

Lesson Title: Observation, Question, and Hypothesis

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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.*

1 hour

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

In this lesson, the students will learn how to create a formalized hypothesis based on observations and/or questions. First, students will learn how to define, recognize, and distinguish between observations, questions, and hypotheses.

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, individual practice

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:

- b. Develop a testable question.
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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.*

Research and Information Fluency

Students apply digital tools to gather, evaluate, and use information. Students:

- a. plan strategies to guide inquiry.
- b. locate, organize, analyze, evaluate, synthesize, and ethically use information from a variety of sources and media.

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.
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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. Students will examine and correctly identify at least 4 out of 5 examples of observations, questions, and hypotheses.
 2. Students will examine and correctly identify at least 4 out of 5 examples of hypotheses.
 3. Students will create 3-5 formalized hypotheses. Each one will be based on a stated question related to an observation.
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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.

1. One cup or glass with water (original water level marked)
2. Hypothesis worksheets
3. Experiment design model/example:
http://edtech2.boisestate.edu/gudeniusm/506/far_transfer/far_transfer_full.jpg

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. Pre-Experimental Stage: Find a Question and Form a Hypothesis
<http://player.discoveryeducation.com/index.cfm?guidAssetId=59C38185-7010-47E7-ADDB-C3CD8BF9176E>
2. Scientific Method Introduction (Flash): <http://edtech2.boisestate.edu/gudeniusm/506/method.swf>
3. Designing an Experiment Visual:
http://edtech2.boisestate.edu/gudeniusm/506/far_transfer/far_transfer.htm

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.

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)

To set up for this lesson, you will need to prepare a day in advance. First make a point to fill a cup about halfway with water and mark the level. Tell the class you can observe anything, even a plain old cup of water. Set the cup outside early on a hot day and let them know you'll observe it again the next morning. When you check the cup first thing in the morning, two things have likely occurred: (1) the water will be below its original level, due to evaporation; (2) there may be beads of dew on the outside of the glass due to the lower temperature during the night. [If conditions are not conducive to doing this experiment, you can simulate the experiment using photos showing the process.]

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. Open with a quick introduction to question and hypothesis using the 2 minute, 17 second Discovery Education video. Then explain that the question we have usually stem from an *observation* we have made; we *observe* something when we notice it using any of our senses. In this case, we are observing the glass of water, which we notice has changed.
 2. Ask the class for *questions* they could ask based on the observation. Some examples could be
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“Where did the water inside the cup go?” or “Where did the water on the outside of the cup come from?”

3. Based on these questions, ask students to think about what might have happened. Some students will likely realize evaporation (or condensation of the dew) has occurred, so ask them to consider another scenario: what would happen if we put Coke in the cup instead of water? What if we put vinegar in a cup? Are those the same as water? Would they still evaporate? If so, would they evaporate the same amount?
4. The guess or prediction that is occurring here is the *hypothesis* or an educated guess about what is likely to happen, based on their observations and existing knowledge. A hypothesis is a prediction based on your knowledge, which you can test. We know that water evaporates, but have never heard of that happening to vinegar. So a testable hypothesis in this case could be: *“If vinegar is left outside on a hot day, it will not evaporate.”*
5. A very good way to present a hypothesis is a *formalized hypothesis*, in which we state both a predicted outcome *and* the reason why we predict it will be this way. This is presented as an “if...then” statement. In this case, we could say *“If evaporation is related to the amount of water in a liquid, then liquids with less water in them will evaporate less.”* This is a very useful hypothesis because it states the assumption we are working under, and the outcome that is likely if that assumption is true. This means that if we do an experiment and it comes out the way we expect, the assumption is true: “evaporation is related to amount of water in a liquid”; if the experiment results do *not* come out the way we expect, it could mean that evaporation is not affected by the concentration of water in a liquid.
6. Students will use the Experiment Design visual and online Scientific Method introduction to identify and distinguish between observations, questions, and hypotheses. Students will also identify hypotheses, formalized hypotheses, and non-hypotheses.

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.

Instruct students to think of one thing they have recently observed at school or at home, which they are curious about and have a question they think they could answer using a testable hypothesis. The topic could be nearly anything – it could be related to animals, sports, hobbies, household products, food, or nature. Students should write a *testable hypothesis* and write the observation and/or question it is based on. Once this is done once successfully, students should write 2-4 more for homework (keeping in mind that one of these will actually turn into a science experiment.)

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 may be assigned to assist an advanced-learner’s project.

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 is to find an example (using websites and/or library) of an experiment in which the hypothesis was *disproven* and the result of the experiment was still very useful.

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.*

Formal assessment will include student identification of questions, observations, hypotheses, and formalized hypotheses. In addition, each student is required to submit at least 3 testable hypotheses provided for an example question and/or observation.

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

Students will create a list of 3-5 questions based on observations they have made at home or at school. Each question will be based on an observation students have made. Students will then write a *formalized hypothesis* for each one.

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