LIPSCOMB UNIVERSITY | Ayers Institute for Teacher Learning & Innovation

Standards-Aligned Lesson Plan

Middle School Science: Edmondson Park (Nashville, TN)

Developed in partnership with the Metropolitan Nashville Arts Commission.

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Planning and Presenting a Science Lesson Based on CCSS

7th Grade Science

Section I: Planning

Overview: This section focuses on the elements to consider when planning for a content-specific lesson with CCSS literacy embedded, such as Content Standards, State Performance Indicators, and CCSS Literacy for the Technical Subjects. Other elements to plan include clear learning targets, task objectives, new learning for students, anticipated learning challenges, scaffolding, opportunities for differentiation, ways to prompt student thinking through assessing and advancing questions, instructional strategies to be used in the lesson, and materials and resources.

Lesson Topic: Elements, Compounds, and Mixtures: Art or Chemistry?	**Time Frame/Lesson Length: 2 (hour long) class periods**

Content Standard	**State Performance Indicators**	**CCS Literacy Standards**	**Assessments (Please describe the specifics of the assessment)** ✓ **Formative** ➢ **Summative**
• Inq GLE 0707.Inq.2 Use appropriate tools and techniques to gather, organize, analyze, and interpret data. • GLE 0707.Inq.5 Communicate scientific understanding using descriptions, explanations, and models. • GLE 0807.9.1 Understand that all matter is made up of atoms. • GLE 0807.9.2 Explain	SPI 0807.Inq.3 Interpret and translate data in a table, graph, or diagram. SPI 0807.9.3 Classify common substances as elements or compounds based on their symbols or formulas. SPI 0807.9.4 Differentiate between a	CCSS.ELA-Literacy.RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table). CCSS.ELA-Literacy.RST.6-8.9 Compare and contrast the information gained from experiments, simulations, video, or multimedia sources with that gained from reading a text on the same topic. CCSS.ELA-Literacy.RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 6-8 texts and topics*.	**Formative** • Students will be formatively assessed during the jigsaw reading lesson through discussion and questioning • Lab handout • Exit Slip Day 1 • Gallery Walk **Summative** • Exit Slip Day 2

that matter has properties that are determined by the structure and arrangement of its atoms. • GLE 0807.9.3 Interpret data from an investigation to differentiate between physical and chemical changes.-Maybe not going to be addressed • GLE 0807.9.4 Distinguish among elements, compounds, and mixtures. • GLE 0807.9.6 Use the periodic table to determine the characteristics of an element.	mixture and a compound. SPI 0807.9.8 Interpret the results of an investigation to determine whether a physical or chemical change has occurred.	CCSS.ELA-Literacy.WHST.6-8.1.b Support claim(s) with logical reasoning and relevant, accurate data and evidence that demonstrate an understanding of the topic or text, using credible sources. CCSS.ELA-Literacy.WHST.6-8.2.d Use precise language and domain-specific vocabulary to inform about or explain the topic.	

Planning Element	**Description**
Clear Learning Targets	• The students will be able to distinguish among elements, compounds, and mixtures.

Task Objectives (steps to reach mastery of clear learning targets)	• The students will be able to look at different artwork and describe the elements, compounds, and mixtures that make up the artwork.
New Learning	• The differences between elements, compounds, and mixtures
Anticipated Learning Challenges	• Students will have difficulty distinguishing between compounds and mixtures
Scaffolding opportunities (to address learning challenges)	• Students who are having difficulty understanding will be assigned a peer tutor to go over the main differences among elements, compounds, and mixtures. • Students will exposed to more examples of the three.
Opportunities to Differentiate Learning (explain how you address particular student needs by differentiating process, content, or product)	• The reading passages can be leveled and differentiated. • The reading groups will be based on ability level. • The lab groups will be heterogeneous groups.
Questioning: Planning to Illuminate Student Thinking	**Essential Questions** 1. What is the difference between elements, compounds, and mixtures? 2. How are the atoms in air, water, and oxygen the same and how are they different? 3. How is art related to elements, compounds, and mixtures? *Assessing questions:* 1. What is the difference between an atom and a compound? 2. How is a heterogeneous mixture different from a homogeneous mixture? 3. How is the way a mixture is combined DIFFERENT from how a compound is combined? 4. What is easier to separate, a mixture or a compound? Why? 5. Which can be found on the periodic table: elements, compounds or mixtures? *Advancing questions: (Gallery Walk)* 1. What can you tell about the art from the pictures? 2. What do you notice about the pose of the figure? What is this person doing? 3. What other details do you notice? 4. What kind of different elements, compounds, or mixtures can you see in the art work? 5. Do you think the artwork when left in the park will undergo any physical or chemical changes? Explain.
Instructional Strategies	• Cooperative Group Work, Gallery Walk, Class Discussion, Jigsaw Reading
Materials and Resources	• Pictures of the Artwork (see appendix) • Various compounds, elements, and mixtures for the lab • Pennies • Other handouts and materials (see appendix)

Section II: Presentation
Overview: This section focuses on the steps involved in presenting the lesson. The lesson presentation is divided into segments, such as "Framing the Lesson," "The Texts and Task," "Sharing, Discussing, and Analyzing" and "Closing the Lesson," and "Extending the Learning." For each of these lesson elements, there is an explanation of the procedure, teacher actions, and student outcomes.

Day 1

🔔 **Framing the Lesson** 5-10 minutes		
Detailed Procedure **<u>Hook: Drawing Activity</u>** • Students will draw a picture with the directions to illustrate what they think a typical artist looks like and what they think a typical scientist looks like. • These pictures will be put on the board and will serve as the starting point for a discussion of the stereotypes of each. • Penny Lab Handout.	**Teacher Actions** • Teacher will monitor the classroom while students are drawing and explaining. Teacher will remind students to use words and pictures. Teacher should make sure students are being descriptive as teacher puts student work on the board. Pictures that are similar will be grouped together. • Teacher will lead the group discussion on the stereotypes of scientist and artist *Suggested discussion questions include:* 1. Why did you draw/describe a scientist in that way? 2. Why did you draw/describe an artist in that way? 3. Are there any similarities/differences between the two? 4. If no one has drawn him/herself, ask the group why no one drew him/herself? Can they be scientists, too? Why or why not? Complete the "Drawing a Scientist" Handout Connections to future learning: Remind	**Student Outcomes** • Students will become engaged, ready to learn, and comfortable sharing art work and "outside- the-box" thinking.

	students that stereotypes and first impressions are not always accurate. Explain that we will spend the next few days comparing and contrasting different vocabulary words and observing properties of elements, mixtures, and compounds. Similarities and differences will begin to become important terms, along with the idea that things are not necessarily as they first appear. There is opportunity here as well to include information about how artist Lonnie Holley takes found objects and transforms them into art (…things seem one way, but they are really another way…). This would lead well into the jigsaw activity (or could be discussed after the jigsaw).	
☙ **Exploring the Texts and Task** (50 minutes)		
Detailed Procedure **<u>Jigsaw Reading: Elements, Compounds, and Mixtures</u>** (30 minutes) *See appendix for the jigsaw activity handout: Elements, Compounds, and Mixtures- Is there an Art to it? - Jigsaw Reading Lesson* • Students will work in homogenous groups of three. • Students will read the Essential Questions and Molecules sections together. • Each student is assigned a number (one through three). The "ones" will read the Elements section, the	**Teacher Actions** • Teacher will assign students groups. • The teacher will monitor time (us of a timer is recommended) for the first read of 7 minutes. • Teacher will monitor students and answer questions that students may have.	**Student Outcomes** • Students will process knowledge as they complete a t-chart with notes from the different readings. • The students will know and understand the difference between compounds, elements, and mixtures.

"twos" will read the section on compounds, and the "threes" will read the section on mixtures. • Students should take about 7 minutes to read his/her section and identify key information to share with their group. • Students will come back to the group and discuss their part of the reading in two to three minute rotations. • Students will all read the Art Connection section and share their thoughts. • Students will complete a t-chart summarizing the readings. **<u>Quick Lab</u>** (20 minutes) *See appendix for Quick Lab Sheet--Lab: Identifying Elements, Compounds, and Mixtures* • Each student group will read through the review chart and answer the pre-lab questions. • Students will then rotate through the stations, identifying each substance as an element, compound, or mixture. (If it is a mixture, they should be sure to include whether it is homogeneous or heterogeneous.) • Students must include at least three observations of the substance and a meaningful REASON for their classifications.	• The teacher will observe and informally assess groups as the students share the information to ensure that students share correct information. • Teacher will have prepared the different stations. • The teacher's main focus should be on the explanation portion of the lab sheet and on monitoring throughout the lab. • The teacher should make sure that students have clear reasoning behind why they choose their classifications. Examples of what teachers can use at the different stations. 1: Oil and Water (in a beaker): mixture (hetero) 2: Copper Wire: element	• Students will be able to describe clearly why certain substances or items are elements, compounds, and mixtures. • Students should be able to defend reasoning behind selection in the different categories.

	3: Chalk (CaCO3): compound 4: Rocks and Sand: mixture (hetero) 5: Water: compound 6: Kool-Aid (or Gatorade): mixture (homogeneous) 7: Aluminum Foil: element 8: Air in a balloon (mixture: homogeneous) Suggested questions to ask during the lab: 1. Why did you classify the item in that category? Explain. 2. Identify or describe one reason why this item could not fit into another category?	
☺ **Sharing, Discussing, and Analyzing**		
Detailed Procedure • Students share, discuss, and analyze throughout the jigsaw and quick lab activities.	**Teacher Actions** • Teacher will monitor activities while promoting accountable talk strategies. Examples include: "I agree with you because…" "I disagree with you because…" "In the reading, on this page, it clearly states…"	**Student Outcomes** • The students will gain an understanding of the differences between elements, compounds, and mixtures. • Students will be exposed to real-world examples of the three as a result of the quick lab activity.
☐ **Closing the Lesson** (5 minutes)		
Detailed Procedure **<u>Exit Slip</u>** • The students will complete and turn in an exit slip (see appendix).	**Teacher Actions** • The teacher will grade the exit slips after class and will use the data to plan for the following day. If the majority of the students have grasped the material, the teacher will continue to Day 2. If the majority of students have not grasped the material, the teacher will reteach the information.	**Student Outcomes** • The students should have mastered the material at the 80% level or above.

Day 2

🔔 **Framing the Lesson** (5-10 minutes)		
Detailed Procedure **<u>Mini Penny Lab</u>** • Students will work in small groups to complete a mini-lab on mixed materials. • Students will take notes and will come analyze the periodic table. • Students will reach conclusions about the penny and its composition based upon the lab.	**Teacher Actions** • Teacher should give each group a penny and a copy of the periodic table • Teacher will explain that the metal in a penny is an alloy of zinc and copper. • Teacher will instruct the class to identify these two metals on a periodic table. • Teacher will instruct students to draw their pennies and then answer the following questions in their journals, using adjectives to describe characteristics. Questions to Be Asked about the Penny Lab 1. What color is the coin? 2. Is it shiny or dull? 3. How would you describe the texture of the surface? 4. Is the metal hard or soft? • Teacher will circulate the classroom while groups are discussing the penny. • Teacher should ask different groups to explain their findings in a whole class setting after the lab.	**Student Outcomes** • Students will to describe objects based on their physical characteristics and begin to think of the composition of objects. • Students will practice using the periodic table of the elements. • Students will have a basic understanding of use of the periodic table.

✍ **Exploring the Texts and Task** (30-35 minutes)		
Detailed Procedure **<u>Gallery Walk Assessment</u>** • The students will participate in a gallery walk in order to analyze different images of art pieces created by Lonnie Holley and Thornton Dial. (see the Gallery Walk images and Gallery Walk Handout in the appendices)	**Teacher Actions** • The teacher will make sure that students are examining the art in a meaningful way. • The teacher will monitor the activity, asking questions throughout. Suggested questions include: 1. What can you tell about the art from the pictures? 2. What do you notice about the pose of the figure? If there is a person represented in the image, what is this person doing? 3. What other details do you notice? 4. What kind of different elements, compounds, or mixtures can you see in the art work? 5. If these art pieces were displayed in a park, would they undergo any physical or chemical changes? Explain. *(Once the park is complete, the teacher may choose to add images of the installed works).*	**Student Outcomes** • Students should have a clear understanding of the difference between elements, compounds, and mixtures. • The students will be introduced to the art of Thornton Dial and Lonnie Holley. • The students will have introductory understanding of considerations an artist might take in creating a public art work (climate and weather conditions, use of durable materials, etc…)

☺ **Sharing, Discussing, and Analyzing** (5-7 minutes)		
Detailed Procedure • After the gallery walk, students will participate in a whole-group discussion regarding the gallery walk activity.	**Teacher Actions** • The teacher will facilitate a class discussion, focusing on the connections between chemistry and art. • Suggested questions include: 1. What piece of art was your favorite? Why? 2. How easy or difficult was it to identify the different materials used in each work? Explain. 3. Can you explain the relationship that art has with chemistry?	**Student Outcomes** • Students will have a deeper understanding and appreciation of art. • Students will be able to make connections between chemistry and art. • Students will be able to analyze information to determine whether something is an element, compound, or mixture.
☐ **Closing the Lesson** (3-5 minutes)		
Detailed Procedure **<u>Exit Slip</u>** • The students will complete and turn in an exit slip (see appendix).	**Teacher Actions** • The teacher will grade the exit slips. If the majority of the students have grasped the material, the teacher will move on to the next concept. If the majority of students have not grasped the material, the teacher will reteach the information.	**Student Outcomes** • The students should have mastered the material at the 80% level or above.
🕮 **Extending the Learning** • The students will have the opportunity to build their own art from recycled or found materials. The art should include at least two elements, compounds, and mixtures. The students will use commonly found materials in their house and at school to create their work—using the examples and inspiration from Lonnie Holley and Thornton Dial. The pieces should be assessed based on the use of the required number of elements/compounds/mixtures; whether or not the student used recycled materials and/or found objects; and the integration of various scientific vocabulary within an accompanying description (it is recommended that the teacher create a rubric).		

Appendices (attach resources used, such as handouts, etc…):

- Scientist/Artist Drawing Handout Day 1- Warm Up
- Elements, Compounds, and Mixtures- Is there an Art to it? - Jigsaw Reading Lesson- Day 1- Reading Activity
- Lab: Identifying Elements, Compounds, and Mixtures- Day 1- Quick Lab
- Exit Slip Vocabulary- Day 1- Exit Slip
- Gallery Walk Pictures- Day 2- Gallery Walk Assessment
- Gallery Walk Handout- Day 2- Worksheet for Students to fill in while completing the gallery walk
- Exit Slip over Content- Day 2- Summative Assessment

Name: _____ Block: _____

Elements, Compounds, and Mixtures- Is there an Art to it? - Jigsaw Reading Lesson

Essential Questions

1. What are the difference among elements, compounds and mixtures?

2. How are the atoms in air, water, and oxygen the same and how are they different?

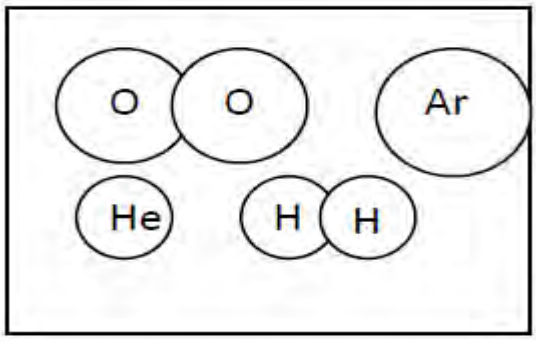
3. How can art be related to elements, compounds, and mixtures?

Molecules

Molecules form when atoms are chemically joined together, and are made up of two or more atoms. The size of a molecule depends upon the size and number of atoms that make it up. For example, the oxygen molecules we breathe are made out of only two atoms joined together and can be represented by the chemical formula O_2. On the other hand, one molecule of aspirin is made of twenty-one atoms and is represented by the chemical formula of $C_9H_8O_4$.

Elements

Molecules are classified into two major types: elements and compounds. Remember, if a molecule is made out of only one type of atom, it is an **element**. Elements can have just one atom, or they can have many of the same atoms joined together. If all of the atoms in a molecule are alike, then the molecule is classified as an element. For example, the O_2 we breathe is an element, since both of the atoms are oxygen. Air also contains other elements, such as Helium (H), Nitrogen (N_2), Hydrogen (H_2), Argon (Ar) and Neon (N).

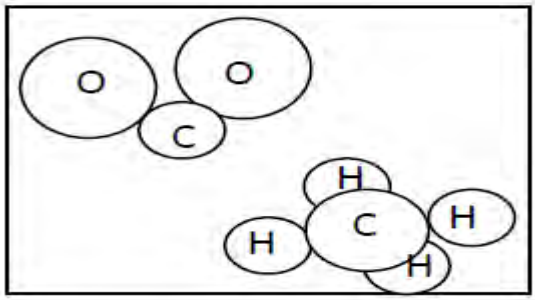


Examples of elements as molecules and atoms

Which of these elements are molecules and which are atoms?

Compounds

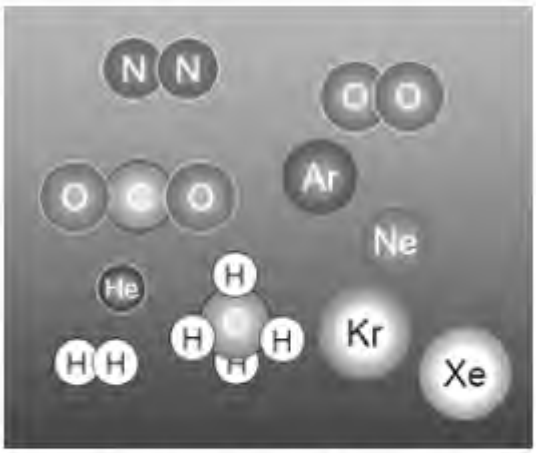
Molecules that have more than one type of atom are called **compounds**. All molecules are made of atoms that have been joined together. However, if all of the atoms are not the same, the molecule is classified as a compound. The aspirin molecule of $C_9H_8O_4$ is made of three different types of atoms: carbon atoms, hydrogen atoms, and oxygen atoms. Therefore, $C_9H_8O_4$ is a compound. Air contains compounds such as carbon dioxide (CO_2), methane (CH_4), and water vapor (H_2O). Notice that all these examples have two or more different elements in them.



Examples of molecules. Notice they have more than one type of atom.

Mixtures

Mixtures are composed of two or more substances which each keep their original properties and do not combine chemically when put together. A salad is an example of a mixture. Each part keeps its own properties—lettuce, tomatoes, carrots, peppers all taste like themselves--but they are all combined to form a salad. The special trait of mixtures is that physical forces can still remove the basic parts. Air is considered a mixture, because it contains different elements and compounds, but each one still maintains its own properties. The oxygen in air is mixed with other elements and compounds, but it is still oxygen.



Example of a mixture. Notice the composition of air includes both elements and compounds.

<u>Art Connection</u>

The Metro Nashville Arts Commission has engaged two internationally-known artists, Thornton Dial and Lonnie Holley, to create site-specific public art works for Edmondson Park in Nashville, Tennessee. This project honors William Edmondson, a native of Davidson County, a self-taught sculptor, and the first African American artist to have a solo exhibition at the New York Museum of Modern Art (1937). Thornton Dial and Lonnie Holley, like Edmondson, are self-taught artists.

Thornton Dial

Born 1928 in Bessemer, Alabama

Dial worked as an industrial worker until 1981, was "discovered" in 1987 by friend, Lonnie Holley and Art Collector William Arnett. His works are largely found objects, both 2D and 3D. Dial is one of the most notable self-taught artists of the last century, exhibiting work in major museums across the US. His work is featured in numerous public and private collections such as Smithsonian American Art Museum and Whitney Museum of American Art. Thornton Dial continues to create work with the help of his son, artist Richard Dial.

Lonnie Holley

Born 1950 Birmingham, Alabama

Holley is a self-taught artist, inspired to pursue art after carving tombstones for his sister's two children who died in a house fire. Like William Edmondson, Holley believes that his work and materials are divinely inspired. Holley's works include carved sandstone and found object assemblages. Some of the materials uses in these assemblages include: orphaned shoes, plastic flowers, tattered quilts, tires, animal bones, VCR remotes, wooden ladders, an old tailor's dummy, a broken Minolta EP 510 copy machine, a pink scooter, rusted oil drums, metal pipes, broken headstone fragments, a half-melted television set, a syringe, a white cross. Holley's sculptures have been displayed in institutions such as The Smithsonian American Museum of Art, The American Folk Art Museum, The High Museum of Art and the White House.

Critical Thinking: Art and Chemistry—is there a connection?

- Thinking about some of the materials the Mr. Holley used in his artwork, please fill in the chart below, and try to list any elements, compounds, and mixtures that you can determine from the above list of materials:

Item from the Art Work	Element	Compounds	Mixtures

Name: _____ Block: ____

Lab: Identifying Elements, Compounds, and Mixtures

Directions: Read the review chart below and answer the pre-lab questions. Then, rotate through the stations, identifying each substance as an element, compound, or mixture. If it is a mixture, be sure to include whether it is **homogeneous** or **heterogeneous**. Be sure to include 3 observations of the substance, and a meaningful REASON for your classification!

Element	Compound	Mixture
Made of ONE kind of atom (found on the periodic table) Cannot be separated into any simpler form chemically or physically	Made of 2 or more kinds of atoms chemically combined in a certain ratio (e.g. water molecule is 2 hydrogens and one oxygen atom) 2 or more elements or compounds mixed together physically	Not chemically combined! Each part keeps its own chemical identity Can be heterogeneous (different throughout) or homogeneous (the same throughout)

Pre-Lab Questions

1. What is the difference between an atom and a compound?

2. How is a heterogeneous mixture different from a homogeneous mixture?

3. How is the way a mixture is combined DIFFERENT from how a compound is combined?

4. What is easier to separate, a mixture or a compound? Why?

5. Which can be found on the periodic table: elements, compounds or mixtures?

Station Number/ Description/ Observations	Identity of Substance	Description/ Observations	Classification (Element, Compound, Mixture) How do you know?
1			
2			
3			
4			
5			
6			
7			
8			

Name: _____ **Block:** _____

Gallery Walk Handout

Picture Title	Name of Artist	First Thoughts	Items Used in the Artwork	What are the different elements, compounds, and mixtures in the artwork?- Explain

Conclusion

1. Sketch a piece of art that could go on display in the classroom (you may use the back of this sheet).
2. Label the materials that you would use.
3. Identify on your paper whether each of your chosen materials is an element, compound, or mixture.

Gallery Walk Pictures

Olympic Rings (LH)

Monument_to_the_Minds_of_the_Little_Negro_Steelworkers.jpg n (TD)

Gabriel's Horn (LH)

Keeping You out of Harm's Way (LH)

High and Wide (Carrying the Rats to the Man) - (TD)

Art of Alabama (TD)

Name: _____ **Block: _____**

Draw a Scientist/Artist Worksheet

How many scientists from our class/group total: (Write your total in the blank provided.)

- **Had glasses?** _____
- **Had big, crazy hair?** _____
- **Wore a lab coat?** _____
- **Had beakers?** _____
- **Were males?** _____
- **Were working in a laboratory?** _____
- **Contained words like 'danger' or 'keep out'?** _____

How many artists, from our class/group total: (Write your total in the blank provided.)

- **Wore a beret?** _____
- **Were holding paint?** _____
- **Looked sloppy?** _____
- **Were females?** _____
- **Had a canvas in front of them?** _____

List any other similarities between the pictures in your group.

Why do you think that your pictures had certain similarities?

Exit Slip Day 1- Vocabulary

1. Describe an element:

2. What makes something a mixture, not a compound?

Exit Slip Day 2- Content

1. True or False- An element can be broken down into a simpler substance.

2. Name one property that scientists use to distinguish elements from one another.

_____

3. True or False- Compounds are two or more elements chemically combined.

4. True or False- Compounds can be formed in any ratio; the elements do not have to be combined in a specific ratio.

5. (True or False) One of the main differences between a mixture and a compound is that a mixture is physically combined and a compound is chemically combined.

Complete the Chart Below with Real-World Examples (Give at least two examples for each)

Elements	Compounds	Mixtures