contents to the cup. Any additional time can be filled by assisting students with individual experiments or reviewing and assessing student knowledge of concepts using the online materials from the previous 3 lessons.

Lesson Closure:

How will the lesson come to a close? The content should be summarized and related to future lessons, and actively involve the students.

Using computer workstations, each lab group will work as a team to create a nicely-formatted and organized digital version of the logbook and all recorded data; this document can then be distributed to each individual member of the team (either on printed paper or digital format placed in student folders, etc.)

Adaptations for Special Learners: *How will you adapt the learning/equipment for students with special needs?*

Audio-visual support will be provided via the video segment and website resource. Students with cognitive disabilities will benefit from peer feedback via think-pair-share and group-based lab work.

Supplemental Activities - Extension and Remediation: *Extensions are additional activities to expand learning on the lesson content. Remediation activities include methods to re-teach the learning for students who need more instruction/practice.*

Remediation is available via the online website resource. One extension activity (possible extra credit) is to have students reflect in logbooks: what could be some possible problems or drawbacks in the procedure? Could any of the activities cause errors in the data? Would there be a better procedure to use?

Assessment/Evaluation: *How will you measure the student's success? Formally or informally? Formal evaluation of student work requires that a grade is taken while informal might be monitoring of work, or class discussion. This section should contain a description of the assessment process, the criteria for achievement, and performance levels. The criteria should directly align to objectives and instruction. Describe your plan for providing feedback to your students.*

Assessment will include: online concepts/vocabulary quiz (formative), small group (lab group) logbooks for the evaporation experiment (collaborative product rubric), and individual logbooks for student experiments (formative assessment to provide constructive feedback to student.)

Student Products: What artifact(s) or products will result from the lesson? (such as a report, newsletter, diagram, slideshow, drawing, etc.)

In small groups, students will each collaboratively create handwritten logbooks to record all information about the evaporation experiment. Individually, students will set up, label and prepare a log book for their own experiment they designed in lesson 3: Designing an Experiment.

Adapted from PDF: *Preparing to Use Technology: A Practical Guide to Curriculum Integration (2007)*

