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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for Science

Quarter 2
Lesson
2

Lesson Exemplar for Science Grade 8
Quarter 2: Lesson 2 of 6 (Week 2)
SY 2025-2026

Development Team

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SCIENCE (CHEMISTRY) /QUARTER 2/ GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The current structure of the atom includes subatomic particles, their symbols, mass, charge, and location.
B. Performance Standards	By the end of the Quarter, learners demonstrate an understanding of the structure of the atom and how our understandings have changed over time. They draw models of the atom and use tables to represent the properties of subatomic particles.
C. Learning Competencies and Objectives	***Learning Competencies:*** The learners draw the structure of an atom in terms of the nucleus and electron shells within an atom; and differentiate the subatomic particles—protons, neutrons, and electrons—in terms of their symbol, mass, charge, and location within an atom. ***Learning Objectives:*** **1.** Identify and label the subatomic particles in each atom diagram. **2.** Describe the properties of protons, neutrons, and electrons. **3.** Explain the significance of the arrangement of subatomic particles in an atom. **4.** Draw the structure of an atom, including the nucleus and electron shells. **5.** Compare and contrast the properties of protons, neutrons, and electrons in terms of their symbol, mass, charge, and location within an atom. **6.** Discuss how the arrangement of electrons in shells influences the chemical properties of an element.
D. Content	**1. Structure of the Atom: Nucleus, Electron Shells** - Nucleus - Electron Shell **2. Properties of Subatomic Particles: Protons, Neutrons, Electrons** - Protons - Neutrons - Electrons **3. Interaction and Significance of Subatomic Particles** - Interactions within the atoms - Significance of Particle Arrangement

E. Integration	**Theme:** Environmental literacy by understanding atomic structure's role in chemistry and its implications for materials science. **Advocacy:** Promotion of scientific literacy and critical thinking.

II. LEARNING RESOURCES

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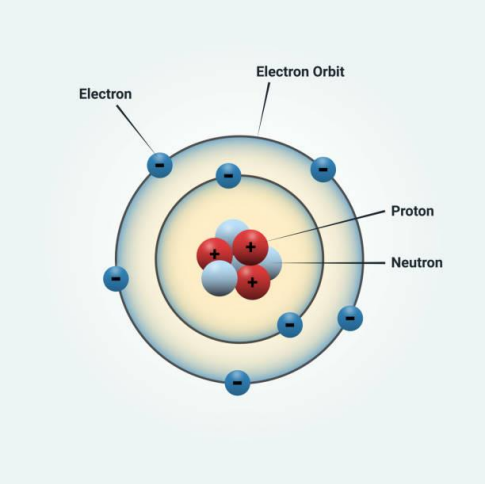
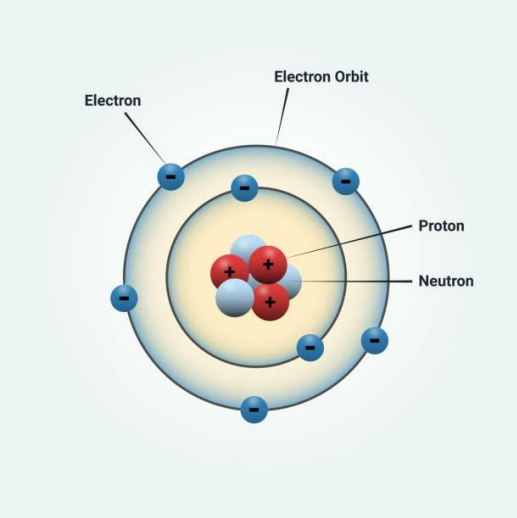
III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**Day 1** • **Short Review** - Begin by recalling the evolution of the atomic model discussed in Week 1. - Conduct a quick quiz on key historical figures and their contributions to atomic theory to reinforce previous learning.	Key: 1. John Dalton 2. J.J. Thomson 3. Ernest Rutherford 4. James Chadwick 5. Neils Bohr

	- **Sample Items:** 1. Who is known as the "father of modern atomic theory" for his work in developing the first atomic theory in the early 19th century? 2. Which scientist discovered the electron and proposed the "plum pudding" model of the atom? 3. Who conducted the gold foil experiment and discovered the nucleus, leading to the nuclear model of the atom? 4. Which scientist is credited with discovering the neutron? 5. Who proposed the planetary model of the atom, where electrons orbit the nucleus in fixed paths? - **Discussion**: Recap the development of atomic models from Democritus to Bohr, highlighting the progression of scientific thought and discovery. - **Feedback**: Provide feedback on the previous week's homework, which involved creating a timeline of atomic model development. For example, praise students for their accurate representations and creativity, and offer constructive feedback on areas needing improvement, such as chronological order and explanatory notes. **Day 2** • **Review of Subatomic Particles** - **Discussion:** Briefly review the basic structure of an atom and its subatomic particles (protons, neutrons, electrons). - **Engagement Questions:** 1 What do you know about the nucleus of an atom? 2. How do electrons differ from protons and neutrons? **Day 3** • **Visualizing Atomic Structure** - **Activity:** Use a diagram to illustrate the basic structure of an atom, focusing on the nucleus and electron shells. - **Engagement Questions:** 1. Can you identify the parts of an atom in this diagram? 2. How are the subatomic particles arranged in an atom?	

	Sample diagram  Image Source: istockphoto.com **Day 4** • **Connecting Subatomic Particles to Chemical Properties** - **Discussion:** Discuss how the arrangement of subatomic particles influences the chemical properties of elements. - **Engagement Questions:** 1. Why is the arrangement of electrons in shells important for an element's chemical behavior? 2. How do protons and neutrons contribute to the stability of the nucleus?	
B. Establishing Lesson Purpose	**1. Lesson Purpose** Discuss the importance of understanding the atom's structure in chemistry and elicit student responses on why knowing subatomic particles is crucial. Enhance engagement by showing a short video clip that highlights the role of atoms in everyday life, making the learning relevant and interesting (International Atomic Energy Agency, 2015). Video Source: https://www.iaea.org/newscenter/multimedia/videos/how-atom-benefits-life	**Guide Questions for watching the video:** **Before Watching the Video** 1. What are some fundamental needs of modern daily life that might be influenced by atomic structure and nuclear technology?

	- *Example in Water: 1:00 – 2:29* - *Example in Food: 2:30 – 4:14* - *Example in Health 4:15- 5:26* **2. Unlocking Content Vocabulary** **Gather Ideas from students:** Before introducing the vocabulary, engage the students in a discussion to see what they already know about atoms and their components. Ask questions such as: - "Can anyone tell me what they know about the center of an atom?" - "What do you think are the parts of an atom?" - "Have you heard of protons, neutrons, or electrons before? What do you think they do?" **Introduce and explain the key vocabulary for the lesson**: Use simple, clear language to explain each term, building on what students have shared such as proton, neutron, among others. - **Nucleus**: The nucleus is the center of an atom. It contains two types of particles: protons and neutrons. The nucleus is very small and dense, holding most of the atom's mass. (Chang & Goldsby, 2016). - **Electron Shells:** Electron shells surround the nucleus and are where electrons are found. These shells are layers at different distances from the nucleus. Electrons in these shells have negative charges and are involved in chemical reactions and bonding (Hill & Kolb, 2001). - **Protons (p^+)**: Protons are particles in the nucleus with a positive charge. Each proton has a mass of 1 atomic mass unit (amu). The number of protons in the nucleus determines the element and its atomic number. - **Neutrons (n)**: Neutrons are particles in the nucleus with no charge. They have a mass like protons, about 1 amu. Neutrons help stabilize the nucleus by reducing the repulsive forces between protons. The number of neutrons can vary in isotopes of the same element, changing the atomic mass without significantly altering chemical properties. - **Electrons (e^-)**: Electrons are negatively charged particles found in electron shells around the nucleus. They have a very small mass compared to protons and neutrons, about 1/1836 of an amu. The arrangement of	**During Watching the Video** 1. What specific examples does the video provide to illustrate the use of nuclear technology in healthcare? **After Watching the Video** 1. Reflect on the various applications of nuclear technology discussed in the video. Which application did you find most interesting and why? 2. How does the knowledge of atomic structure contribute to the safety and effectiveness of nuclear technologies in different fields?

	electrons determines the atom's reactivity, chemical properties, and bonding behavior. - **Electrostatic Forces:** Electrostatic forces are the attractive or repulsive forces between charged particles. In an atom, these forces keep negatively charged electrons orbiting around the positively charged protons in the nucleus of Subatomic Particles - **Nuclear Forces:** Nuclear forces are the strong forces that hold protons and neutrons together in the nucleus of an atom. These forces are much stronger than electrostatic forces and ensure the nucleus stays intact despite the repulsive forces between positively charged protons.	
C. Developing and Deepening Understanding	**Day 1** **SUB-TOPIC 1: Structure of the Atom** **1. Explicitation** Contextualize the atom's structure within the nucleus and electron shells. Use a diagram to illustrate the basic structure of an atom and elicit responses from students about their prior knowledge of atoms. This foundational understanding will prepare them for more detailed learning. Sample diagram  Image Source: istockphoto.com	**Explicitation**: When introducing new concepts, always connect them to prior knowledge and real-life examples to make them more relatable and easier to understand. **Worked Example**: Use clear, step-by-step demonstrations to model the process of drawing atomic structures or identifying subatomic particles. Encourage students to ask questions throughout to ensure they are following along. Lesson **Activity**: Design activities that cater to different learning styles. Visual learners will benefit from drawing and diagrams, while hands-on learners may

	2. Worked Example
	Draw a simple atom (e.g., hydrogen) on the board, labeling the nucleus and electron shell. Discuss the properties of protons, neutrons, and electrons, and explain how the number of protons determines the element's identity. This hands-on example helps students visualize and understand the atomic structure.
	
	3. Lesson Activity
	For Activity 1, have students draw their own models of a carbon atom, labeling all subatomic particles.
	
	Follow this with Activity 2: Subatomic Particle Poster Presentation. Follow the guidelines:
	
	Follow Materials Needed: Bond paper, markers/pens, and reference materials (textbooks or class notes)
	
	Procedure:
	- **Group Assignment**: Divide the class into three groups. Assign each group one type of subatomic particle (protons, neutrons, or electrons).
	- **Research and Preparation**: Each group will create a poster about their assigned particle. The poster should include:
	  - The particle's charge (positive, negative, or neutral)
	  - The particle's relative mass
	  - The particle's location within the atom
	  - The particle's role/function in the atom
	  - Any interesting facts or historical information about the particle
	- **Poster Creation**: Allow groups time to research, design, and create their posters using class notes and textbooks.
	- **Presentation**: Have each group present their poster to the class, explaining the information they included and why it is important. Encourage other students to ask questions and provide feedback after each presentation.
	- **Class Discussion**: After all presentations, facilitate a class discussion comparing the three types of subatomic particles. Then, alongside the students, summarize key points on the board, such as the differences in charge, mass, location, and function.
		benefit from interactive simulations.
		
		See Learning Activity Sheet: *Activity #1: Completing the Table of Subatomic Particles*
		&
		See Learning Activity Sheet: *Activity #2: Understanding Atomic Structure*
		
		Activity 2 Assessment:
		- Evaluate the posters based on accuracy, creativity, and completeness.
		- Assess group presentations on clarity and how well they communicated the information.
		- Collect and review student reflections to gauge their understanding of subatomic particles.

- **Reflection**: Have students individually write a short reflection on what they learned about subatomic particles from the activity. Prompt them to include how the particles differ and why these differences are significant.

Day 2-3
SUB-TOPIC 2: Properties of Subatomic Particles

1. **Explicitation**

   Use a video to illustrate the discovery of electrons by J.J. Thomson (Infinity Learn NEET, 2022). Show how protons and neutrons were discovered and explain their significance in the nucleus.
   Link: https://www.youtube.com/watch?v=iJSF6Miq2sc

   Ask questions about the charge and location of electrons to check for understanding and encourage critical thinking.

   Sample questions:
   1. Why is the discovery of the electron significant in understanding atomic structure?
   2. How does the location of electrons affect the chemical behavior of an element?
   3. Explain how the electron cloud model provides a more accurate representation of electron location compared to Thomson's initial model.

2. **Worked Example**

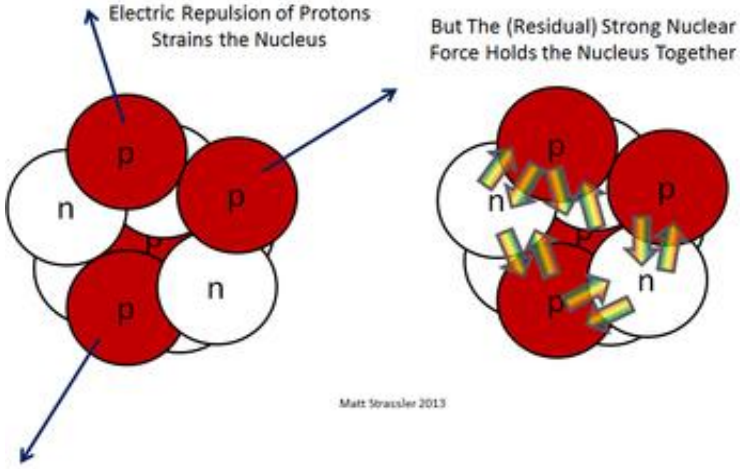
   Conduct a guided practice where students fill out a table of subatomic particles' properties (symbol, mass, charge, location). For example:

Particle	**Symbol**	**Mass(amu)**	**Charge**	**Location**
Proton	p^+	1	+1	Nucleus
Neutron	N	1	0	Nucleus
Electron	e^-	~0	-1	Electron shell

3. **Lesson Activity**

   In Activity 3, students complete a worksheet on identifying the properties of subatomic particles in different elements.

Answer Keys:
1. The discovery of the electron revealed that atoms have internal structure and are not indivisible, leading to the development of modern atomic theory and understanding of chemical reactions.
2. Electrons in the outermost energy levels (valence electrons) determine an element's chemical reactivity and bonding properties, influencing how elements interact to form compounds.
3. The electron cloud model depicts electrons in probabilistic orbitals rather than fixed paths, reflecting the uncertainty and distribution of electrons around the nucleus more accurately than Thomson's "plum pudding" model.

	For Activity 4, pair students to quiz each other on subatomic particles' properties, reinforcing their learning through peer interaction. **Day 4** **SUB-TOPIC 3: Interaction and Significance of Subatomic Particles Explicitation** For electrostatic attraction, get two magnets. If not available, just let the students imagine magnets that either pull towards each other or push away, depending on their charges. Ask the questions: 1. "Why do you think electrons do not crash into the nucleus despite their attraction to protons?" 2. "How might these forces affect the stability of an atom?" For nuclear forces, let them think of glue that is strong enough to hold the nucleus together even when the protons want to push apart. Ask the questions: 3. "What might happen to the nucleus if there were no neutrons?" 4. "Why are these forces crucial for the nucleus?" **1. Worked Example** Using a model or Diagram, show the forces at play within an atom. Explain how electrostatic forces keep electrons in orbit and how nuclear forces hold the nucleus together. When discussing particle stability, explain how protons and neutrons contribute to the nucleus' stability and discuss what would happen if these forces were not balanced.  Image Source: uomus.edu.iq *Guide Questions:* *1. "How do nuclear forces contribute to the stability of the nucleus?"* *2. "What role do neutrons play in keeping the nucleus stable?"*	See Learning Activity Sheet: *Activity #3: Role of Subatomic Particles and Atomic Stability* & See Learning Activity Sheet: *Activity #4: Investigatory Case Study – The Mystery of the Unstable Atom* **Note**: Just introduce the concept. This will be further discussed on Week-7. **Key ideas**: 1. Electrons are kept in orbit by their energy and the balance of forces. 2. Balanced forces keep the atom stable; imbalance can make it unstable. 3. Without neutrons, protons would repel each other, causing the nucleus to break apart. 4. Nuclear forces keep protons and neutrons together, ensuring nucleus stability. **Note:** Do not mention the word "isotope" yet. It will be discussed on Week-3.

2. **Lesson Activity**

Materials Needed: Models of atomic nuclei (choose any), marker, whiteboard or chart paper, and worksheets for notetaking

Procedure:

- **Demonstration**: Show models of different atomic nuclei (e.g., helium, carbon, uranium) and discuss their stability. Use the models to illustrate how protons and neutrons are arranged in the nucleus.

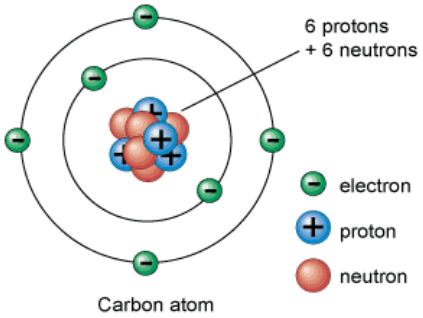
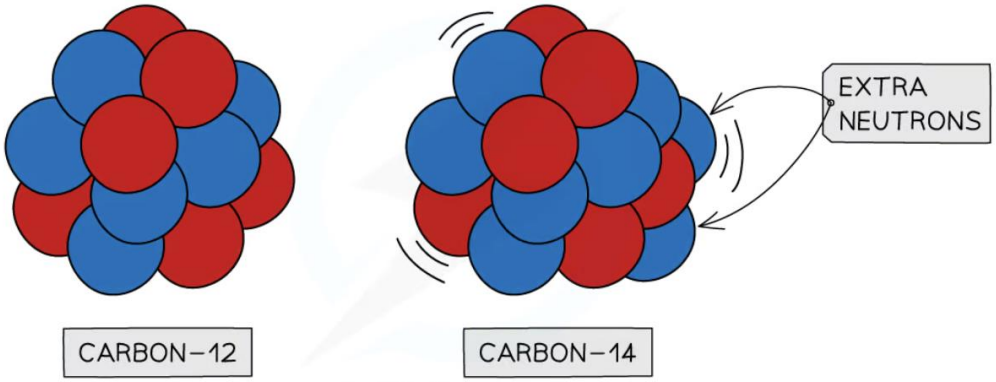


Image Source: https://nuclear-energy.net/atom

- **Group Activity:** Divide students into small groups and provide each group with different nucleus models Instruct each group to analyze the model, noting the number of protons and neutrons. Have each group discuss and record their observations about the stability of the nucleus based on the arrangement of protons and neutrons.
- **Comparison and Contrast**: Bring the class together and have each group present their findings. Compare and contrast the roles of protons and neutrons in maintaining the nucleus' stability. Discuss how an imbalance (too many or too few neutrons) can affect the nucleus's stability.
- **Discussion on Imbalanced Forces:** Discussion on Imbalanced Forces: Discuss the implications of imbalanced forces within the nucleus, such as why certain nuclei are radioactive and tend to decay. Use visual aids to show examples of stable and unstable nuclei and explain the concept of nuclear stability.

	 Image Source: savemyexams.com - **Reflection Question:** "Why are neutrons important for the stability of the nucleus?" - **Research Assignment**: Assign a short research task where students investigate real-world examples of nuclear stability, such as why certain elements are used in nuclear reactors and others are not.	
D. Making Generalizations	**1. Learners' Takeaways** Prompt students to write a summary of the structure of an atom and the properties of subatomic particles. Discuss key points as a class, reinforcing the importance of each subatomic particle. **Summary:** *Structure of an Atom:* The atom is composed of a central nucleus and surrounding electron shells. The nucleus, located at the center of the atom, contains protons and neutrons. Electron shells surround the nucleus and contain electrons that orbit the nucleus. *Properties of Subatomic Particles:* Protons, which are positively charged (+1), reside in the nucleus and determine the atomic number and identity of the element. Neutrons, which have no charge (0), are also located in the nucleus and contribute to the atomic mass and stability of the nucleus. Electrons, negatively charged (-1), orbit the nucleus in electron shells and play a crucial role in chemical reactions and bonding.	Encourage students to summarize in their own words to reinforce learning and check for understanding. Guide students to think about their learning process and outcomes, which can help them become more effective, independent learners.

	Significance of Arrangement: The arrangement of these subatomic particles is significant for the stability and behavior of the atom. The stability of the nucleus is maintained by nuclear forces that hold protons and neutrons together, with neutrons preventing the repulsion between protons. The configuration of electrons in different shells determines the chemical properties and reactivity of the element. Valence electrons, or the electrons in the outermost shell, are particularly important for chemical bonding. **2. Reflection on Learning** Ask students to reflect on how understanding the atom's structure helps in comprehending broader chemistry concepts. Encourage self-assessment by asking, "*What new information did I learn today about the atom*?" and set personal goals for mastering atomic structure concepts.	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Administer a short quiz on the properties of protons, neutrons, and electrons. Assess the accuracy of students' drawn atomic models and observe their participation in interactive simulations to gauge understanding. Sample Quiz: 1. What is the charge of a proton? **+1** 2. Where are the electrons located in an atom? **Electron shells** 3. Which subatomic particles has no charge? **neutron** 4. What is the relative mass of an electron compared to a proton? **Much smaller** 5. How do neutrons contribute to the stability of the nucleus? **By reducing repulson between particles** 6. Protons and neutrons are in the electron shells. (True/**False**) 7. The atomic number of an element is determined by the number of protons in its nucleus. (**True**/False)	Provide clear guidelines and rubrics for both the quiz and the homework assignments to ensure students understand the expectations. Offer examples or templates for the poster/digital presentation to guide students in organizing their information effectively. Encourage students to use creative elements in their posters, such as diagrams, drawings, or digital graphics, to make their

<table>
<tr>
<td></td>
<td colspan="3">8. What is the significance of valence electrons in chemical bonding? Valence electrons are the outermost electrons of an atom and are involved in forming chemical bonds with other atoms.
9. Draw and label a simple diagram of a carbon atom, indicating the nucleus and electron shells. (Diagram of a carbon atom with 6 protons and 6 neutrons in the nucleus, and 2 electrons in the first shell, 4 electrons in the second shell)

2. Homework (Optional)
Option 1: Have students create a detailed 2D poster or digital presentation that illustrates the structure of an atom, including labeled subatomic particles. This project can also include a brief written explanation of each particle's properties and functions.

Option 2: ask students to research and write a short report on a scientist who contributed to the atomic theory, such as Rutherford or Bohr. This report should cover the scientist's key discoveries, the experiments they conducted, and how their work advanced our understanding of atomic structure. This assignment will reinforce their understanding of historical contributions to atomic theory and improve their research and writing skills.</td>
<td>presentations visually appealing.

For the research report, suggest reliable sources and provide a structure to help students organize their findings coherently.</td>
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<td rowspan="3">B. Teacher's Remarks</td>
<td>Note observations on any of the following areas:</td>
<td>Effective Practices</td>
<td>Problems Encountered</td>
<td rowspan="3">Effective Practices:
Note any effective strategies that helped in explaining the structure of the atom. Record levels of student engagement and participation to identify successful approaches.</td>
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<tr>
<td>strategies explored</td>
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	learner engagement/ interaction			**Problems Encountered**: Document any difficulties students faced in understanding the concepts and note any issues with materials or resources that need addressing.
	Others			
C. Teacher's Reflection	*Reflection guide or prompt can be on:* ▪ *Principles behind the teaching* *What principles and beliefs informed my lesson?* *Why did I teach the lesson the way I did?* ▪ *Students* *What roles did my students play in my lesson?* *What did my students learn? How did they learn?* ▪ *Ways forward* *What could I have done differently?* *What can I explore in the next lesson?* ▪ *Classroom dynamics* *How did classroom dynamics influence the learning environment?* *Were there any disruptions or moments of high engagement?* *How can these dynamics be managed or leveraged in future lessons?* ▪ *Use of resources* *Were they accessible and engaging for all students?* *Are there additional resources that could be incorporated?*			Reflect on the principles behind the teaching methods used and consider student roles and learning outcomes. Use these reflections to plan for future lessons, addressing observed challenges and building on successes.

	▪ *<u>Differentiation</u>* *Were there opportunities for differentiation, and were they effective?* *How can you further support diverse learners in your classroom?*	