8

DepED
DEPARTMENT OF EDUCATION

Lesson Exemplar for TLE

Quarter 4
Lesson
6

Lesson Exemplar for TLE Grade 8
Quarter 4: Lesson 6 (Week 6)
SY 2025-2026

Development Team

Writer:
- Jan Vincent H. Leuterio, MTTE (Mindanao State University-Iligan Institute of Technology)

Validator:
- Victor S. Rosales, PhD (Mindanao State University-Iligan Institute of Technology)

Management Team

Philippine Normal University
Research Institute for Teacher Quality
SiMERR National Research Centre

TLE/ QUARTER 4/ GRADE 8

I. CURRICULUM CONTENT, STANDARDS, AND LESSON COMPETENCIES	
A. Content Standards	Demonstrate an understanding of the concepts and principles in performing simple diagnostics and simple troubleshooting in industrial arts services.
B. Performance Standards	The learners perform simple diagnostics and simple troubleshooting in industrial arts services.
C. Learning Competencies and Objectives	**Learning Competency** ● Discuss simple diagnostics in industrial arts services. ● Perform simple troubleshooting in industrial arts services. **Learning Objectives** At the end of the lesson, the students are expected to: 1. Recognize diagnostic techniques used in various industrial arts services, including woodwork, metalwork, masonry, construction painting, plumbing, and tile setting, to identify issues and determine root causes effectively. 2. Apply troubleshooting methods and strategies to address common problems in construction projects, such as material defects, structural issues, equipment malfunctions, and workmanship errors. 3. Familiar with diagnostic tools and equipment specific to different industrial arts services, including measuring devices, testing instruments, inspection tools, and software applications, to diagnose problems accurately and efficiently.
D. Content	● Visual Inspection of the structure/components ● Measurement and Dimension ● Tools and Maintenance Adjustment ● Material Selection and Evaluation
E. Integration	Integrating construction diagnostics and troubleshooting into the Sustainable Development Goals (SDGs) entails a comprehensive strategy that encompasses sustainability, innovation, and responsibility across various fronts. For **SDG 7**, efficient diagnostics pinpoint energy wastage in buildings, leading to reduced consumption and more affordable energy bills for occupants, while integrating renewable energy sources enhances clean energy generation in the construction sector. In line with **SDG 9**, advanced diagnostic technologies foster innovation in construction practices, facilitating efficient infrastructure development and resilient structures. **SDG 12** benefits from minimized material wastage and enhanced resource efficiency through diagnostic-driven troubleshooting, promoting responsible consumption and sustainable production within the sector. Finally, addressing **SDG 13,** construction diagnostics play a pivotal role in

	identifying and mitigating factors contributing to greenhouse gas emissions, while implementing climate-resilient techniques based on diagnostic findings aids in mitigating climate change impacts. Collaboration among stakeholders, supported by policies favoring sustainable practices and investments in innovative tools and capacity-building programs, is crucial for effectively advancing these goals.

II. LEARNING RESOURCES

6 Types of Dimensional Measurement Tools – Keller Technology. (2018, July 19). Keller Technology Corporation. https://www.kellertechnology.com/blog/6-types-of-dimensional-measurement-tools/

Cambridge Dictionary. (2024, March 6). diagnostic. @CambridgeWords. https://dictionary.cambridge.org/us/dictionary/english/diagnostic

Diagnostic Tools for Energy Management and Maintenance - zumBrunnen. (2012, March 16). https://zumbrunnen.com/diagnostic-tools-for-energy-management-and-maintenance/

Kwan, Albert & Ng, P.L.. (2015). Building Diagnostic Techniques and Building Diagnosis: The Way Forward. 10.1007/978-3-319-09507-3_74.

Ltd, B. (2021). Choosing materials for building projects. Www.level.org.nz. https://www.level.org.nz/material-use/choosing-materials/

Materials Selection. (n.d.). Durable Building Solutions. https://durablebuildingsolutions.org/building-future/materials-selection/

Materials Selection: Design Requirements. (2017, May 29). Industrial Metallurgists. https://www.imetllc.com/materials-selection-design-requirements/

Measurement in Construction. (n.d.). Ascpro0.Ascweb.org. http://ascpro0.ascweb.org/archives/cd/2006/2006pro/2006/CEUE18_Ellingson06_8400.htm

Nondestructive Testing (NDT) Equipment Selection Guide: Types, Features, Applications | Engineering360. (n.d.). Www.globalspec.com. https://www.globalspec.com/learnmore/measurement_test_equipment/nondestructive_test_equipment/ndt_instruments#:~:text=Non%2Ddestructive%20testing%20(NDT)

Six Key Components of a Structural Engineer Inspection. (2022, February 16). Blog | PEforHire.com. https://www.peforhire.com/blog/six-key-components-of-a-structural-engineer-inspection/

Visual Inspection In Asset Management And Quality Control. (2021, May 3). Limble. https://limblecmms.com/blog/visual-inspection/

Visual Inspection: Evolution, Methods, and Applications. (2023, October 19). TRADESAFE. https://trdsf.com/blogs/news/visual-inspection-the-eyes-behind-defect-detection

What Are Building Diagnostics? (n.d.). Enertiv - Smart Building Technology & Submetering Solutions. https://www.enertiv.com/resources/faq/what-are-building-diagnostics

What is Structural Health Monitoring (SHM)? (n.d.). Www.linkedin.com. Retrieved March 18, 2024, from https://www.linkedin.com/pulse/what-structural-health-monitoring-shm-maneli-parsy

What is troubleshooting and why is it important? (n.d.). WhatIs.com. https://www.techtarget.com/whatis/definition/troubleshooting#:~:text=Troubleshooting%20is%20a%20systematic%20approach

III. TEACHING AND LEARNING PROCEDURE		NOTES TO TEACHERS
A. Activating Prior Knowledge	**DAY 1** **1. Short Review: Construction Tools Identification** The teacher will present pictures or samples of common construction tools. Divide students into groups and instruct the students that a member must stand up to give their answer. Present the pictures and let each group identify the tool. The group whose members stand up first can answer. If the group did not give the correct answer, other groups will have the chance to give their answer. The group with the most answers will win. The teacher can give extra points to the winning group. The teacher can use at least 10 pictures for the review. **2. Feedback (Optional)**	The teacher can use references for the pictures from the previous lessons. Also, the teacher can choose how many points they can give for each correct answer.
B. Establishing Lesson Purpose	**1. Lesson Purpose** The incorporation of construction diagnostics and troubleshooting into school curricula serves a dual purpose: it educates students about the intricacies of building structures while fostering critical thinking and problem-solving skills. By engaging with real-world scenarios and practical exercises, students understand how buildings function and the common challenges they may encounter. Moreover, this hands-on approach cultivates a mindset of inquiry and innovation, empowering students to analyze complex issues systematically and develop effective solutions. Through this integrated learning experience, students acquire valuable knowledge about construction practices and sharpen essential skills applicable across various disciplines and future endeavors. **2. Unlocking Content Vocabulary** • **Building Diagnostic** - involves identifying the reasons behind issues and finding solutions within buildings. (*What Are Building Diagnostics?*, n.d.) • **Diagnostics** - used for discovering the characteristics or cause of a problem in a system or machine (Cambridge Dictionary, 2024) • **Non-Destructive Testing (NDT) Equipment** - serves the purpose of identifying, examining, and gauging defects, the integrity of bonds, and various material conditions without causing permanent alteration or damage to the examined component or item. This category encompasses a diverse array of instruments and systems. (*Nondestructive Testing (NDT) Equipment Selection Guide: Types, Features, Applications	Engineering360*, n.d.)	

<table>
<tr><td></td><td>

- **Troubleshooting** - is a systematic approach to problem-solving often used to find and correct issues with complex machines, electronics, computers and software systems. (What Is Troubleshooting and Why Is It Important?, n.d.)
- **Visual Inspection** - It's employed to visually inspect the surface of an object for indications such as cracks, scratches, misalignments, corrosion, and other visible flaws. (Visual Inspection in Asset Management and Quality Control, 2021)

</td><td></td></tr>
<tr><td>C. Developing and Deepening Understanding</td><td>

DAY 1
SUB-TOPIC 1: Visual Inspection of the Structure/Components

1. Explicitation
Visual inspection of the structure/components involves a comprehensive examination in which individuals carefully examine various elements for visible indications of damage, wear, misalignment, or other noticeable problems. This entails scrutinizing surfaces, joints, connections, and overall conditions to identify any anomalies or defects impacting their integrity or functionality. This initial assessment method offers valuable insights into the structural health and performance of the components, guiding subsequent diagnostic or maintenance measures as needed.

Visual inspectors such as a structural engineer, possess advanced expertise in physics, mathematics, and building codes. During their assessment of the building or property, engineers will focus on:
A. Structural design, including foundation layout
B. Types of construction materials utilized
C. Strength and load-bearing capabilities of materials
D. Environmental considerations like soil erosion

Visual Defects
Understanding the characteristics of defects is pivotal for their visual identification. Some common and readily noticeable visual imperfections encompass:

<table>
<tr><td>Visual Defects</td></tr>
<tr><td></td></tr>
</table>

</td><td>The teacher may encourage the students to take pictures of the identified defect, as evidenced by their observations. The activity can be done in 10 minutes. 5 minutes for observation and 5 minutes for the short discussion</td></tr>
</table>

	Cracks: These represent visible fractures or fissures on surfaces, indicating potential weaknesses in the material or structural components. Factors such as settlement, shrinkage, or overloading can cause cracks.	
	Spalling: Spalling pertains to the chipping, flaking, or peeling of concrete surfaces, often triggered by factors like poor quality materials, improper curing, or exposure to environmental conditions such as freeze-thaw cycles.	
	Efflorescence: This phenomenon entails the formation of white, powdery deposits on the surface of masonry or concrete structures. It results from the migration of soluble salts to the surface, suggesting possible moisture infiltration and inadequate waterproofing.	
	Honeycombing: Honeycombing refers to voids or air pockets within concrete structures, resulting from insufficient compaction during placement or inadequate quality control during construction. It poses a risk to structural integrity and durability.	
	Surface Imperfections: These encompass scratches, dents, stains, or uneven surfaces, detracting from the appearance of the completed structure. Surface imperfections can arise from mishandling, improper installation, or insufficient quality control measures.	
	Rust Staining: Rust staining occurs when metal components, such as reinforcement bars or fasteners, corrode and release rust onto nearby surfaces. This can indicate inadequate corrosion protection measures or exposure to moisture.	
	Misalignment: Misalignment involves deviations from the intended positions or orientations of structural elements like columns, beams, or walls. Such deviations can compromise structural stability and aesthetics, impacting the overall performance of the building.	
	Poor Finishes: This category includes uneven paint application, inconsistent textures, or visible joints and seams in finishes like drywall or flooring. Poor finishes may result from subpar workmanship or a lack of attention to detail during construction.	
	Visual inspection equipment and tools •**Magnifying Glass**: This straightforward yet highly effective tool enlarges the inspected item, allowing the human eye to discern finer details. •**Microscope**: They magnify tiny structures or components to visible proportions, revealing defects or attributes that might go unnoticed.	

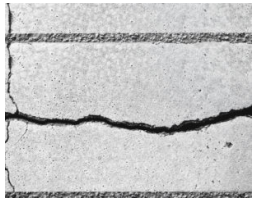
- **Endoscope / Borescope**: Essential for examining areas inaccessible or concealed from direct view, endoscopes (or industrial borescopes) feature an elongated design with a camera and light source at the tip.
- **High-Resolution Cameras**: They capture intricate details with exceptional clarity, making them indispensable for automated inspection systems.
- **Drones with Cameras**: Increasingly popular for inspections covering vast areas, challenging terrains, or hazardous environments, drones equipped with high-definition cameras offer versatility and efficiency.

2. Worked Example:

Divide the class and form them into groups. Let them observe inside and outside the classroom, and have each group visually inspect to see if they can identify defects in the classroom. Then, after identifying, ask the students to reflect on the causes of the defects they have identified and ask if they have observed or seen these defects in other buildings or their homes.

3. Lesson Activity

Directions: Identify and briefly describe each picture of the building defect based on the table. **(Please refer to worksheet no. 1 for the students to accomplish.)**

Visual Defect	Description
 Image from ESOG Repair	Crack Visible fractures on surfaces indicate potential weaknesses in materials or structural components, often caused by settlement, shrinkage, or overloading.
 Image from Wikimedia Commons	Efflorescence Formation of white, powdery deposits on concrete surfaces due to soluble salts migrating

The teacher may use pictures from the references or pictures from the Internet. The teacher can also use pictures taken from the school premises.

 Image by grungetextures, from Flickr	Rust Staining Rust release from corroded metal components onto nearby surfaces, indicating exposure to moisture.
 Concrete honeycomb on ring beam by Wikimedia Commons user, from Wikimedia Commons	Honeycombed Presence of air pockets within concrete structures resulting from insufficient compaction during placement
 Brick Uneven Wall of Building in Street by Engin Akyurt, from Pexels	Misalignment Deviations from the intended positions of structural elements like columns or beams compromise structural stability and aesthetics.

DAY 2

SUB-TOPIC 2: Measurement and Dimension

1. Explicitation

Within construction diagnostics and troubleshooting, precise measurements and dimensions play a vital role in assessing structural integrity and uncovering potential issues. Parameters such as length, width, height, and thickness allow for a thorough evaluation of structural components' size, proportions, and robustness, such as walls, beams, and foundations. Moreover, angles, slopes, and surface characteristics, including levelness and flatness, are crucial for ensuring proper alignment and stability, which are essential for safety and operational effectiveness. Through meticulous measurement and dimension analysis, construction practitioners can proficiently identify issues,

	implement suitable remedies, and uphold the durability and security of construction endeavors. **Common Measurements and Dimensions for Construction Problem-Solving** ● **Length, width, and height** These fundamental dimensions are indispensable for assessing the size and proportions of structural elements like walls, beams, and columns. Discrepancies in these measurements may signal structural deformities or inaccuracies in construction. ● **Thickness** The measurement of material thickness is pivotal for gauging the structural integrity and load-bearing capacity of components such as slabs, walls, and foundations. Variances from specified thicknesses could indicate weaknesses or deficiencies. ● **Angles and slopes** The evaluation of angles and slopes ensures the proper alignment and inclination of elements like roofs, stairs, and ramps. Inaccuracies in angles or slopes may result in drainage issues, uneven surfaces, or structural instability. ● **Square Footage/Area** Calculating the total surface area aids in estimating material requirements for projects, ensuring sufficient coverage and minimizing waste. ● **Levelness and flatness** Assessing the levelness and flatness of surfaces such as floors and walls is crucial for ensuring safety, functionality, and aesthetics. Irregularities in levelness or flatness suggest settlement, subsidence, or improper construction techniques. ● **Clearances and gaps:** Measuring clearances and gaps between structural components assists in identifying alignment issues, improper installations, or material shrinkage, which could compromise structural integrity or functionality. ● **Volumes** Calculating volumes of materials like concrete, aggregates, or excavated soil helps estimate quantities required for construction activities, facilitating efficient project planning and resource allocation. ● **Tolerances**	

	The assessment of tolerances ensures that measurements and dimensions adhere to acceptable ranges specified by building codes, standards, or project requirements. Deviations beyond tolerances may require corrective action to maintain quality and compliance. **2. Worked Example**: **Hands-on Measurement Exercise** Divide students into small groups. Provide each group with a ruler or tape measure and assign them a specific measurement to focus on (e.g., length, thickness, angles). Instruct the groups to measure various objects related to their assigned measurement in the classroom or outside (e.g., desks, doors, stairs). Have students record their measurements and discuss any variations they observe. Bring the groups back together and have them share their findings. Facilitate a discussion on how measurement variations could impact construction projects and what actions could be taken to address them. Encourage students to reflect on the importance of accuracy and attention to detail in construction diagnostics. **3. Lesson Activity**: **Matching Type** Match column A to column B. **(Please refer to worksheet no. 2 for the students to accomplish.)** **DAY 3** **SUB-TOPIC 3: Diagnostic Tools and Equipment in Construction Services** **1. Explicitation** Diagnostic instruments and gear play a vital role in construction services, aiding builders in verifying the safety and durability of structures. For example, digital multimeters gauge electricity in buildings to detect issues, whereas thermal imaging cameras pinpoint concealed problems like heat leaks or moisture. Overall, these instruments ensure buildings are erected securely and endure over time, bolstering the reliability and credibility of construction services. Additionally, students can familiarize themselves with other pivotal equipment used in construction. For instance, laser leveling devices ensure precision during grading and alignment, which is pivotal for establishing sturdy foundations. **Common Diagnostic Tools and Equipment Used in Construction Services**	The teacher may use defective furniture or any objects/part that are unbalance or uneven measurements that can be found in the classroom with un. The activity can be done in 8-10 minutes. 3-5 minutes for observation and 3-5 minutes for the short discussion

Digital Multimeters These devices serve to measure voltage, current, and resistance within electrical systems, aiding in the identification and diagnosis of electrical issues within buildings
Thermal Imaging Cameras These cameras are designed to detect infrared radiation emitted by objects, allowing construction experts to pinpoint heat leaks, moisture infiltration, and areas of electrical overheating.
Ultrasonic Testing Equipment This category of devices is utilized to uncover flaws, determine material thickness, and evaluate the structural integrity of various components such as welds, concrete, and metal structures.
Ground Penetrating Radar (GPR) GPR systems are employed to scan through concrete, soil, and other materials, identifying subsurface objects, voids, and irregularities, thus assisting in structural assessments and utility mapping.
Moisture Meters These instruments gauge moisture levels within building materials like wood, drywall, concrete, and insulation, aiding in detecting areas susceptible to mold, decay, or water damage.
Concrete Testing Equipment This encompasses tools such as concrete compressive strength testers, slump tests, and air entrainment meters, which are utilized to evaluate the quality and characteristics of concrete mixes during both the construction and post-construction phases.
Vibration Monitoring Equipment These tools are utilized to monitor vibrations generated by construction activities such as pile driving, blasting, or heavy machinery operation, ensuring adherence to regulatory limits and preventing damage to nearby buildings.
Environmental Monitoring Devices This category includes instruments for measuring air quality, noise levels, and dust particles at construction sites, thereby mitigating environmental impacts and ensuring compliance with regulations.
Structural Health Monitoring (SHM) Systems

SHM systems integrate sensors, data acquisition units, and analysis software to continuously monitor the structural behavior of buildings, bridges, and other infrastructure, identifying anomalies and assessing maintenance or repair needs.
Laser Leveling Devices Laser levels offer precise measurements for grading, alignment, and elevation control during site preparation and construction activities.
Remote Inspection Technologies es equipped with cameras and sensors facilitate remote visual inspections of tall tures, rooftops, and inaccessible areas, enhancing safety and efficiency in construction ctions.

2. Worked Example

Divide the class into small groups or pairs, depending on the class size. Distribute the pictures or illustrations of the diagnostic tools and equipment to each group. Ask the students to write down the names of the tools on a piece of paper, one tool per paper. Instruct the groups to match each tool with its corresponding description or function. Students can discuss among themselves to figure out which tool matches which function. Once the students have matched all the tools with their functions, have each group present their matches to the class and explain why they made those choices.

3. Lesson Activity

Directions: Complete the table below to identify the Diagnostic Tools and Equipment to be used for the problem. **(Refer to worksheet no. 3)**

Problem/fault	Diagnostic Tools/Equipment to be used	Explain why?
A building has unidentified moisture damage in the basement walls.	Moisture Meter	A moisture meter measures moisture in materials like walls, identifying water damage or mold risk.

An electrical circuit keeps tripping without any visible signs of damage.	Digital Multimeter	A digital multimeter measures electrical systems' voltage, current, and resistance, diagnosing faults without harm.
Cracks have appeared in the concrete foundation of a newly constructed house.	Ultrasonic Testing Equipment	Ultrasonic testing equipment finds flaws in structures like concrete foundations, measuring thickness and detecting internal defects.
Uneven surfaces are observed on the floor of a newly constructed warehouse.	Laser Leveling Device	A laser leveling device ensures precision in grading and alignment, identifying and correcting uneven surfaces in construction projects like floors, guaranteeing a stable foundation.
The efficiency of a building's heating system is suspected to be compromised, leading to uneven heating and temperature fluctuations.	Thermal Imaging Camera	A thermal imaging camera identifies heat distribution patterns. It locates areas of heat loss or inefficiency in heating systems, aiding construction professionals in making repairs or adjustments to enhance heating performance and energy efficiency.

DAY 4

SUB-TOPIC 4: Material Selection and Evaluation

1. Explicitation

Material selection and evaluation within construction services employ various methods to guarantee the most suitable materials for construction projects. These methods encompass material testing, where properties such as strength, durability, and thermal conductivity are assessed through laboratory tests. Life cycle assessment examines the environmental impact of materials throughout their entire lifespan, advocating for sustainable options. These methodologies collectively ensure that materials chosen for construction projects meet desired quality, sustainability, and performance standards.

Techniques Commonly Used in Materials Testing and Evaluation

The teacher may use all of the techniques to be printed and also, the description can be rephrased to short sentences, or the teacher can use a phrase from the descriptions.

Example descriptions:

1. Laboratory tests are conducted on construction material samples to evaluate properties like strength, durability,

	• **Material Testing** This encompasses performing laboratory examinations on samples of construction materials to evaluate their characteristics such as strength, durability, thermal conductivity, and moisture resistance. Common tests include assessing the compressive strength of concrete, the tensile strength of steel, and the moisture content of wood. • **Life Cycle Assessment (LCA)** LCA appraises the environmental impact of materials throughout their complete life cycle, spanning extraction, manufacturing, transportation, usage, and disposal stages. It aids in choosing materials with reduced environmental footprints and advocating sustainable construction practices. • **Durability Assessment** Durability assessments predict a material's performance over time under diverse environmental conditions, encompassing exposure to weather, moisture, chemicals, and wear and tear. This assists in selecting materials capable of enduring the anticipated service life of the structure. • **Energy Efficiency Analysis** This approach evaluates the energy performance of building materials, taking into account factors like thermal insulation properties, solar reflectance, and emissivity. It aids in selecting materials contributing to energy-efficient building designs and reducing heating, cooling, and lighting demands. • **Recyclability and Reusability Evaluation** Evaluating the recyclability and reusability of materials promotes principles of the circular economy and diminishes waste generation. Preference is given to materials that can be easily recycled or reused at the end of their life cycle. • **Performance Specifications** Developing performance specifications for materials involves establishing criteria and standards for their performance based on project requirements and industry norms. This ensures that materials meet desired performance criteria and regulatory stipulations. • **Supplier Qualification and Quality Control**	thermal conductivity, and moisture resistance. 2. Various materials are compared to determine the most cost-effective option, considering factors such as initial costs, maintenance expenses, and energy efficiency. 3. Energy performance of building materials is assessed, considering factors like thermal insulation properties, solar reflectance, and emissivity, to select materials for energy-efficient building designs. The teacher may use other scenario for the other techniques to be used. Also, the teacher may encourage the students to support reasons to their answer, the same with the answer given in the example.

Assessing material suppliers and implementing quality control measures across the supply chain ensures that materials adhere to specified standards and requirements. This includes conducting supplier audits, inspections, and quality testing of incoming materials.

- **Building Information Modeling (BIM)**
  BIM technology enables construction professionals to visualize, simulate, and analyze building designs and material properties in a digital realm. It streamlines the selection and assessment of materials by furnishing comprehensive data and simulations of their performance within the building context.

2. Worked Example: **Material Match-Up**

In this classroom activity, participants will utilize printed cards or strips containing material selection and evaluation techniques, such as Material Testing, Life Cycle Assessment, Cost-Benefit Analysis, and Durability Assessment. These cards will be affixed to a board or wall using tape. Additionally, printed cards or strips will be provided with descriptions or explanations of each technique. The class will be divided into small groups or pairs, and the cards with the names of material selection and evaluation techniques will be distributed among them. Subsequently, the cards with descriptions or explanations will be spread out on a table or display area. Participants will be instructed to match each technique card with its corresponding description or explanation within a set time limit, typically 5-10 minutes. Following the activity, the matches will be reviewed as a class, allowing for discussion of any discrepancies or questions. Optionally, points can be awarded to groups for correct matches, adding a competitive element to the activity.

3. Lesson Activity

Applying Material Selection and Evaluation Techniques in Construction Services

Objective: This activity aims to engage students in applying material selection and evaluation techniques in construction services through a hands-on application and worksheet completion.

Materials Needed:

Worksheet containing scenarios related to material selection and evaluation techniques (see example worksheet below).
Answer key for the worksheet.

	Pens or pencils for students. **Instructions:** ● Divide the class into small groups. ● Distribute samples of construction materials to each group. ● Assign each group a scenario related to material selection and evaluation techniques (e.g., selecting the most suitable material for a specific construction project, evaluating the environmental impact of different materials, etc.). ● Instruct the groups to apply the appropriate material selection and evaluation techniques to address the given scenario. ● Encourage students to discuss and analyze the properties of the materials provided, considering factors such as strength, durability, environmental impact, cost-effectiveness, etc. ● Allow time for groups to brainstorm and come up with their recommendations based on their analysis. ● Allow students time to complete the worksheet independently. ● Once all students have finished, review the answers together as a class using the provided answer key. ● Discuss any questions or concepts that students found challenging, providing additional explanation or examples as needed. **Worksheet Example:** **Material Selection and Evaluation Techniques Worksheet** Objective: Apply the appropriate material selection and evaluation technique to address each scenario. **(Refer to the worksheet no. 4)**	
D. Making Generalizations	**1. Learners' Takeaways** Summary Questions: 1. Elaborate on the significance of diagnostics within construction services. How does adept diagnostic analysis bolster project outcomes and foster client contentment? 2. Outline the fundamental procedures for diagnosing issues in construction projects. How can construction experts streamline the identification and resolution of problems throughout a project's progression?	

	3. Analyze the differences between diagnostic methodologies employed in construction services, including visual inspections, testing modalities, and digital resources. What are the respective strengths and weaknesses of these methods? **2. Reflection on Learning** The learners will answer the following reflection questions: 1. Reflect on real-world case studies or examples where effective diagnostics and troubleshooting have played a crucial role in the success or failure of construction projects. What lessons can be learned from these experiences? 2. Reflect on a challenging construction issue you've encountered. How was it diagnosed and resolved? What lessons did you learn from this experience?	

IV. EVALUATING LEARNING: FORMATIVE ASSESSMENT AND TEACHER'S REFLECTION		**NOTES TO TEACHERS**
A. Evaluating Learning	**1. Formative Assessment** **Multiple Choice** **Directions:** Choose the letter of the correct answer. 1. What is the primary purpose of diagnostics in construction services? a) To identify potential cost overruns b) To assess project progress c) To diagnose and resolve construction-related issues d) To enhance project aesthetics 2. Which of the following is a key step in diagnosing construction-related problems? a) Increasing project budget b) Conducting thorough inspections and tests c) Ignoring client feedback d) Rushing through the project completion 3. Which diagnostic technique involves the use of drones and sensors for data collection? a) Digital tools b) Visual inspections c) Manual testing methods d) None of the above	**Answer key:** c) To diagnose and resolve construction-related issues b) Conducting thorough inspections and tests a) Digital tools b) Reduced human error d) By identifying and addressing issues promptly

<table>
<tr><td></td><td colspan="3">4. What are some advantages of using digital tools for diagnostics in construction?
a) Limited data storage capacity
b) Reduced human error
c) Inability to access real-time data
d) Higher costs associated with implementation
5. How can effective diagnostics contribute to project success and client satisfaction?
a) By increasing project delays
b) By reducing the need for collaboration
c) By disregarding safety concerns
d) By identifying and addressing issues promptly

2. Homework (Optional)</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">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="3">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?
▪ <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>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>