Lesson Title	Scientific Method
Length of Lesson	50 Minutes
Created By	Adam Lenz
Subject	Earth & Space Science
Grade Level	7th Grade
State Standards	1b, 1d, 1h, 4a
DOK Level	DOK levels 1, 2, 3
DOK Application	Recognize, Predict, Cause/Effect, Hypothesize, Draw Conclusions
National Standards	Inquiry – recognize the relationship between explanation and evidence; identify questions that can be answered through scientific investigation; make relationships between evidence and explanation. Earth & Space Science – Structure of Earth processes, importance of Earth materials.

Graduate Research Element

In my research we have to test water for water quality which includes substances that can natural substances such as chalk, and salt that can dissolve in water. We also test for a lot of other substances that are not necessarily anticipated to be in the water. This simple experiment shows that substances that look similar may go into dissolution and vastly different rates. This experiment also exhibits how dissolved solids are not visible with the human eye and therefore can be misleading of the water quality.

Student Learning Goal:

The goal of the lesson is to teach students the basic principles of the Scientific Method through a simple hands-on experiment. The goal of the experiment is to give the students a short hands-on lab that will make the scientific method and associated vocabulary memorable enough for the students to reflect on later in the semester or during later experiments.

Materials Needed (supplies, hand-outs, resources):

Three clear plastic cups per group, wash bottle, stir sticks, one stopwatch per group, and ¼ teaspoon of salt, sugar, and chalk per group.

Lesson Performance Task/Assessment:

Students will perform will perform a simple experiment which involves dissolving sugar, salt, and chalk in individual cups. They will be asked to hypothesize which will dissolve fastest/slowest, collect data by timing and recording the time of dissolution of each substance in a data table, and draw conclusions about the experiment to determine if their hypothesis was correct.

Lesson Relevance to Performance Task and Students:
The experiment is a simple enough for the students to understand, but the relevance of the experiment is to give the students a hands-on approach to the processes of the scientific method. After each step the students will be involved in an in-class brainstorming activity about the vocabulary and the relevant procedures of the scientific methods. This will give them an opportunity to reflect on previous steps and anticipate upcoming steps of the scientific method.

Anticipatory Set/Capture Interest:
In the lab experiment we are looking at dissolution rates of some common household materials. Students can easily relate these items to how they may dissolve when they use these items (sugar and salt) to cook. They could also relate scientific method and dissolution rates to recipe planning which will make the lesson much more enjoyable for the students.

Guided Practice:
To begin the class the students will be given a brief description of steps of the Scientific Method and an introduction to the experiment. After each step of the lesson the instructor will talk the students through the next step while asking questions to engage the class and provoke anticipatory thought.

Independent Practice:
In small groups of 3-4 the students will be conduct their own dissolution experiment. Each student will also be filling out a handout which includes; creating a hypothesis, filling out data table, drawing conclusions, and reflecting on the experiment. Afterword students are encouraged to share and compare their findings with the rest of the class.

Remediation and/or Enrichment:
Remediation: Students may work larger or smaller groups with the assistance of a secondary helper/instructor to guide them through the experiment at their own pace.

Enrichment: Between steps the instructor may ask anticipatory questions rather than explain the next step to allow students to grasp the concepts on their own. Students may also be asked to reflect on the experiment about other ways to conduct the same

experiment, discuss alternative factors that may have affected the outcome and discuss the differences between independent and dependent variables.

Check(s) for Understanding:
Each student will have a lab worksheet and data table to fill out and hand in at the conclusion of the lab. A post-lab class discussion would also help the instructor know if real understanding of the scientific method took place.

- Can you compare and contrast the data collected from the dissolution rates test?
- Can you make inferences about why some materials dissolve faster than others?
- What other factors might affect dissolution rates?

Closure:
After completing the lab students will brainstorm about what may have caused the outcomes they achieved. Students will also be involved in an in-class discussion that may provoke critical thinking in their fellow students.

Possible Alternate Subject Integrations:

- Math
- Earth Science
- Chemistry

Teacher Notes:
The instructor must be consciously aware of how well the students are grasping the concepts, what instructions need to be emphasized to particular groups of students, and the time it takes the students to complete key steps in the lesson. Afterword the instructor should guide the in-class discussion to make sure key concepts were learned and students understand what factors affect their experiment.