Lesson Title	Metals Across the Periodic Table
Length of Lesson	2 days
Created By	Hannah Brackin
Subject:	Chemistry
Grade Level:	7^{th}-8th
State Standards	Eighth Grade: 2b
DOK Level	DOK 2
DOK Application	Classify, compare, make observation, categorize
National Standards	5-8: B: Physical Science
Graduate Research Element:	Reactivity of Metals

Student Learning Goal:

State Standards Eighth Grade:
2(b) Predict the properties and interactions of given elements using the periodic table of the elements (DOK 2)

National Standards 5-8: B: Physical Science
Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.

Students will be provided with a review of chemical symbols and the periodic table. Nonmetals and metalloids will be covered briefly. They will then be introduced to the types of metals on the periodic table. Students will be able to identify characteristics of metals based on where they are located on the periodic table. Briefly explain why metals burn as bright/characteristic colors.,

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

Flame source, crucible (one for teacher), Zn, NaOH, tongs, pennies, Q-tips, metal samples (optional), various metal salts ($BaCl_2$, $CaCl_2$, $CuCl_2$, $PbCl_2$, LiCl, KCl, NaCl, $SrCl_2$), and ethanol or water for solutions.

Lesson Performance Task/Assessment:

Students will be given a table of metals and their characteristic colors. Using their knowledge on the properties of metals they will make observations and match the color of the flame with the corresponding metal.

Lesson Relevance to Performance Task and Students:

Students will be able to relate the characteristics of metals that they just learned by seeing the distinctive colors of the metals. They will have to use observations to identify unknown samples.

Anticipatory Set/Capture Interest:

Penny experiment (refer to teachers notes)

Guided Practice:

Day 1

To catch the attention of the students, the teacher will do a short demonstration (Anticipatory Set). The teacher will take a penny (copper) and place it into a boiling solution of zinc and NaOH. (cover with watchglass when heating). The Zn will coat the penny and this will turn the penny silver. The silver penny will be placed directly in the flame and will then turn gold.

The teacher will begin the discussion on the type of elements on the periodic table. Nonmetals and metalloids will be covered first, but the focus will be on metals. As each group of metals is covered samples of metals in that group will be passed around for the students to see. Each group of metals on the periodic level has specific characteristics that the students will learn. After the teacher has covered reactivity of the metals the teacher will introduce a small discussion on their research. They will cover the use of the glove box and tell students that the sample metals that they held were from the lab that the teacher works in. To help lead into day 2, explain why we are able to see the colors when metals burn.

Day 2

Teachers will assign students to groups of 3-4. The teacher will explain that each sample is a metal compound dissolved in ethanol. Each group will have a beaker full of Q-tips and a burner. The solutions of metals will be at the front of the room with the teacher to have more control over the experiment. The students will take a Q-tip and soak it in a solution and take it back to their workstation and place it in the flame. They will make and record observations on the flame color. They will do this for all samples and as a class discuss their results. Upon discussion the idea of emission spectrums will be introduced.

Independent Practice:

Groups of students will independently work in a laboratory setting and show their understanding of lab safety.

Students will make observations and have to answer questions based on what they observe.

Remediation and/or Enrichment:

Remediation:

Individual IEP. Shorten the length of the experiment by allowing the students to watch the teacher perform the flame test while they make observations.

Enrichment:

By using a spectrometer, students could look at emission spectra from gas discharge tubes. Ask students to relate their results to other areas.

Check(s) for Understanding:

By working in small groups in a laboratory setting, the students will show their understanding of lab safety.

What makes an element a metal?

Can the location on the periodic table provide information about the metal?

Is there any other information that can be learned from the color that the metal burns?

Closure:

Answer the "check for understanding" questions on worksheet and then have a class discussion.

Possible Alternate Subject Integrations:
Physics:

By using a spectrometer, students could look at emission spectra from gas discharge tubes. Students could then use the Rydberg equation for hydrogen to assign the electron transitions.

Teacher Notes:

Penny experiment: http://www.chem.ucsb.edu/~outreach/station4.htm

The penny experiment should be performed in a fume hood because potentially hazardous fumes.

Flame test experiment preformed on day 2 modified from Mississippi State University CH 1211 Lab Manual