7

Lesson Exemplar for Science

Quarter 1
Lesson
8

Lesson Exemplar for Science 7
Quarter 1: Lesson 8 (Week 8)
S.Y. 2024-2025

Development Team

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SCIENCE (CHEMISTRY) / QUARTER 1 / GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners shall learn the properties of solutions such as solubility and reaction to litmus paper and other indicators.
B. Performance Standards	By the end of the quarter, the learners shall demonstrate an understanding of the role of solute and solvent in solutions and the factors that affect solubility.
C. Learning Competencies and Objectives	***Learning Competency*** The learners shall be able demonstrate how different factors affect the solubility of a solute in each solvent; identify solutions such as acids, bases, and salts which can be found at home, and in school that react with litmus paper; and demonstrate proper use and handling of science equipment. ***Learning Objectives*** At the end of the lesson, the learner shall be able to: 1. *explain how temperature affects the solubility of solid material.* 2. *explain how the nature of solute/particle size and solvent affect the rate of solubility.* 3. *identify solutions such as acids, bases, and salts which can be found at home, and in school that react with litmus paper* 4. *identify the different science equipment, demonstrate the proper handling of science equipment, and appreciate the importance of science equipment.*
D. Content	Factors Affecting Solubility Types of Solutions Proper Use and Handling of Science Equipment
E. Integration	Biochemistry, biology, environmental science, medicine and healthcare, education and research, food science and nutrition, analytical techniques

II. LEARNING RESOURCES

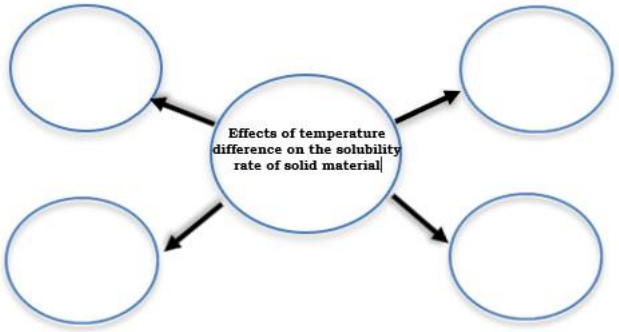
- Science 7 Q1 PIVOT Learning Materials pages 20-24
- Asuncion, Alvie et.al "Science Grade 7 Learners Material" First Edition 2017, 111-112
- Set-up of Filtration (3D diagram). Retrieved from https://quizlet.com/hk/241654822/set-up-of-filtration-3-d-diagram/
- Saturated vs. Unsaturated Solutions. Retrieved from https://chemistrynonmetals.wordpress.com/solubility/

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**DAY 1** **Short Review** Guided by the illustrations, the learners will calculate word problems on concentration of solution.   1. What is the % of concentration of sugar in 355 mL coca cola? 2. What is the % concentration of sugar in 591 mL of Gatorade?	
B. Establishing Lesson Purpose	**1. Lesson Purpose** The learners should be able to explain how temperature affects solubility of a solid material.	

	2. Unlocking Content Vocabulary *Ask the learners to read the following sentences. Then let them determine the meaning of the underlined words through the context clues. (5 minutes)* 1. Solubility is the **degree** to which a substance dissolves in a solvent to make a solution. (Amount, lack, loss, differ) 2. Similar **ratios** of solutes can be used to investigate the effect of temperature difference on their solubility. (Difference, percentage, whole, disproportions) 3. Wine is a mixture of alcohol and **fermented** fruits. (non-alcoholic, fresh, soured, sweet) 4. **Temperature** affects the solubility of a material. (condition, coolness, high temperature, hotness and coldness).	
C. Developing and Deepening Understanding	**1. Explicitation** *The learners will be asked to read and understand the text.* Solubility is the ability of a solid, liquid, or gaseous chemical substance (referred to as the solute) to dissolve in solvent (usually a liquid) and form a ***solution***. The solubility of a substance fundamentally depends on the solvent used, temperature and pressure. The solubility of a substance in a particular solvent is measured through the concentration of the saturated solution. A solution is considered saturated when adding additional solute no longer increases the concentration of the solution. The solubility of a given solute in each solvent typically depends on temperature. For many solids dissolved in liquid water; solubility tends to correspond with increasing temperature. As water molecules heat up, they vibrate more quickly and are better able to interact with and break apart the solute. *Solubility can be found in everyday life. For example:* 1. Salt or sodium chloride – usually soluble in water at 20°C. 2. Sugar usually dissolves in water molecules at 20°C. 3. Gelatin - soluble in water in the presence of heat.	

	4. Powdered juices are a mixture of sugar, flavorings, and preservatives, usually soluble in water at 20°C. 1. Wine is a mixture of alcohol and fermented fruits. 2. Soap - since it contains carbon, hydrogen, and salt, it dissolves in contact with water. 3. Oxygen – oxygen atom, dissolved in water, is essential for the aquatic world's inhabitants and other living things. **1. Worked Example** 1. What is solubility? _____ _____ 2. How does temperature affect the solubility of a solid material? When a solution is heated, what do the molecules of solvent (water) do with the solute? _____ _____ 3. Is solubility important to daily life? Why? Why not? _____ _____ **3. Lesson Activity** The learners will conduct a simple investigation by group to see how fast coffee dissolves in cold and hot water. **Title:** How Fast Does Coffee Dissolve in Hot Water? Cold Water? **Materials:** 2 cups hot water 2 stirrers 2 cups cold water measuring cups instant coffee powder measuring spoon clear plastics cups	Refer to Learning Activity Sheet #1

	Procedure: 1. Place 1/2 cup of cold water in a cup. 2. Place 1/2 cup of hot water in another cup. 3. At the same time, add 1/2 teaspoon of coffee in each cup. 4. Stir the solution for 10 seconds and observe. 5. Stir the solution for another 10 seconds and observe. ***Note:*** *The procedure mentioned above, is only one method learners can use in performing the activity. Different ratios of coffee can be assigned to investigate the effect of temperature on the solubility of material.* *The learners will discuss the result of the investigation by answering the guide questions:* 1. At what temperature does coffee dissolve faster? Slower? 2. Does temperature affect the solubility of coffee? Give evidence based on your observations. 3. What is the relationship of temperature and solubility? 4. When a coffee is added to hot water, what do the molecules of solvent (water) do with the solute (coffee)?	*Safety Notes:* *Be careful when handling boiling water, as it can cause burns. Use appropriate safety precautions and equipment when dealing with hot water. Do not pour the boiling water in plastic cups.*
D. Making Generalizations	**Learners' Takeaways** Using the spider diagram, the learners will write down the effects of temperature differences on the solubility of a solid material.	

	 **Reflection on Learning** *Does conducting investigations help you better understand the effect of temperature difference on the solubility of a solid material? If yes, how?* _____ _____	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Written Work. The learners will be given a set of questions which will serve as formative assessment to evaluate their learning outcomes for the day's lesson objectives and competencies. **Directions:** Read each question carefully and write only the letter of the correct answer on a separate sheet of paper. 1. What is the maximum amount of solute that can be dissolved in a fixed amount of solvent at a given temperature? A. Dilution B. Dissolution C. Percent by mass	**ANSWER KEY:** 1. D 2. A 3. C 4. B 5. A

	D. Solubility 2. All the following affects the solubility of a solid in a liquid EXCEPT: A. Pressure B. Stirring C. Surface area D. Temperature 3. Which of the processes can help solids dissolve faster? A. Decrease the amount of solvent. B. Decrease the temperature of the solution. C. Increase the temperature of the solution. D. Increase the amount of solute. 4. Which method below will not speed up the rate of salt dissolving in water? A. Increasing the surface area of the solute B. Decreasing the temperature of the solvent C. Stirring the solute into the solvent D. Heating the solvent before adding the solute 5. A greater amount of sugar will dissolve in warm water than in cold water. What is the factor affecting solubility? A. Temperature of solvent B. Nature of solute C. Amount of solute D. Manner of stirring **6. Homework** The learners will be tasked to have an advance reading on the factors affecting solubility such as particle size and stirring.	

A. Activating Prior Knowledge	**DAY 2** **Short Review** The learners will unlock the hidden words. Write the word in the space provided. 1. EEETTRRAPUM - is the degree of hotness or coldness of a body. _____ 2. LLIISOUBTY - is the degree to which a substance dissolves in a solvent to make a solution. _____ 3. EOULST- is the substance being dissolved. _____ 4. EOLNSTV - the substance doing the dissolving. _____	**ANSWER KEY:** 1. TEMPERATURE 2. SOLUBILITY 3.SOLUTE 4. SOLVENT
B. Establishing Lesson Purpose	**1. Lesson Purpose** The learners will compare the solubility of different solid substances when exposed to a solvent with varying temperatures. **2. Unlocking Content Vocabulary** The piece the learners will read serves as a springboard for a much deeper discussion of solubility. They will also be asked to cite unfamiliar terms, phrases or sentences. **Three Factors Affecting Dissolving** The rate of dissolving is a very important property of solutions. The rate of dissolving depends on several factors: • Temperature • Agitation • Particle size	

	For most solid solutes, the rate of dissolving is greater at higher temperatures. At high temperatures, the solvent molecules have greater kinetic energy and collide with undissolved solid molecules more frequently. Agitating a mixture by stirring or shaking the container increases the rate of dissolving. Agitation brings fresh solvent into contact with undissolved solute. Decreasing the size of the particles increases the rate of dissolving. When a large mass of solute is broken into smaller pieces, the surface area in contact with the solvent increases. **Solubility and Particle Attractions** The reasons why a solute may or may not dissolve in a solvent are related to the forces of attraction between the solute and the solvent particles. When the forces of attraction between different particles in a mixture are stronger than the forces of attraction between like particles in a mixture, a solution forms.	
C. Developing and Deepening Understanding	**1. Explicitation** Ask learners to investigate how factors such as temperature, particle size, and stirring affect the solubility of a substance and the rate at which substances dissolve. **Title:** Size Matters! **Materials:** 4 cups hot water — measuring cup/beaker 2 teaspoon crushed salt — measuring spoon 2 tablespoon of rock salt **Procedures:** 1. Place 20 mL of hot water in a cup. 2. Place another 20 mL of hot water in another cup. 3. At the same time, add 2 teaspoons of rock and crushed salts to each cup.	Refer to Learning Activity Sheet #2 Safety Notes: Be careful *when handling boiling water, as it can cause burns. Use appropriate safety precautions and equipment when dealing with hot water. Do not pour the boiling water in plastic cups.*

4. Stir the salt in each cup for 10 seconds and observe.
5. Record your observation.
6. Set aside both containers/
7. After 5 minutes, observe closely the bottom of the container.

2. Worked Example

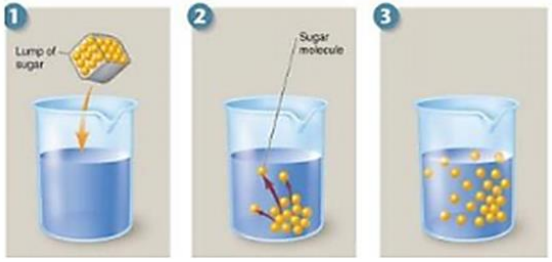
Discuss the result of investigations. Ask the following questions:

1. Which dissolves faster in hot water: rock salt or crushed salt?
2. Does temperature affect how fast rock salt and crushed salt dissolve in water? Give evidence based on your observations.
3. Does particle size affect how fast rock and crushed salts dissolve in water? Give evidence based on your observations.

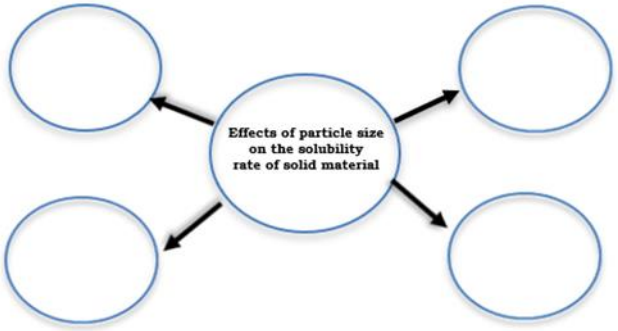
3. Lesson Activity

The learners will arrange the correct sequence of process of dissolving at particle level by writing down a number before each step. The diagram serves a guide in identifying the steps.

SOLUBILITY OF SUGAR



_____ Particles of sugar begin to break of from the lump.
____ Eventually, all the sugar particles become evenly distributed throughout the water.
_____ More and more sugar particles move away and randomly bounce around.
_____ A lump of sugar is dropped to a beaker with water.

D. Making Generalizations	**Learners' Takeaways** Using the spider diagram, the learners will write down the effects of particle size and stirring on the solubility of a solid material.  **Reflection on Learning** Does conducting investigations help you better understand how particle size and stirring difference affect the solubility of a solid material? If yes how?	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** Written Work. The learners will be given a set of questions, which will serve as formative assessment to evaluate their learning outcomes for the day's lesson objectives and competencies. **Directions:** Read each question carefully and write only the letter of the correct answer on a separate sheet of paper. 1. Which process or processes affects the speed of dissolving? A. Stirring only B. Particle size, temperature, stirring.	**ANSWER KEY:** 1. B 2. A 3. A 4. A 5. D

	C. Particle size only D. Type of container used 2. Which factor would not affect the solubility of sugar in water? A. Add salt to water. B. Grind the sugar to make it finer. C. Stir the water and sugar. D. Heat the water and sugar. 3. Imagine that you performed an experiment in which you dissolved different samples of sugar (sugar cubes, extra fine sugar ad regular table sugar) into water samples to compare how long they took to dissolve. What factor would be at least important to the design of this experiment? A. All samples must be tested exactly at the same time. B. The sugar samples must contain sugar and water only. C. All water samples must have the same temperatures. D. The same amount of sugar must be placed in each sample. 4. How does shaking or stirring a mixture of solute and solvent affect a solution? A. It increases the rate of dissolving. B. It decreases the rate of dissolving. C. It increases the solubility of solute. D. It decreases the solubility of solute. 5. These are the factors affecting the solubility of the substance EXCEPT: A. Particle B. Rate of stirring C. Nature of solute and solvents D. Humidity **2. Homework** The learners will be tasked to write in their notebooks the different solutions found at home and in school.	

A. Activating Prior Knowledge	**DAY 2** **Short Review** Learners will be asked to read the listed words based on the previous lesson and will supply the needed information: Acids Salts Bases Solutions 1. Select one of the words above and write one sentence using the word in everyday language. 2. Select one of the words above and write one sentence using the word in scientific meaning.	The teacher will explain to the learners that some everyday words have different meanings when used in science. It is significant to recognize these differences in word use in the language. The teacher will establish the linkage of idea from the definition of acids, bases, and salts to identifying acidic, basic, and salt solutions found at home and in school.
B. Establishing Lesson Purpose	**1. Lesson Purpose** Explain to the learners that the lesson is all about acids, bases and salts and perform simple activity using solutions found at home and in school. **2. Unlocking Content Vocabulary** The learners will be given reading material. After reading, they will mark and describe unfamiliar terms, phrases, or sentences. Acids and bases are found all around us, and the currency of acid-base chemistry is the proton, or hydrogen ion. Acid-base chemistry is part of everyday life, from baking food to the innumerable reactions that keep the human body alive. Acid-base chemistry is measured on the pH scale—the concentration of hydrogen ions in a solution. Buffers can control pH, whether used in the lab or in the acid- base components of human blood. The role of acids and bases will be shown in food—from the rise of a cake to the making of cheese. In the environment, acid rain plagues industrial portions of the world; the chemical nature of acid rain reactions and the environmental response and impact is part of acid-base chemistry.	The teacher will facilitate the discussion by asking the learners to give their insights on the unfamiliar terms, phrases, or sentences cited/identified in an operational manner. Then, the teacher will provide additional information/knowledge on those cited/identified terms, phrases, and sentences.

C. Developing and Deepening Understanding	**1. Explicitation** The learners will perform a class activity entitled “Acid (and Base) Rainbows”. **Objective:** At the end of the activity, the learners will be able to identify which solutions are acids, base, and salt. **Materials:** Litmus paper (red and blue) vinegar tap water 10 plastic cups dishwashing liquid baking powder Dropper coffee calamansi Stirrer toothpaste plastic teaspoon distilled water **Procedure:** 1. Prepare 20 strips of litmus paper (10 blue, 10 red). 2. Place one (1) teaspoon of each sample in a plastic cup. Label the cups using a marker and masking tape. 3. At each cup dip one (1) red and one (1) blue litmus paper for about 10 seconds then remove and observe any color change. Be sure to put the paper towel under the test strips so you do not spill any substances on the counter tops. 4. Record the change in color of the litmus paper in the correct column of the table. 5. Fill in the last column of the table. Is the substance an acid, base, or salt? 6. Repeat for the remaining substances. | Solution	Red litmus paper	Blue litmus paper | |---|---|---| | Acidic | Red | Red | | Basic | Blue | Blue | | Neutral | No change in colour | No change in colour |	Refer to Learning Activity Sheet #3

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2. Worked Example
The learners will be asked to answer the table:
<table>
<tr><th>Substance</th><th>Litmus Paper color change</th><th>Acid, base or Salt</th></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td></tr>
</table>
3. Lesson Activity
The learners will be asked to read out and answer the following questions:
1. What happens to the red litmus paper when you dip it on acid substances?
2. What happens to the blue litmus paper when you dip it on acid substances?
3. What happens to the red litmus paper when you dip it on base substances?
4. What happens to the blue litmus paper when you dip it on base substances?
5. What happens to the blue and litmus paper when you dip it on salt substances?
6. What are the acidic solutions found at home and in school?
7. What are the basic solutions found at home and in school?
</td>
<td>
The teacher will observe learners' answers and will ask the learners to volunteer their answers, giving positive feedback.

The teacher will select a sample answer for all learners to write down. This may come from one of the learners or from the sample answers.
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<tr>
<td>D. Making Generalizations</td>
<td>
Learners' Takeaways
The teacher will highlight to the learners that the lesson is all about acid, base, and salt, performing a simple activity and identifying the different acids, bases and salts solutions found at home and school.
The learners will be asked to answer the listed question either by class discussion or writing the answers in their worksheet.

Reflection on Learning
Has this lesson helped you to better identify the different acids, bases and salts solutions found at home and in school?
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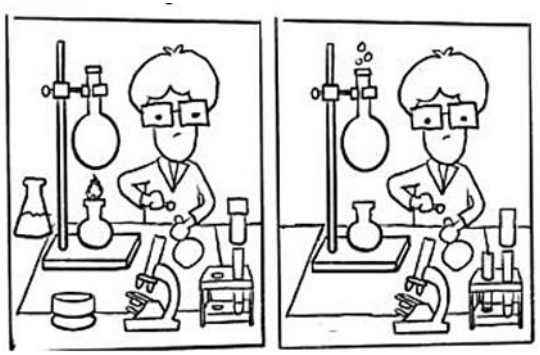
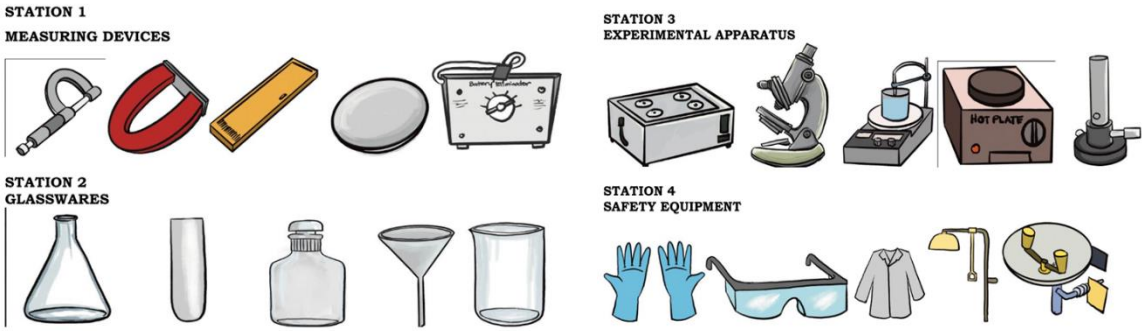
A. Evaluating Learning	**1. Formative Assessment** The learners will be given a set of questions which will serve as formative assessment to evaluate their learning outcomes for the day's lesson objectives and competencies. **Direction:** Read each question carefully and write only the letter of the correct answer on a separate sheet of paper. 1. Acids gives some foods a/an _____ taste. A. Sour B. Alkali C. Corrosive D. Neutral 2. Which among the following solutions are acid? A. Soap B. Vinegar C. dishwashing liquid D. baking soda 3. Which of the following solutions are base? A. Vinegar B. Coffee C. lemon juice D. soap 4. What happen to the red litmus paper when dip in salt solution? A. turns blue B. turns green C. turns yellow D. no change in color 5. What happen to the blue litmus paper when dip in a vinegar? A. turns green B. turns red C. turns yellow D. no change in color	**ANSWER KEY:** 1. A 2. B 3. D 4. D 5. B

A. Activating Prior Knowledge	**Day 4** **Short Review** Based on the previous lesson about solutions, what are the things you need to prepare? Write it on any scratch paper and place it on the bucket. 	Present and explain the lesson objectives to the learners.
B. Establishing Lesson Purpose	**1. Lesson Purpose** Present and explain the lesson objectives to the learners. The learners can: • identify the different science equipment, • demonstrate the proper handling of science equipment, and • appreciate the importance of science equipment. **2. Unlocking Content Vocabulary** Spot the Difference is a popular and beneficial game that people of all ages enjoy playing. It improves visual attention, concentration, comparison, and scanning skills in a fun way. 	

	Questions: 1. What are the things you found different from the two pictures? _____ _____ 2. Are you familiar with these things? _____ _____ 3. What is the setting of the picture? _____ _____	
C. Developing and Deepening Understanding	**1. Explicitation** The learners will watch the video about science laboratory equipment. The learners will write down important equipment's they watched and its use. **YOUTUBE WATCH** https://www.youtube.com/watch?v=6eP1VUegldc The teacher will facilitate the discussion by asking the learners to give their insights first on the unfamiliar terms, phrases, or sentences cited/identified in an operational manner. Then, the teacher will provide additional information/knowledge on those cited/identified terms, phrases, and sentences. **2. Worked Example** The learners will be grouped into four. Each group will have a respective station. At each station, there will be a poster and a short video on how to properly handle the equipment. The learners will take down and the different science equipment in each station.	

	 The learners will be asked to read out and answer the following questions: 1. What are the science equipment use for measuring? 2. What are the four classifications of science equipment? 3. What is the main function of glassware? **3. Lesson Activity** 1. How is the equipment grouped? 2. What is the importance of knowing the proper handling and use of the science equipment? 3. How does this equipment help you and other fields such as medicine with their tasks? The teacher will observe the learners' answers and will ask the learners to volunteer their answers, giving positive feedback.	The teacher will observe the learners' answers and will ask the learners to volunteer their answers, giving positive feedback.
D. Making Generalizations	**Learners' Takeaways** The learners will be asked to answer the listed question either through class discussion or writing the answers in their worksheets. **Reflection on Learning** Has this lesson helped you to better identify the use and proper handling of science equipment? If so, how?	The teacher will highlight to the learners that the lesson is all about the proper handling of science equipment.

<table>
<tr><th colspan="4">IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION</th><th>NOTES TO TEACHERS</th></tr>
<tr><td>A. Evaluating Learning</td><td colspan="3">1. Formative Assessment

Performance task.
The learners will draw one piece of scientific equipment and write its use and proper handling. The learners will do their activity on a bond paper.
• 5 points for scientific equipment
• 5 points for the use and proper handling of science equipment

2. Homework
The teacher can assign homework to the learners about other science laboratory equipment that was not mentioned in the discussion.</td><td></td></tr>
<tr><td rowspan="5">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="5"></td></tr>
<tr><td>strategies explored</td><td></td><td></td></tr>
<tr><td>materials used</td><td></td><td></td></tr>
<tr><td>learner engagement/ interaction</td><td></td><td></td></tr>
<tr><td>others</td><td></td><td></td></tr>
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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?*	