



<b>Lesson Title</b>	How can you study things you can't see like: Atoms?
<b>Length of Lesson</b>	45 min
<b>Created By</b>	Kelli Dawkins
<b>Subject</b>	Chemistry
<b>Grade Level</b>	Grades 10-12
<b>State Standards</b>	1c,d 2c
<b>DOK Level</b>	2 and 3
<b>DOK Application</b>	Hypothesize, Construct, Draw conclusions
<b>National Standards</b>	A (inquiry) ;B(physical);G ( history and nature of science)
<b>Graduate Research Element</b>	

**Student Learning Goal:**

**Chemistry: MS State Standards**

**1c. Demonstrate the use of scientific inquiry and methods to formulate, conduct, and evaluate laboratory investigations. (DOK 3)**

**1d. Organize data to construct graphs, draw conclusions, and make inferences. (DOK 3)**

**2c. Develop a model of atomic and nuclear structure based on theory and knowledge of fundamental particles. (DOK 2)**

**National Science Educational Standards of Content 9-12**

**A- inquiry: use appropriate techniques to gather, analyze, and interpret data; think logically and critically to demonstrate connections between investigations of data and a historical body of knowledge.**

**B-matter is made of minute (unseen) particles of atoms; these components have measurable properties.**

**G-individuals and teams have contributed and will continue to contribute to the scientific enterprise; use logical arguments to gain the best explanations; be consistent with observational evidence and make accurate predictions about systems being studied.**

**Materials Needed (supplies, hand-outs, resources): 12 ob-sertainers (purchased from Lab-aids Inc.), notepaper and writing utensil**

**Lesson Performance Task/Assessment:**

**Summative Assessment: Students will determine if any of their guesses were correct when the actual obstruction is revealed for each of the 12 numbered obsertainers. They will hand in their drawings for a grade.**



**Lesson Relevance to Performance Task and Students:**

The inquiry activity will aid students in creating a way to discover what obstruction is in each of the 12 numbered ob-sertainers. It will also help the students understand that scientists must sometimes design experiments for things that can not be seen even with high powered microscopes.

**Anticipatory Set/Capture Interest:**

An empty, wrapped gift will be shown to the class. The students must write down past experiences about how they determined what was in a gift without actually opening the gift. Discussion will follow on how they decided what the actual gift was and if they guessed correctly what was inside the gift.

**Guided Practice:**

The teacher will relate the similarities of a gift and an atom. Discussion will follow on how hard it would be to investigate something that can't be seen. Next the teacher would open an ob-sertainer and show what an obstruction might look like without revealing the # on the ob-sertainer.

Rules for the obsertainer activity would then be discussed as follows:

1. Each student must test all 12 numbered obsertainers.
2. Each student must design his/her own way to test the obsertainers and indicate the procedure at the top of the data sheet. (cite file)
3. Each student must draw the shape of the obstruction for each numbered obsertainer inside the labeled boxes on the data sheet.
4. Each student should then pass an obsertainer on to another student that is close by them until they have tested all 12 different obsertainers.

\*The obsertainers should not be opened until all students are finished testing each of the 12 obsertainers.

**Independent Practice:**

Each student will design a way to investigate what type of obstruction is on the inside of the obsertainer without opening the obsertainer. The procedure will be written at the top of the data sheet. The student will then formulate and construct a drawing on a data sheet (cite file) that best illustrates what is on the inside of the obsertainer.

**Remediation and/or Enrichment:**

**Remediation:** individual IEP; partner help throughout the less; shorten parts of the assignment; focus on few processes



**Check(s) for Understanding:**

**What are some ways scientists might study/investigate things they can't see with a powerful microscope?**

**Will technology get better in time to allow scientist to see things that they can't see today?**

**Closure:**

**After all students have completed their testing, the obstruction will be revealed for each of the 12 labeled obsertainers. Students will mark on their sheet which drawings are exactly like or close to the actual obstruction in the obsertainer. Students hand in their data sheets before leaving the room.**

**Possible Alternate Subject Integrations:**

**Math- graphing and probability**

**Teacher Notes:**

**Obsertainer kit is available through Lab-aids inc.**