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DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for TLE

Quarter 4
Lesson
6

Lesson Exemplar for TLE Grade 7
Quarter 4: Lesson 6 (Week 6)
SY 2024-2025

Development Team

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TLE/QUARTER 4/ GRADE 7

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	The learners demonstrate an understanding of the concepts and principles in performing mensuration and calculations.
B. Performance Standards	The learners perform mensuration and calculations following safety precautions
C. Learning Competencies and Objectives	**Learning Competency** Interpret the readings in different measuring instruments. **Learning Objectives** At the end of the lesson, the students are expected to: 1. Explain the function and uses of volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter. 2. Identify the parts of the volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter. 3. Interpret the readings of volt-ohm-milliammeter, tachometer, oscilloscope, and ampere meter.
D. Content	**Topic:** Scale Reading **Subtopic:** Volt-ohm-milliammeter
E. Integration	**SDG 9**: Industry Innovation and Structures

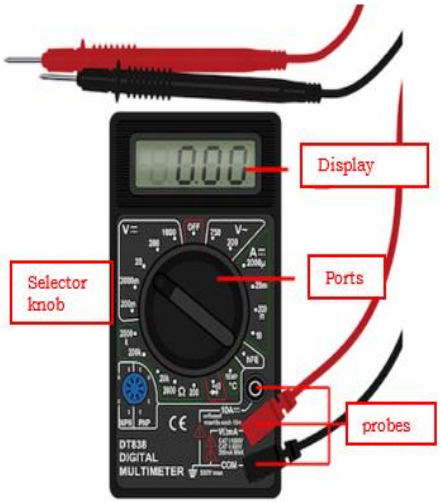
II. LEARNING RESOURCES

Analog multi meter parts and functions (Part 1). (2021, October 25). YouTube. https://youtu.be/6UhX893En6A?si=vsmfbMV2TCQFeFBL
Analog multimeter AC & DC voltage reading Part 3. (2021, October 26). YouTube. https://youtu.be/j9jxh8Hjm-8?si=HLCLHrjaIyK5pN2Z
Analog multimeter DC current reading Part4. (2021, October 26). YouTube. https://youtu.be/YRmeMa5j1qI?si=zfbgd6ngcwwmfXOk
Analog multimeter resistance reading Part 2. (2021, October 25). YouTube. https://youtu.be/rBPw5zC1qCQ?si=s2LT_GVMFkuhXqJOComputer Lesson 101 - Tagalog. (2021). *How to Measure Current (Amperes) using Analog Multi-meter* [Video]. YouTube. https://www.youtube.com/watch?v=CcfQFqcMa7U
Fluke. (n.d.). *What is a digital multimeter?* https://www.fluke.com/en-in/learn/blog/electrical/what-is-a-digital-multimeter#
James Gatlin. (2024). *How to use a multimeter like a Pro, the ultimate guide* [Video]. YouTube. https://www.youtube.com/watch?v=0loXukB302Q
Joy, A. T. (2024). *How to use a multimeter, types, components and more*. Tameson.com. https://tameson.com/pages/multimeter
Kuhlman, J. (2024). *How to Read a Multimeter (with Pictures) - wikiHow*. wikiHow. https://www.wikihow.com/Read-a-Multimeter
Source of Skills. (2023). *How to use analog multimeter | Analog multimeter tutorial | Check AC volt with analog multimeter* [Video]. YouTube. https://www.youtube.com/watch?v=z8U9ny6ZPKg
T, A. (2017). *Volt-Ohm-Milli-Ammeter (VOM)*. Circuit Globe. https://circuitglobe.com/volt-ohm-milli-ammeter-vom.html

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**DAY 1** **1. Short Review: Pass the Cabbage** Create a cabbage-like vegetable made of crumpled papers, cabbage will be passed to one another as the class sings any type of song. Once the music stops, a student who got the cabbage will peel one page and answer the question that is written on the cabbage paper. **2. Feedback (Optional)**	Create a set of questions about Maintain tools and Equipment. A teacher may also include questions about students' personal experiences in connection with the previous topic. Write each set of question on each leaf of a cabbage-like paper.
B. Establishing Lesson Purpose	**1. Lesson Purpose** Ask students if they have seen their grandfather, father, uncle, or elder brother using Multi tester at home. Let them share their experiences and encounters seeing multi tester being used. **2. Unlocking Content Vocabulary** • **Volt-Ohm-Milliammeter (VOM)** – It is an instrument that can be is used to measure voltage, current and resistance. • **Voltmeter -** Measures electrical pressure (voltage) between two points. • **Ohmmeter -** Measures resistance to electrical flow (resistance). • **Milliammeter -** Measures small electrical currents (milliamps). • **Scale** - refers to the series of graduated marks or numerical settings used to interpret the readings of voltage, current, resistance, and other electrical properties.	Show a picture or actual Multi tester to let students think and share their experiences. The teacher may also play video in using multitester. The teacher can have a follow-up question on the voltage, current and resistance.
C. Developing and Deepening Understanding	**SUB-TOPIC 1: Volt-Ohm-Milliammeter** **1. Explicitation** Voltage, current and resistance in electrical circuit need to be determined and measured. The volt-ohm-milli-ammeter (VOM) is also called as Multimeter. This type of meter performs several functions. In other words, in VOM the several measuring functions are combined in a single unit. It is used to measure voltage, current and resistance. **A. Types of Volt-ohm-milliammeter/Multimeter:** **1. Analog Multimeter-** Analog multimeters use a microammeter, voltmeter, and ohmmeter with a moving pointer to show or display its readings.	The primary focus of this learning skill is the analog multimeter. The teacher may use other references to supplement the parts and functions of multi-tester.

2. **Digital Multimeter-** This device displays the measurements on a digital screen, making it easy to read and understand the results accurately.

B. Parts of Multimeter

ANALOG MULTIMETER	DIGITAL MULTIMETER
	
Source: https://medium.com/@phillipfixit/how-to-use-an-analog-multi-tester-d80ac3563bd5	Source: https://tameson.com/pages/multimeter
a. *Pointer – Shows the values read from the scale.* b. *Scale – Shows the value of what is being measured.* c. *Zero position adjuster – adjusts/positions the needle at the right scale.* d. *Range Selection knob-* allows switching the function and scale. e. Test pins – They serve as the conductor from the item being tested to the multimeter. f. Test Probes - It is used to connect to the device under test.	a. *Selector knob* – It comes with an arrow pointer to its end to choose the parameter being measured. b. *Display panel* – It displays a liquid crystal display, which can show up to four digits under normal conditions and has the provision to show negative sign. c. *Ports* – Displays the three main ports on the front of panel. d. *Probes* – It is used to establish an electrical connection between the device under test (DUT) and the multimeter.

The teacher should emphasize the function part of the multitester with the help of selector knob.

- Ohmmeter
- DC Voltmeter
- AC Voltmeter
- DC Milliammeter

The teacher may use this video as supplementary instructional material:
Analog multi meter parts and functions (Part 1). (2021, October 25).
YouTube. https://youtu.be/6UhX893En6A?si=UV5f7-tvJ9qCoiry

This instructional video is only a supplement for the teacher to use. He/she may have a better source to use.

The teacher may use instructional videos in utilizing VOM provided he/she mastered the calibration of the instrument.

Always refer to the manufacturer's instructional manual when using the VOM or multi-tester, as this is the best guide for using the VOM's features.

g. Zero Ohm Adjustment knob - is used to calibrate the multi tester when you want to measure the resistance of an object.	

How to read Analog Multimeter Result

1. Find the right scale on an analog multimeter.
   Analog multimeters have needle behind a glass cover, which moves to show the result. Naturally, there are three arcs printed behind the needle. These are three different scales, each of which is used for a different purpose.
2. Make a voltage scale reading based on your range.
   Look carefully at the voltage scales, either DC or AC. There should be several rows of numbers beneath the scale. Check which ranges you have selected on the dial and look for a corresponding label next to one of these rows.
3. Estimate the value between numbers.
   Voltage scales on an analog multimeter work just like an ordinary ruler. The resistance scale, however, is logarithmic, meaning that the same distance represents a different change in value depending on where you are on the scale.
4. Multiply the resistance reading on an analog multimeter.
   Look at the range setting that the dial of your multimeter is set to.
5. Find out more about the dB scale.
   The "dB" (decibel) scale, typically the lowest, smallest one on an analog meter, requires some additional training to use. It is a logarithmic scale measuring the voltage ratio (also called gain or loss).

DAY 2

C. SCALE of VOM

Multimeters can have different types of scales to display these measurements, depending on whether they are analog or digital.

1. **Analog multimeters** use a needle and a printed scale to display measurements. The types of scales found in analog multimeters include:
   - **Voltage (V) Scale**: Indicates the voltage measurement. Separate scales are typically provided for AC (alternating current) and DC (direct current) voltage measurements.
   - **Current (A) Scale**: Indicates the current measurement. Similar to the voltage scale, there are separate scales for AC and DC current.

The teacher may use a step-by-step process of using Multimeter or use similar videos as to How Multimeter works.

After watching, ask students to reflect on the importance of using multi meter. Identify at least three importance and what it contributes to ensuring that the devices, appliances, and the like are working in good condition.

The teacher should demonstrate in class the proper way of reading multimeters for accurate and realistic application.

The teacher may use the following as reference:

How to use Analog Multimeter?
How to use analog multimeter | analog multimeter tutorial | Check AC volt with analog multimeter. (2023, September 3). YouTube. https://youtu.be/z8U9ny6ZPKg?si=kWfeqZhbCaKhE44i

- **Resistance (Ω) Scale**: Indicates the resistance measurement. The resistance scale often has a non-linear progression due to the nature of how resistance is measured.
- **Decibel (dB) Scale**: Used for measuring audio signals, particularly in telecommunications and audio equipment testing.
- **Continuity Scale**: Indicates if there is a continuous path in the circuit. This is often a simple pass/fail indication.

2. Digital Displays

Digital multimeters (DMMs) have numeric displays that show the measurement values directly. The main types of measurement functions in a digital multimeter include:

- **Voltage (V) Display**: Displays the voltage reading, selectable for AC and DC measurements.
- **Current (A) Display**: Displays the current reading, also selectable for AC and DC measurements.
- **Resistance (Ω) Display**: Shows the resistance value directly.
- **Continuity Indication**: Often provided as an audible beep when a continuous path is detected.
- **Capacitance (F) Measurement**: Some digital multimeters include a capacitance measurement function.
- **Frequency (Hz) Measurement**: Digital multimeters may also measure the frequency of an electrical signal.
- **Temperature (°C/°F) Measurement**: Some advanced multimeters can measure temperature using a thermocouple probe.

D. TYPES OF SCALE IN ANALOG VOM

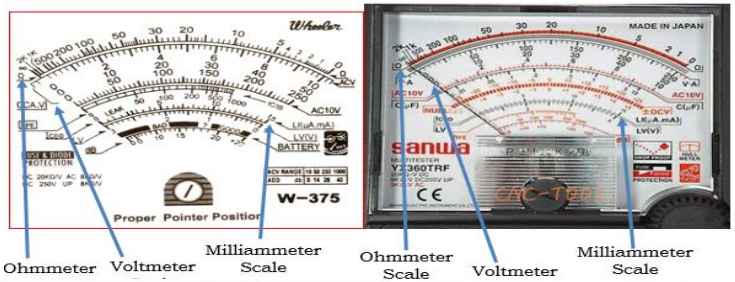
Scale definition	Usage	Characteristics
• A **LOGARITHMIC SCALE** is one in which the spacing between each mark increases logarithmically. This means that each successive unit of measurement represents a	• Typically used for measuring resistance and sometimes for decibel scales in audio equipment .	• Variable Intervals: The distance between units increases as the value increases. For example, the space between 1 and 10 is the same as the space between 10 and 100. • Handling Large Ranges: Useful for measuring quantities that cover a large range of values, making it possible to represent both very small and very large values on the same scale. • Example: In a resistance measurement, the scale might start with very small

How to use Digital Multimeter?
How to use a multimeter like a pro, the ultimate guide. (2024, January 21).
YouTube. https://youtu.be/0loXukB302Q?si=WfAojmcw4n8NHWgr

tenfold increase in quantity.		intervals for lower resistance values and expand to larger intervals for higher resistance values.
• A **LINEAR SCALE** is one in which the spacing between each mark is consistent across the entire range. This means that each unit of measurement is represented by the same physical distance on the scale.	• Typically used for measuring quantities like voltage and current.	• Equal Intervals: Each unit increase corresponds to the same amount of physical movement of the needle. • Ease of Reading: Easier to read when measuring values that change linearly. • Example: If the scale ranges from 0 to 10 volts, the distance between 1 and 2 volts is the same as the distance between 9 and 10 volts.

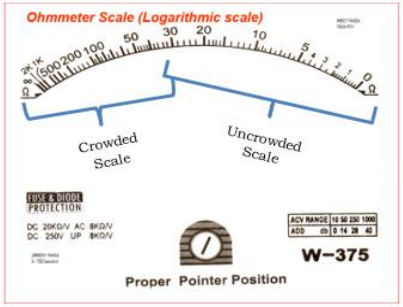
DAY 3

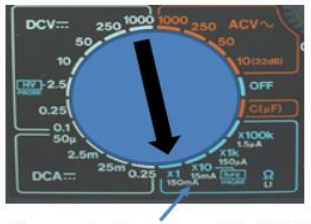
E. RESISTANCE (OHMMETER) SCALE



Reading Ohmmeter Scale

How to read the ohmmeter scale of the multi tester?
To read the multi tester's resistance range, consult





Ohmmeter Function of the VOM. The selector knob is pointed to the X1 to the highest multiplier.

The picture presented does not promote any brand but is just used for educational purposes.

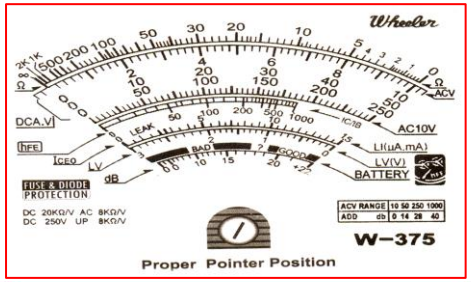
The teacher should limit his/her coverage on the Voltmeter, Ohmmeter and Milli-ammeter function of the tester.

The teacher should highlight the logarithmic ohmmeter scale. He/she should also illustrate the crowded and uncrowded scales of the ohmmeter.

the table below. Ohms are the unit of measurement for resistance.

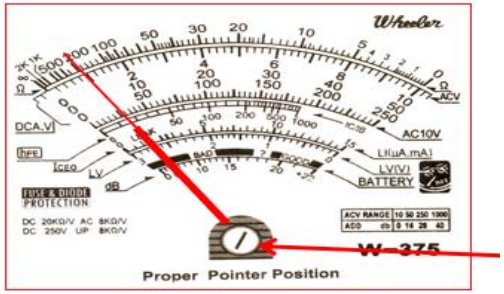
Range	0-2	2-10	10-20	20-50	50-100	100-200
X 1	0.2	0.5	1	2	5	20
X 10	2	5	10	20	50	200
X 100	20	50	100	200	500	2000
X 1 k	200	500	1000	2000	5000	20000
X 10 k	2000	5000	10000	20000	50000	200000
X 100k	20000	50000	100000	20000	500000	2000000

PREPARATION FOR MEASUREMENT



1. Before making any measurements, make sure that the meter pointer is in the zero position. If not, you may turn the zero adjuster so that the pointer may align right to zero position.

Wrong Pointer Setting



If this occurs, you should turn the **adjustment screw** (zero corrector screw) in counterclockwise direction until the pointer at zero voltage range.

Turn adjustment screw to counterclockwise.

Scale	Purpose
Crowded Scale	Used for reading high resistance values
Uncrowded Scale	Used for reading low resistance values

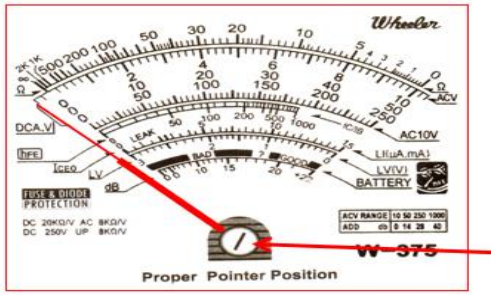
The teacher should also demonstrate how to use the VOM's ohmmeter function and range multipliers.

The teacher must thoroughly clarify the processes for reading the multi-tester scale. Putting the range and scale in relation to the range multiplier.

Brands and models of Analog Multitester may differ with the multiplier of the ohmmeter function particularly the highest multiplier.

The teacher always reminds the learner that ohmmeter function is only for passive circuit and is connected across the circuit or in parallel with the circuit or component to be measured.

The teacher should have a specific number of available VOM to

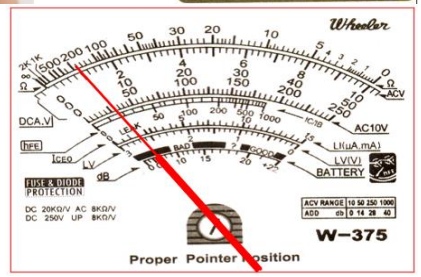


If the pointer points not exactly to the infinity at ohmmeter reading, this causes inaccuracy to the measured value.

Turn adjustment screw to clockwise rotation

2. Check the accuracy of the ohmmeter by touching two test probes. Set VOM to x1 ohm or x10 ohm selector resistance range. Hold the two sets probes simultaneously.

The pointer deflects (as shown) while holding the two-test probe at x1 or x10 ohm selector range indicating that the multi-tester in ohmmeter is defective.



demonstrate the resistance reading.

The teacher may utilize this video link to enhance the lesson or for review by the learner.

Analog multimeter resistance reading Part 2. (2021, October 25). YouTube. https://youtu.be/rBPw5zC1qCQ?si=8nfOUBsuJpMN1gZt

(Using VOM in Measuring Resistance)

V. Synthesis/Extended Practice/Differentiation:

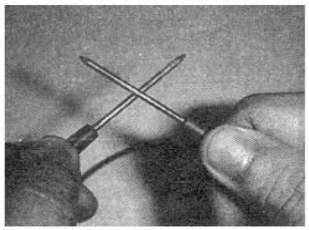
After the activity is done, the teacher may ask his/her learners, what insights they have gained while doing the measuring activity with their partner or peer.

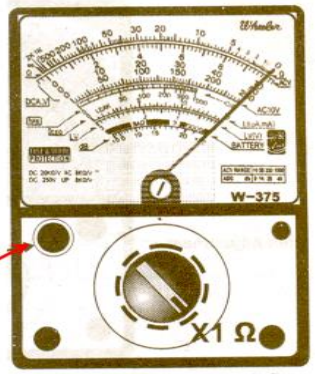
- *Learners must realize the importance of helping relationship with peers (or collaboration) make things or accomplished work easier.*
- *Learner maybe introduces to measure the resistance of an electrical circuit whether it is open or closed.*

Check the probes if they are ok, (ohmmeter calibration)

a. Set the multi-tester to corresponding selector resistance range

b. Short the two test probes lead together.



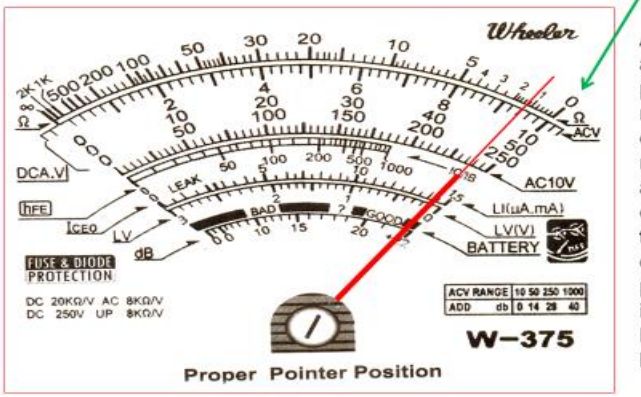


Ohmmeter Adjuster

The pointer should deflect towards ohm reading

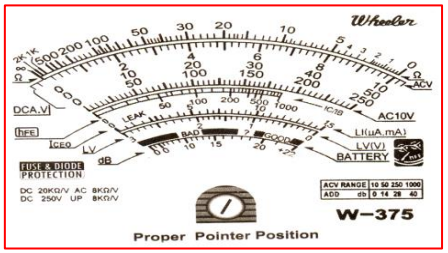
Turn this knob into clockwise rotation

Zero Ohm



Proper Pointer Position

Adjust the ohm adjustment if the pointer could not rest exactly at "0" ohm reading. If nothing happened after adjusting ohm adjustment, the most possible cause is, low powered battery inside the tester. Replaced the battery.



Proper Pointer Position

If the pointer did not deflect at all, check the probes, there's a possibility that one is broken or open at some point. If probes are good, there is also a possibility that the fuse is busted, otherwise tester is defective.

Interpreting Resistance Reading

If the pointer stays at infinite resistance even after using the highest ohm range, then circuit is open.

If the pointer deflects to zero resistance when the selector switch is at Rx1 range, then circuit is shorted.

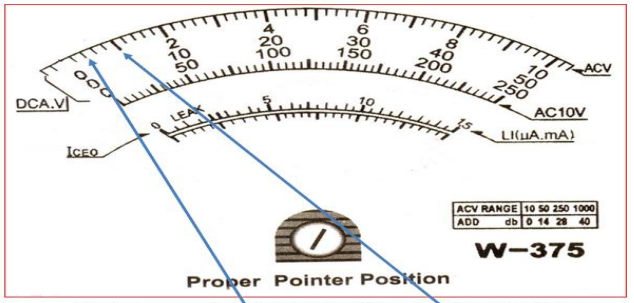
If the pointer deflects in between infinite and zero resistance that is equivalent to the load resistance using any range, then device, circuit is in good condition.

DAY 4

F. VOLTMETER SCALE

The voltmeter scale is intended for reading voltage and can be used to measure both DC (Direct Current) and AC (Alternating Current) voltages.

Voltmeter Scale (Linear scale)



RANGE	MINOR DIVISION	MAJOR DIVISION
0.1 - DC	0.002	0.02
0.25 - DC	0.005	0.05
2.5 - DC	0.05	0.5
10 – AC/DC	0.2	2
50 – AC/DC	1	10
250 – AC/DC	5	50
1000 – AC/DC	20	200

Minor Division – short line
Major Division – long line

The teacher should emphasize the linear scale of a voltmeter.

The teacher also reiterates the difference between DC voltage and AC Voltage measurement.

The teacher may use a step-by-step process of using VOM as DC Voltmeter or AC Voltmeter or may search for a similar video.

Safety is highlighted when measuring voltage.

Scale Type	Description	Value per Major Division	Number of Minor Divisions	Value per Minor Division
Major Divisions	Represent larger intervals	Varies (e.g., 1V, 2V, 5V)	Varies	Calculated based on major division
Minor Divisions	Lie between major divisions	Calculated based on major division	Varies (typically 5 or more)	Calculated based on major division

2. Worked Example

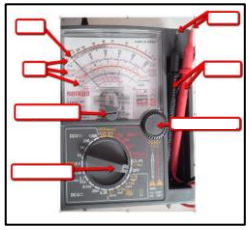
The teacher will demonstrate first the correct function of multimeter as ohmmeter and voltmeter. After the demonstration, the teacher will let the students use the multimeter on their own by following the steps given and demonstrated earlier. Students who have tried using it will share his/her thoughts on the importance of understanding its function.

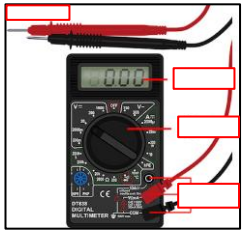
3. Lesson Activity

The teacher will be showing to the class the actual multitester and let them identify/write the parts of the multitester as outlined below.
(See worksheet #1 for the activity which students will accomplish.)

Parts of Multimeter

Directions: Label the parts of Multimeter and write down its function on the space provided below.





ANALOG MULTIMETER		DIGITAL MULTIMETER	
Name	Function	Name	Function

The teacher may use this video link to supplement the lesson or for review purposes.

Analog multimeter AC & DC voltage reading Part 3. (2021, October 26). YouTube. https://youtu.be/j9jxh8Hjm-8?si=P_366q4Y1hAhCV5Q

The teacher should supervise the learners when performing the task given.

Depending upon the availability of the VOM. The teacher may use the actual or the picture of the VOM.

In the student worksheet, the teacher will guide the students when doing the activity.

Note: Safety is a must. The teacher should be around when students are doing the voltage measurement.

Using VOM in Measuring DC Voltage (30 minutes)

V. Synthesis/Extended Practice/Differentiation:

After the activity is done, the teacher may ask his/her learners, what insights they have gained while doing the measuring activity with their partner or peer.

- *Learners must be aware on the importance of using voltmeter in electric circuits.*

	(To apply what the students learned with the topics, an additional activity will be given. See worksheet #2, 3, and 4 for the activity which students will accomplish.)	• *Learner should be aware on the polarity of the DC sources to be measure.* **Using Analog VOM in Measuring AC Voltage (30 minutes)** **V. Synthesis/Extended Practice/Differentiation:** After the activity is done, the teacher may ask his/her learners, what insights they have gained while doing the measuring activity with their partner or peer. • *Learners must realize the importance of helping relationship with peers (or collaboration) make things or accomplished work easier.* • *Learners must be aware on the importance of safety when using AC voltmeter in electric circuits.*
D. Making Generalizations	**1. Learners' Takeaways** 1. Can you summarize the four different scale reading device and state its functions? What is its importance in our daily lives? 2. Consider that you are owning any type of business, for you, what is the implication of understanding this lesson? **2. Reflection on Learning** Let the students make a reflection on what was discussed in this lesson by listing the remarkable information they've got.	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		NOTES TO TEACHERS
A. Evaluating Learning	**1. Formative Assessment** **I. Multiple Choice Quiz**. Students will take the 5-item test. 1. What scale reading device is also known an multi meter? A. Ammeter B. Oscilloscope C. Tachometer D. Volt-ohm-milliammeter 2. Which of the following parts of analog multi meter is used to indicate the values read from the scale? A. Pointer B. Range selection Knob C. Test pins D. Zero position adjuster 3. What type of multi meter device is used to displays the measurements on a digital screen, making it easy to read and understand the results accurately? A. Analog Multimeter B. Automatic Multimeter C. Analog-Digital Multimeter D. Digital Multimeter 4. What is a common use for a logarithmic scale in a multimeter? A. Measuring temperature B. Measuring distance C. Measuring resistance D. Measuring weight 5. If a voltage scale ranges from 0 to 10 volts and the distance between 1 and 2 volts is the same as between 9 and 10 volts, what type of scale is this? A. Logarithmic Scale B. Linear Scale C. Mixed Scale D. Variable Scale **Part II. Essay:** **Directions:** Explain the precautionary measure when using the VOM as Ohmmeter and as a Voltmeter.	**Answer Key**: 1. D 2. A 3. D 4. C 5. B Answers may vary.

<table>
<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">The teacher may take note of some observations related to the effective practices and problems encountered after utilizing the different strategies, materials used, learner engagement and other related stuff.

Teachers may also suggest ways to improve the different activities explored/ lesson exemplar.</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>
<tr><td>C. Teacher's Reflection</td><td colspan="2">Reflection guide or prompt can be on:
▪ <u>Principles behind the teaching</u>
What principles and beliefs informed my lesson?
Why did I teach the lesson the way I did?
Do I have the necessary skill in using the instruments?

▪ <u>Students</u>
What roles did my students play in my lesson?
What did my students learn? How did they learn?

▪ <u>Ways forward</u>
What could I have done differently?
What can I explore in the next lesson?</td><td colspan="2">Teacher's reflection in every lesson conducted/ facilitated is essential and necessary to improve practice. You may also consider this as an input for the LAC/Collab sessions.</td></tr>
</table>