Lesson 4.3: Simple Maintenance and Repairs

Unit: Unit 4, Spaces We Live In (Environmental Design and Management) **Topic:** 4.1 Safe, Healthy, Sustainable Homes **Grade:** 6 to 8 (written at grade 7; see Differentiation for the grade 6 support and grade 8 stretch) **Days:** 2 class periods of 40 minutes (days 93 and 94 of the year) **Room:** FACS lab or classroom with table space for five stations (a no-tools version is below)

Standards

- NYS module line: NYS EDM 1. Healthy, Safe, Sustainable Living Spaces b) Identify common safety hazards found in living spaces and describe ways to minimize risks to individuals, families, and household members
- NYS module line: NYS EDM 1. Healthy, Safe, Sustainable Living Spaces c) Formulate a safety plan for home, work, and community settings
- CTE theme line: CTE HSW 4. Classroom and Workplace Safety c) Apply safety practices when using tools, machines, and equipment
- CTE theme line: CTE HSW 4. Classroom and Workplace Safety d) Wear appropriate protective clothing and gear when using tools, machines, and equipment
- CTE theme line: CTE PSI 3. Troubleshooting Process (Reactive) a) Implement a formal troubleshooting process to solve a given problem by a. Defining the problem being addressed; b. Identifying criteria and specifications for the desired outcomes or operation; c. Testing and evaluating to isolate the problem; d. Correcting the problem by implementing changes or repairs; e. Validating that the corrective action produced desired outcomes or operation; f. Identifying strategies to prevent future problems
- NYS FACS Learning Standard 2 (Intermediate), Key Idea: Students will know the basic principles of home and community safety. They can demonstrate the skills necessary to maintain their homes and workplaces in a safe and comfortable condition. They can provide a safe and nurturing environment for themselves and others.; Performance Indicator: Students know the basics of managing a safe and healthy home.
- CDOS Standard 3a Universal Foundation Skills: Technology
- National FCS 3.0: 11.3.5 Examine how housing, interiors, and furnishings affect public health, safety, and welfare.
- National FCS 3.0: 5.2 Demonstrate planning, organizing, and maintaining an efficient operation of residential or commercial facilities. (content standard; Area 5 is confirmed only at the content-standard level in the web research file)

Note on EDM 1. b): quoted from the NYSED 2023 copy, which prints the line cleanly (the June 2018 PDF had fused “Plan ways of maintaining” into it; crosswalk Part E.5). This lesson teaches the second half of the line: maintenance and repair are how a household minimizes the risks Lesson 4.2 identified. Note on the National FCS lines: the task suggested 5.6.x; in 3.0, 5.6 is laundering, so 5.2 (maintaining a residential facility) and 11.3.5 are cited instead.

Enduring understanding and essential question

Big idea: A home is a machine that needs small fixes all the time. Most of them take five minutes and no money if you know the steps and the tool. Knowing them is the difference between a $5 fix and a $150 service call. **Essential question:** Which of the small jobs in a home should everyone be able to do by the time they are fourteen, and which should always go to a professional?

Objectives

By the end of this lesson, students will be able to:

1. (Low: remember or understand) Given a tray of seven hand tools, name each one and match it to the home job it is used for.
2. (Mid: apply or analyze) At each of five repair stations, perform the task following the steps on the station card and the safety rule, and check it with the station's test (the screw is flush, the plunger sealed, the measurement is within an eighth of an inch, the bubble is centered, the breaker is reset in the right order).
3. (High: evaluate or create) Given a blank twelve-month grid and a task bank, create a maintenance calendar for a home, placing every task in a sensible month, and justify three placements.

Vocabulary

Tier 2 (general academic): maintain, troubleshoot, isolate, validate Tier 3 (FACS): circuit breaker, tripped, flapper (toilet), plunger, Phillips and flathead screwdriver, adjustable wrench, level, tape measure, stud, filter. See the unit vocabulary list for Turkish, Portuguese, and Spanish.

Materials and setup

- Tool tray for Day 1 tool ID and Day 2 stations: two Phillips screwdrivers, two flathead screwdrivers, one pair of pliers, one adjustable wrench, one 24-inch level, three tape measures, one sink plunger (cup) and one toilet plunger (flange), one furnace filter (any size, new), one light bulb (LED) and one small lamp, safety glasses (one pair per student at the screw station; a class set of 8 to 10)
- Station 1, screw board: a scrap 2 by 6 board (about 18 inches), pre-drilled with pilot holes, and a box of 1.25-inch wood screws (Phillips), plus a few flathead screws so students choose the driver
- Station 2, plunger drain: a 5-gallon bucket with 3 inches of water and a sink strainer or a plastic tub with a drain hole; the task is to feel the seal and the push-pull, not to clear a real clog
- Station 3, tape measure: five taped lines on the table or wall, each labeled A to E, plus a book and a box to measure
- Station 4, level: a scrap board with a shelf bracket screwed on one side only, so the bracket can pivot; students level it and mark; and a picture frame on a string over a nail in a scrap board

- Station 5, breaker and bulb: a photo of a breaker panel with one breaker in the middle (tripped) position, printed large; the small lamp with a bulb that is out; a fixture label showing “60 W max”
- Handouts, one per student: Handout 04.03 - Repair Station Cards and Maintenance Calendar.md (the seven jobs, tool ID, five station cards, the calendar)
- Slides: Slides 04.03 - Simple Maintenance and Repairs (Day 1 and Day 2 labeled)
- Timer visible to the class
- Setup notes: pre-drill the pilot holes so no student is pushing a screw into hard wood; set the stations after the previous period leaves and photograph them for reset. Nothing electrical is live at any station: the breaker is a photo and the lamp is unplugged. Allergy check: none needed. *[Sal: the custodian may have every one of these tools; ask before buying. Budget if buying: about $60 for the set, once.]*

Pre-assessment

The Unit 4 pre-test asked students to name one tool and one small home repair. Most name a hammer and “fix a leak.” Today’s do now asks who has done any of the seven jobs. The hand count per job tells you which stations need the most coaching on Day 2.

Do now and hook (Time: 5 min)

Day 1. On the board: “Which of these have you ever done or watched someone do: change a light bulb, reset a breaker, unclog a drain, stop a running toilet, hang something on a wall, change a filter? Write the ones you have done. Then: what happened the last time something in your home broke?”

Debrief: hand vote per job. Hook: hold up a plumber’s invoice you made up for the slide, “$185, running toilet, 15 minutes.” Say: “The part was $8. Today you learn the fifteen minutes.”

Day 2. On the board: “Name the tool: it has a bubble in a tube and tells you if something is straight. Name the tool: it has a rubber cup on a stick. Name the tool: its tip is shaped like a plus sign.” Then: “Which station do you think will be hardest? Why?” Debrief in one minute; the answers are the tool ID check.

Procedure

Day 1

Step	Teacher will	Students will	Time
1. Direct instruction: the seven small jobs	One slide per job with the steps and the one safety rule: change a light bulb (switch off, let it cool, check the max watts on the fixture,	Fill in the seven-jobs table on the handout, Part 1: job, first step, safety rule, tool.	10 min

	righty tighty, LED if you can); reset a tripped breaker (find the one in the middle position, push it fully OFF, then ON, and if it trips again, stop and call someone, because something is wrong); unclog a drain without chemicals (pull the hair out with a plastic drain tool, then plunge, then hot water; never mix chemicals, never plunge after chemicals); stop a running toilet (lift the tank lid, check the chain is not caught, check the flapper is sitting flat, bend the float arm down or turn the float screw); tighten a loose screw (match the driver to the head, push in while turning, stop when snug, do not strip it); hang something on a wall (find the stud with a knock or a finder, or use an anchor, mark with a level, nail or screw at a slight upward angle); clean a filter (furnace filters every one to three months, arrow		

	toward the furnace; range hood and dryer lint filters every use or every month). Demo the toilet flapper with the slide photo and the filter with the real one.		
2. Learning activity: tool ID	Pass the tool tray around the tables, one minute per table. Name each tool once on the slide: Phillips and flathead screwdrivers, pliers, adjustable wrench, level, tape measure, sink plunger and toilet plunger (the flange is the difference). Then the match task: Part 2 of the handout, tool to job.	Handle each tool, name it, match it to a job on the handout.	8 min
3. Direct instruction: the troubleshooting process and safety rules	Show the six-step troubleshooting process from the state's PSI theme in plain words: what is the problem, what should it do, test to find the cause, fix it, check that the fix worked, stop it happening again. Walk the running toilet through all six on the slide. Then the safety rules for tomorrow: eyes protected at the screw station, no tool leaves its	Write the six steps on the handout, Part 3, and fill in the running-toilet example. Copy the five safety rules.	9 min

	station, nothing is plugged in, hands dry at the drain station, the level and tape are not toys, one person works while the others watch and coach.		
4. Share and preview	Show the five station photos. Assign five teams of four to six. Ask each team: what is the test at your first station that proves you did it?	Read the station cards; name the test.	4 min

Day 2

Step	Teacher will	Students will	Time
1. Station rules and rotation	Restate the five safety rules. Rotation: 4 minutes per station, rotate on the reset cue (lights, countdown, hands empty). Every student performs the task at least once at each station; the team coaches. Hand out safety glasses at Station 1.	Move to the first station with the handout open to the station cards.	3 min
2. Practice: the five repair stations	Start the timer. Rotate every 4 minutes. Circulate with the clipboard check (see below). Station 1: drive a screw into a pilot hole until the head is flush, then remove it; choose the right driver for the head. Station 2:	Perform each task, check it with the test on the card, initial the card. Coach teammates.	20 min

	seat the plunger over the drain under water, push and pull straight up and down six times, feel the seal. Station 3: measure the five lines to the nearest eighth of an inch and the book and box in inches; write them. Station 4: level the pivoting bracket and mark the second hole; hang the frame and check with the level. Station 5: find the tripped breaker in the photo and say the reset in order (off, then on); check the lamp's bulb is out, read the max watts label, say the four steps, and screw in the new LED.		
3. Practice: the maintenance calendar	Teams stay at the last station. Show the task bank on the slide: monthly (test smoke and CO detectors, check the furnace filter, clean the range hood filter, clean the dryer lint trap after every load), seasonal (fall: gutters, furnace check, reverse ceiling fans, bring in hoses; winter: check for ice dams, salt the	Fill the twelve-month grid; write three justifications.	8 min

	steps; spring: check the roof, test the AC, clean the gutters again; summer: check the deck, seal the driveway), yearly (new detector batteries, drain the water heater, check the fire extinguisher). Task: place every task in a month on the grid, Part 4, and write why three of them go where they go.		
4. Share	Take the two placements teams disagree on most (usually the gutters and the detector batteries). Settle them on the board.	Report; correct their grid in another color.	5 min

Questions to ask

Monitor understanding:

- What is the first step before you touch a light bulb? Why?
- A breaker trips, you reset it, and it trips again right away. What do you do?
- Which plunger is for the toilet? How can you tell?

Deepen learning:

- The plumber's bill was $185 for a $8 part. Is that unfair, or is that what knowledge costs? When would you still call the plumber?
- The troubleshooting process says "validate" before you stop. What happens in a home when someone skips that step?
- Which of the seven jobs is one you would still not do alone at fourteen? Why that one?

Check for understanding

Day 1: the tool tray pass. As the tray moves, ask one student per table to name the tool you point to. Five correct out of five tables means Day 2 runs without a tool review. Day 2: clipboard checklist at the stations, for each student a yes or no on "followed the steps on

the card," "passed the station's test," and "used the safety rule without a reminder." Two yeses out of three at four stations is "got it."

Closure (Time: 4 min)

Day 1. 3-2-1 exit card: 3 tools you can name, 2 jobs you could do at home this week, 1 job you would leave to a professional and why. Three students read line 3.

Day 2. Exit card: the six troubleshooting steps in order, from memory, plus one line: the station that was hardest and what made it hard. Sort into "got it" and "needs more." The "needs more" pile on the six steps decides whether the Home Safety and Conservation Quiz review in Lesson 4.5 spends a minute on them.

Differentiation and supports

- ELL: every station card has a picture for each step; the tool ID slide has the tool name in Turkish, Portuguese, and Spanish under each picture (see Vocabulary 04.md); sentence starter for the calendar justification: "___ goes in ___ because ___ happens then." Pair each ELL student with a partner who can demonstrate before they try.
- IEP and 504 (general): teams of four to six so every student performs once and no one performs alone; a student who cannot grip a screwdriver coaches at Station 1 and performs at the others (the objective is scored on four stations); printed station cards in large type; extended time at the last station; the calendar can be done by placing task cards on the grid instead of writing.
- Grade 6 support: Station 3 measures to the nearest half inch; the calendar uses eight tasks instead of fifteen; the troubleshooting example is given filled in and students only order the steps.
- Grade 8 stretch: at Station 5 students also explain why a breaker trips (too much current for the wire) and what a GFCI does; the calendar adds a cost column using the price list on the handout and totals the year (this previews EDM 3. a)).
- UDL checkpoint used: multiple means of action and expression (every job is demonstrated, drawn on a card, and performed) and multiple means of engagement (stations are timed with a team check, not a worksheet).
- No-kitchen or no-machine alternative (no-tools version): if tools cannot come into the room, run Day 2 as five demonstration stations on the slides with a video clip or a sequence of photos for each, and students order the steps on cards and say the test. The screw and level stations can still run with a screwdriver, a level, and a scrap board from the custodian, which are safe in any room. *[Sal: the custodian is your partner here.]*

Assessment

Objective	Standards met	Learning task	Assessment (formative or summative; tool)
1. Name seven tools and match them to	EDM 1. b); HSW 4. c); Std 2 PI B	Tool ID, Day 1 Step 2; Day 2 do now	Formative; tool tray pass, handout Part 2

jobs			checked
2. Perform five station tasks with the safety rule and pass each test	EDM 1. b); HSW 4. c), 4. d); PSI 3. a) c., d., e.; CDOS 3a Technology; National FCS 5.2	The five repair stations, Day 2 Step 2	Formative; clipboard checklist at the stations, initialed station cards; counts as daily work
3. Create and justify a maintenance calendar	EDM 1. c); PSI 3. a) f.; National FCS 11.3.5	The maintenance calendar, Day 2 Step 3	Formative; grid scored complete, partial, or missing; the three justifications are read for cause and season

Objective 2 is checked summatively on the Home Safety and Conservation Quiz at the end of Lesson 4.5 (the breaker item and the drain item).

Homework

None. Optional: with an adult, find the breaker panel in your home and read one label. Tell me what one breaker was labeled. No photos.

Connections

Inside the building: the custodian is the expert. A five-minute visit on Day 1 to show the building's breaker panel door (not inside it) and the furnace filter gives students a real professional and gives the custodian a class that stops leaving faucets running. Math: the calendar's cost column (grade 8 stretch) is a budgeting exercise the math teacher can extend. Community: a hardware store's "how to" clinic, if one exists locally, for Lesson 4.16 careers. *[Sal: name the store.]*

Sources

- NYS Middle Level CTE FACS Content Module 04, Environmental Design and Management (nyctecenter.org, June 2018), lines 1. b) and 1. c). Copy in 02 Standards/NYS Module PDFs/.
- NYS Middle Level CTE Theme Module, Health, Safety, and Wellness, lines 4. c) and 4. d); Theme Module, Problem Solving and Innovation, line 3. a) with sub-lines a. to f. Text per 02 Standards/NYS ML CTE FACS Modules - verbatim extract of all twelve.md.
- NYS Learning Standards for Health, Physical Education, and Family and Consumer Sciences (1996), Standard 2, Intermediate. Wording per the crosswalk, Part A.6.
- National Standards for Family and Consumer Sciences Education 3.0 (LEAD FCS Education, 2018), competency 11.3.5 and content standard 5.2, per 02 Standards/STANDARDS SOURCES - web research.md.

- Repair steps are standard homeowner guidance (U.S. Consumer Product Safety Commission and manufacturer instructions for breakers and detectors). *[Sal: check the breaker reset steps against your building's panel type; some panels reset differently.]*

Teacher notes

- If Day 1 runs short, cut Step 3's running-toilet walkthrough to three steps and finish the six steps as the Day 2 do now. If Day 2 runs short, drop Step 4 and settle the gutters argument at the start of Lesson 4.4. Never cut the station time; the performing is the lesson.
- Common mistake at Station 1: pushing a Phillips driver into a flathead screw and stripping it. Put one flathead screw in the box on purpose so every team hits the choice.
- Common mistake at Station 5: saying "flip it back on" without "off first." A tripped breaker sits in the middle and will not reset from the middle. Make them say both words.
- Station 2 is the one students laugh at. It is also the one they will actually do at home. Keep it.
- The invoice on the hook slide is made up. Say so if asked. The point is the ratio, not the number. *[Sal: if you have a real repair bill from your own home with the address blacked out, it lands harder.]*
- The maintenance calendar comes back in Lesson 4.11 when the client brief asks what the family's home needs this year.