Lesson Plan: Behind the Metal

FOR THE TEACHER

Summary
In this lesson, students will learn about the properties of metals. The students will work in small groups to create a video to anthropomorphize their selected metal as though it were a heavy metal musician and share the video with their peers.

Grade Level
Middle School

NGSS Alignment
This lesson will help prepare your students to meet the performance expectations in the following standards:

- **MS-PS1-2**: Analyze and interpret data on the properties of substances before and after the substances interact to determine if a chemical reaction has occurred.
- **MS-PS1-3**: Gather and make sense of information to describe that synthetic materials come from natural resources and impact society.
- **Scientific and Engineering Practices**:
  - Obtaining, Evaluating, and Communicating Information

Objectives
By the end of this lesson, students should be able to

- List and describe at least four characteristics of metals.
- Identify compounds containing metals.

Chemistry Topics
This lesson supports students’ understanding of

- Metals
- Physical Properties
- Chemical Properties
- Alloys
- Compounds
- Chemical Reactions

Time

Teacher Preparation:
- Activity 1: 10 minutes to prepare the materials (optional)

Lesson:
- Activity 1: 30 minutes
- Activity 2: 45 minutes
- Activity 3: 45 minutes
- Activity 4: Depends on the number of groups though student presentations can be limited in time to ensure they fit into a class period

Materials
- Activity 1
  - Metal sheet: A small piece of copper, tin, or even aluminum foil
  - Metal wire: Copper, gold, etc. The wire should not have a plastic coating.
  - Metal cooking pan or sheet
Periodic Table of Elements to display or a copy for each student
• Activity 2
  o Behind the Metal student handout part 2
  o Team Contract handout
• Activity 3
  o Completed group work plan
  o Digital recording device – cell phone, Chromebook, tablet, etc.
  o Optional: Recording software such as Screencast-O-Matic or Flipgrid
• Activity 4
  o Behind the Metal student handout part 4

Safety
• No specific safety precautions need to be observed for this activity.

Teacher Notes
• Activity 1: This part of the lesson serves as an introduction to the characteristics of metal elements.
  • The students do not need to have previous experience with the characteristics of metals in order to complete this activity. This activity will serve to activate students’ prior knowledge about metals and can help the teacher determine the best way to proceed with the rest of the lesson.
  • Prior to beginning the activity, the teacher can prepare information about the characteristics of metals in a format that works best for their students. The list of terms and examples listed at the end of this activity can be turned into slides or can be read by the teacher.
  • To begin the activity, the teacher should have the students respond to a written prompt: What are the characteristics of metal? The teacher should provide students with a few minutes to respond to the prompt and can then ask the students to share their thoughts with the class.
  • The teacher should make a list of the characteristics on the board or chart paper. These two questions are found in Part 1 of the Behind the Metal student handout.
  • Once the students are finished sharing their thoughts, the teacher should lead a review of the characteristics, using scientific terms to replace the students’ wording as necessary. Providing tangible examples of each may be helpful in developing student understanding.
  • Terms to review include:
    o Luster: Metals reflect light (they are shiny). The teacher can use the sheet of metal, pan/cooking sheet, and/or the wire to show the students how light reflects off of the metal. The teacher can ask the students to name other items that reflect light, which can include airplanes, vehicles, some metal playground equipment, etc.
    o Malleability: Metals can be hammered into thin sheets. The teacher can use the sheet of metal to show the students that metal can be made into sheets.
    o Ductility: Metals can be drawn into wires. The teacher can use the metal wire as an example to show the students that metal can be pulled into wire.
    o Conductors: Metals conduct heat and electricity. The teacher can explain that metal pans help conduct heat to cook food and metal wires (the copper wire could be used as an example) are used to conduct electricity.
    o Additionally, most metals are hard, are solid at room temperature, and have high melting points. The teacher can model these characteristics with the metal sheet, wire, and/or pan if the materials are available.
  • The teacher will explain that the students will be working on a project to explore a metal of their choice more in depth.
  • The teacher will display or give each student a copy of the periodic table of elements and ask them to identify the metals. The periodic table used should have clear labels/coloring and students should easily be able to read the key and identify the elements that are metals.
The teacher will explain that the students will be working in groups to create a video about a metal as if the metal was a musician. Optional: The teacher will ask the students if they are familiar with the VH1 show, Behind the Music. The teacher may choose to show a brief clip of the show to help the students understand the project.

Activity 2: The teacher will explain the idea that metals may have chemical reactions with other elements and that sometimes these reactions form alloys or compounds, while other reactions can have a more explosive effect.

The teacher will explain that some metals can be combined to create an alloy that is designed to display specific characteristics that may not be present in a single metal. For example, the teacher could explain that many times gold jewelry is an alloy made of gold and another metal (nickel, silver, copper, etc.) to give the jewelry a different color and to make it more durable.

The teacher will then place the students into small groups. If using groups of three, roles can be assigned to ensure students stay on task. Each student can be responsible for recording or writing the information for one of the three sections of the video: The Early Years, Allies and Enemies, Accomplishments.

The teacher can also have students complete the Team Contract worksheet to divide up the work evenly among the students in the group. The teacher may decide to assign each group an element to research or the students may be allowed to select an element on their own. Students tend to select metals that they are familiar with, which allows them to conduct a deeper exploration of an item that interests them.

The teacher will provide time for students to research the information they need to create their video. The Behind the Metal student handout part 2 has been designed for students to use as they conduct the research for their video.

A helpful source for students to use while completing the handout is ptable.com.

At the end of the work time, students should complete the Progress Update portion of their Team Contract handout. The teacher can review student responses to ensure that the students are completing their share of the work.

Activity 3: The teacher will provide students with the time and devices to create their Behind the Metal video.

The students should revisit their Team Contract and complete Part 3 of the Behind the Metal handout.

Students should create a draft of their script and prepare the visuals for their videos.

Students may create slides and use Screencast-o-Matic to record their slides and audio.

They could also narrate a PowerPoint presentation or hold up pictures of a live recording.

If recording equipment is not available, students may practice their presentation and present live.

The teacher should review the students’ scripts before they begin recording.

Part 3 of the Behind the Metal handout can be used to guide students through this activity.

Activity 4: The teacher will have the students view the videos created by their peers and take notes while they view the videos.

The students will complete a summary activity summarizing the properties of metals and some of the ways they are used in society by completing Part 4 of the Behind the Metal handout.

Sample student work, and video rubric documents have been included for teacher reference.