Lesson Title: Atoms and Elements
Length of Lesson : 2-3 Blocks
Created By: Torri Clay
Subject: Physical Science
Grade Level: 9-12
State Standards: Mississippi 4d
DOK Level: 2
DOK Application: Predict, Explain Patterns, Draw Conclusions
National Standards: B1 (Physical Science Structure of Atoms)

Student Learning Goal:

Mississippi 9-12 Physical Science 4d – Develop an understanding of the atom

d. Utilize the periodic table to predict and explain patterns and draw conclusions about the structure, properties, and organization of matter; atomic composition, periodic trends, periodic properties of atoms and how they relate to position in the periodic table

- TSW explain the proper way to determine information using the periodic table of elements
- TSW explain how many protons, neutrons, and electrons an element has given its symbol, atomic number, and mass number
- TSW relate the organization of the periodic table to the arrangement of electrons within an atom
- TSW identify facts about an element or group of elements on the periodic table.
- TSW Identify the different parts of an atom.
- TSW Realize that electrons are not static, but always moving.
- TSW Know the relationship between the numbers of electrons to the type of atom.
- TSW Differentiate between ions and isotopes.
- TSW Understand the connection between energy levels and valence electrons to the shape of periodic table.

National Standards – Physical Science 9-12 B1

- Matter is made of minute particles called atoms, and atoms are composed of even smaller components
- The atom's nucleus is composed of protons and neutrons, which are much more massive than electrons

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

- Atomic Musical Chairs Handout
- Periodic Table Windsock Project Handout
- Computer
- Projector
- Smartboard
- Teacher PowerPoint (created by the teacher for the lesson)
- Student Version Notes (same as teacher version notes, but keywords are left out for the student to fill in)
- Grading Rubric
- Tape or Glue
- Colored Construction Paper
- String/Yarn
- Scissors

- 40 balls of two colors (18 one color = protons, 22 another color = neutrons, ex.
- Tennis balls, rubber balls, golf balls, Nerf balls, etc…)
- 2 Small Round Laundry Baskets (1 for the nucleus, 1 to store unused balls)
- 10 – 18 Chairs
- Periodic Tables
- Music

Lesson Performance Task/Assessment:
Students will use what they have learned in order to create their windsocks. They will be able to calculate the number of protons, neutrons, and electrons and place this information on their project. They will also include the electron configurations of the elements using the information they obtained from class.

Lesson Relevance to Performance Task and Students:
Students will be engaged in the hands-on activity, while utilizing and demonstrating their knowledge of the topic. Students create objects which are meaningful and will be displayed in the classroom, which encourages them to work hard and be proud of their work.

Anticipatory Set/Capture Interest:
The students will complete the atomic musical chairs activity(handout - sciencespot.net by Marc Bonem of the Science and Arts Academy, Des Plaines, IL and edited/revised by Liz LaRosa.) The chairs will be set up prior to the class arrival and the students will place the balls according to the teacher's instructions. The goal is to get the balls into the correct positions and have students placed in the correct positions to represent the electrons, neutrons, and protons of an atom. The students get to move around and take part in the activity, which gives them a visual of the information as well as gets them excited about the material.

Guided Practice:
Day One:
The instructor will begin by using the pre-inquiry activity (atomic musical chairs) to spark interest in the topic. After the activity, the students will follow along in the student version notes and participate in the classroom discussion while the teacher reviews the material (including terms and learning objectives). The presentation will include images and interactive animations of atoms and the periodic table.

Day Two:
The instructor will answer any questions the students have from the previous lesson and introduce the windsock activity (www.nclark.net/windsockproject.htm). The students will complete the windsocks (with each student having a different element).

Day Three:
The students will present their project to the class.

Independent Practice:
Day One:
Students will complete individual activities during class as well as for homework, in which they will be calculating the number of atomic particles, drawing electron configurations, and identifying elements on the periodic table.

Day Two:
Students will complete their windsocks individually, using the grading rubric so they know what is expected.

Day Three: Students will present their projects which they have created.

Remediation and/or Enrichment:
Remediation:

- Pair students with other students who understand the material and let them use visual materials to work on
- Give a simpler version of the activity (atomic math worksheet from sciencespot.net)
- IEP's will be followed

Enrichment/Extension
Atomic Musical Chairs

- Discuss radioactivity by having the nucleus shoot out particles.
- Have an outside force (electricity) knock out an electron from its energy level.
- Have it emit a photon (ping-pong ball) as it drops back in.
- Discuss why groups have the same chemical properties.
- Lead into ionic bonding.
- Depending on time, you can stop at Neon and do more the next day as a review. Instead of going in order, after you have completed the basic idea and the students have gotten a hang of it, you can pick elements at random from Hydrogen to Argon and see how quickly they can do it. Keep them on their toes!
- You can also break the class into two teams and have them compete against each other. You can have one team go at a time and figure out how many protons and neutrons to put into the basket as well as how many electrons need to be in the energy levels. You can play music and the team has to be done before the music stops. (If you have 28 kids, you can do 2 teams of 14 and do the elements Hydrogen$_1$ to Silicon$_{14}$.)

Check(s) for Understanding:
Inquiry questions will be asked throughout the lesson. Students will respond by using their response systems, or by being called on randomly during the discussion. The questions will include, but will not be limited to:

- What do we know about the periodic table?
- How is one atom different from another?
- What do we know about the number of electrons?
- What do we know about electron orbitals?

Closure:

- The students could arrange themselves (according to the elements they are assigned) in the order the elements appear on the periodic table, or they could compare how their element differs from those of other students.
- The students could answer questions such as:
  What did we learn?
  What is the electron state of Lithium, Fluorine, Chlorine, Sodium, Potassium, Oxygen, etc.?
  How do the energy levels relate to the periods?
  Why did we keep changing seats?
  How does Carbon, for example, relate to Nitrogen? Etc…

Possible Alternate Subject Integrations:
Physical Science, Biology, Chemistry, Physics

Teacher Notes:

- This lesson can be done without the PowerPoint presentations if the resources are not available.
- The lesson may also span more time depending on the time needed to explain the material.
- If used with the PowerPoint and student version notes, this lesson will address three different learning styles. The aural learner benefits by hearing the notes as they are explained. The kinesthetic learner is kept busy by moving around and having to fill in the blanks on the student version notes, while also having to participate in classroom discussions. The visual learner is able to see the material in the written notes which are given to the students, and in the PowerPoint presentation. The intro activity (atomic musical chairs) allows the visual learner to see everything in its place, and get an idea of how subatomic particles are arranged.
- This lesson should be presented after students have an understanding of the periodic table and the elements it includes.
- The windsocks are great for displaying student work in the classroom. I use hooks or paperclips to hang them from the ceiling