

Lesson 4.10: Reading and Drawing a Floor Plan to Scale, and the Design Vocabulary Check

Unit: Unit 4, Spaces We Live In (Environmental Design and Management) **Topic:** 4.2 Design: Elements, Principles, Color **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 104 and 105 of the year) **Room:** classroom or FACS lab, flat tables, a wall with a door and at least one window to measure

Day note: the unit calendar and the unit plan place this lesson on days 104 and 105, with the Design Vocabulary Check in the last 12 minutes of Day 2 and Lesson 4.11 fixed on day 106. The writing task that produced this file said days 106 to 107. Days 104 and 105 are correct. This is the lesson Lesson 4.12 depends on: everything Lesson 4.12 Day 1 assumes a student already knows (the symbols, the door swing, the scale, the zones) is taught here, and the daily floor plan do now that runs through Lesson 4.14 starts here.

Standards

- NYS module line: NYS EDM 2. Environment and Interior Design b) Create a floor plan designed to meet the needs of individuals, families, or communities
- NYS module line: NYS EDM 2. Environment and Interior Design a) Design shared environments and living space zones (for home, school, work, and/or community) which show respect for individual privacy needs and appreciation of large group social needs
- NYS module line: NYS EDM 2. Environment and Interior Design c) Incorporate the elements and principles of design into a design plan
- CTE theme line: CTE PSI 2. Design Process (Proactive) b) Demonstrate personal development of design skills through practice of these skills in a variety of classroom applications
- CTE theme line: CTE PSI 2. Design Process (Proactive) a) Implement a formal design process to solve a given problem by d. Brainstorming and examining possible solutions; h. Optimizing the solution for best form and function
- 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: Basic Skills
- National FCS 3.0: 11.4.3 Draw an interior space to scale using architectural symbols.
- National FCS 3.0: 11.4.2 Judge floor plans for efficiency and safety: zones, traffic patterns, storage, and the electrical, plumbing, ventilation, and heating systems.
- National FCS 3.0: 11.2.4 Design housing, interiors, and furnishings around how people behave, move, and measure.

Note on the theme line: the crosswalk's EDM 2. b) row offers CTE PSI 2. Design Process (Proactive) a) f., "Developing and constructing a prototype or model of the selected design." Nothing is built today, and that line is cited where it belongs, on Lesson 4.14. PSI 2. b), the practice line, and sub-lines d. and h. are what this lesson actually does, so those are cited instead. Note on the National FCS lines: all three are confirmed word for word in 02 Standards/STANDARDS SOURCES - web research.md, section 4.11. Note on the NYS FACS performance indicator: the crosswalk assigns Standard 2, the key idea, and PI B to all five EDM 2 lines, so PI B is quoted above.

Enduring understanding and essential question

Big idea: A floor plan is a room shrunk to a rule. Once you know the rule, you can measure any room in the world, draw it on a sheet of paper, and try ten arrangements before you move anything heavy. **Essential question:** How can a drawing the size of your hand prove that a bed, a desk, and a person all fit in the same room?

Objectives

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

1. (Low: remember or understand) Given a sample floor plan and a legend, identify eleven floor plan symbols (wall, door with its swing, window, closet, stairs, sink, toilet, tub, stove, refrigerator, outlet) and state in words what "1/4 inch = 1 foot" means.
2. (Mid: apply or analyze) Working in a team with a tape measure, measure the classroom to the nearest half foot and draw it to scale on quarter-inch graph paper with the walls, the door and its swing, and the windows in the right places.
3. (High: evaluate or create) Draw a bedroom to scale, place furniture cut-outs at the same scale in zones, then evaluate the layout for traffic flow, fix one path that does not work, and write in one sentence what moved and why.

Vocabulary

Tier 2 (general academic): scale, ratio, convert, dimension, path Tier 3 (FACS): floor plan, symbol, door swing, scale (1/4 inch = 1 foot), zone (sleep, work, store, move), traffic flow, clearance, elevation (named only; drawn in Lesson 4.14). See Vocabulary 04.md for Turkish, Portuguese, and Spanish.

Materials and setup

- Handout, one per student (four parts, printed double sided): Handout 04.10 - Floor Plan Symbols Graph Paper Guide and Furniture Cut-Outs.md
- Quarter-inch graph paper: five sheets per student across the two days (one for sketch 1, one for the classroom plan with sketch 2 on its back, one for sketch 3, one for the bedroom plan, one for sketch 4) plus spares. That keeps the unit's total at about 14 sheets per student for the whole project: five here, seven for sketches 5 to 11, two for the project plan
- Rulers marked in quarter inches, one per student
- Pencils with erasers, one per student. This lesson is pencil only. No pens.

- Tape measures, one per team of four (25-foot retracting measures are best; a 12-foot is enough for one wall at a time). *[Sal: the custodian's tray from Lesson 4.3 already has three; six teams need six, so borrow or buy three more of the cheap ones.]*
- Scissors, one per pair, and a small envelope or paper clip per student for loose cut-outs
- A manila folder or a two-pocket folder per student, labeled with the name: the project folder, which starts today and is collected with Project 04 in Lesson 4.15
- One real floor plan printed large for Day 1, an apartment or a small house with a bathroom and a kitchen in it, address removed. *[Sal: a local real estate listing, an architect who is a parent, or the school's own fire evacuation plan all work. The fire plan is the easiest to get and students already know the building.]*
- Slides: Slides 04.10 - Reading and Drawing a Floor Plan to Scale (Day 1 and Day 2 marked)
- A projector with a free browser floor plan tool open in a tab for the Day 2 preview, four minutes, teacher device only. *[Sal: pick the tool once you know what your school allows on the network; nobody but you needs a device for this lesson.]*
- Assessment, one per student for Day 2: Assessment 04.2 - Design Vocabulary Check.md
- Timer visible to the class
- Setup notes: label and stack the project folders before the bell on Day 1. Tape the large floor plan where every student can see it, or put it on the slide and hand out a half-size copy per pair. Measure the classroom yourself the night before and write the real numbers on a sticky note in your pocket; you will need them to tell a team that 9 feet is not 19 feet without walking over with a tape. Decide the team split for Day 1 Step 3 in advance (a wall each, so no two teams measure the same wall).

Pre-assessment

The Day 1 do now is the pre-assessment: it asks for a room drawn from above with no instruction at all, which shows you who has seen a floor plan before and who draws the room as a picture with a bed you can see the pillow on. Also ask the hand vote in the hook: who has used a tape measure, and who has read a map's scale bar in social studies or math? The math teacher's answer to "have you taught scale drawings yet" matters more than either, and the unit plan says to ask in advance.

Do now and hook (Time: 4 min each day)

Day 1 do now (sketch 1 of the stack of 11). On the board: "Draw this room the way a bird would see it, looking straight down. Put in the door, the windows, and the teacher's desk. Two minutes. Do not worry about size yet." Two minutes to draw, then hold them up.

Hook: put two drawings side by side under the document camera, one drawn from above and one drawn from a person's eye. Say: "Both of these are good drawings. Only one of them can prove a bed fits. Architects, designers, firefighters, and the people who moved your family's couch all use the one drawn from above, and they all use it the same way." Then hold up the real floor plan: "This is somebody's actual apartment. By the end of today you will read it and you will draw this room."

Day 2 do now (sketch 3 of the stack of 11). On the board: “A bedroom is 10 feet by 11 feet. Draw it at 1/4 inch = 1 foot on the graph paper. Put a 3-foot door on a short wall with its swing, and a 4-foot window on a long wall. Label the scale in the corner.” Two minutes to draw, one minute to trade with a neighbor and check two things: is the door swing drawn, and is 10 feet 10 squares?

Hook for Day 2: “Yesterday you measured a room somebody else built. Today you draw the room you sleep in, and then you find the one thing in it that is in the way.”

Procedure

Day 1: symbols, scale, and the classroom measured

Step	Teacher will	Students will	Time
1. Direct instruction: the symbols and the scale	Slides 2 to 8. Teach the eleven symbols off the legend on the handout, drawing each one on the board as you say it: wall (two close parallel lines, filled in), door (a gap in the wall, a straight line for the panel, and a quarter-circle arc for the swing), window (a break in the wall with two thin parallel lines across it), closet (a small rectangle open to the room with a line or a dashed line for its door), stairs (a run of parallel lines with an arrow that says UP), sink (a rectangle with a small circle for the drain), toilet (an oval on a small rectangle), tub (a long rectangle with a rounded end and a small circle), stove	Fill Part 1 of the handout: draw each symbol once in the box beside its name. Copy the two conversions into the box at the top of Part 2.	10 min

	(a square with four small circles), refrigerator (a square with REF written in it), outlet (a short line on the wall with two dots). Then the scale: “1/4 inch on this paper equals 1 foot in the room. Every square on your graph paper is a quarter inch, so one square is one foot. That is the whole rule.” Write the two worked conversions on the board and leave them there for both days: 12 feet is 12 squares; 36 inches is 3 feet is 3 squares.		
2. Guided practice: read a real plan and trace the traffic	Slide 9. Put the real floor plan up. Ask the class to find, in this order: the front door and which way it swings, a window, the bathroom (how do you know), the kitchen (how do you know), a closet. Then trace with a finger or a laser pointer the path a person walks from the front door to the kitchen sink, and ask what the path passes through and what is in the way. Name the four zones out loud and label them on the plan:	Find each item on the half-size copy and circle it. Draw the path from the door to the sink with a pencil. Write the four zone names on the plan where they belong.	8 min

	sleep, work, store, move. Define traffic flow in one sentence: the paths people actually walk through a room. Say the two numbers now and put them on the board for the rest of the unit: 36 inches for any path a walker or a wheelchair uses and for the front entry, 30 inches everywhere else.		
3. Learning activity: measure this room and draw it to scale	Slide 10. Teams of four, one wall each plus the door and the windows. Model the measuring rule once: hook the tape at the corner, read where the wall ends, and round to the nearest half foot (“9 feet 4 inches rounds to 9 feet 6 inches; write 9.5”). Model reading to the nearest half inch on the tape so the rounding makes sense. Hand out the measuring record table (handout Part 3). Circulate with your sticky note of the real numbers; a team more than a foot off gets sent back to the wall, not corrected. At minute 7 call “tapes down” and every team	Measure the assigned wall to the nearest half foot, the door width, the window widths, and the distance from the corner to the door. Write every number in the record table. Agree the four wall numbers as a class. Then draw the classroom to scale on graph paper: four walls, the door with its swing, the windows, and the scale written in the corner.	14 min

	draws the room from the class numbers agreed on the board.		
4. Share, closure, and sketch 2	Slide 11. Hold up three plans. Ask the class which one you could hand to a stranger and have them find the door. Then set sketch 2 of the stack: "On the back of your classroom plan, redraw this room with the desks arranged a different way, and shade one path from the door to the window." Two minutes. Collect nothing; everything goes in the new project folder, labeled, stacked by period.	Compare, then draw sketch 2 and shade the path. Put the classroom plan, sketch 1, and sketch 2 in the project folder in order.	4 min

Day 2: your own bedroom, the daily do now, and the check

Step	Teacher will	Students will	Time
1. Practice: draw your own bedroom to scale	Slides 12 to 14. Give the choice out loud before anyone starts: draw your own bedroom from the measurements you remember or estimate, or draw the described bedroom on the handout (11 feet by 12 feet, one 3-foot door on a short wall, one 4-foot window centered on the far	Draw the room outline to scale, with the door and its swing, the window, the closet, and the scale in the corner. Write the four wall lengths in feet along the walls.	11 min

	long wall, a 2 by 5 closet). Nobody is asked to say anything about their home, and no bedroom is shown to the class without the student offering it. Model an estimate honestly: "A step is about two and a half feet. If your room is five steps across it is about twelve feet." Draw the walls, the door with the swing, the window, and the closet. Circulate with the two-line clipboard check.		
2. Practice: furniture at scale, zones, and one traffic fix	Slide 15. Point at the cut-out sheet (handout Part 4): every piece is drawn at the same 1/4 inch = 1 foot, with its real size in inches printed on it. Say the one rule that makes this work: "The cut-out and your room are the same scale, or nothing you learn here is true." Task: place a bed, one storage piece, and one more piece the room needs; pencil the zones (sleep, work, store, move); then shade every path and find one that is too narrow, and fix it. Circulate	Cut and place the pieces, pencil the four zones, shade the paths, count the squares at the narrowest point, and write the width in inches. Find one path under 30 inches and move a piece to fix it. Write one sentence at the bottom: what moved and why.	7 min

	and ask: “Where is your path narrowest? How many squares? How many inches is that?”		
3. The daily do now, announced, and the CAD preview	Slide 16. Announce the routine and put it on the wall: “Starting now and running to the last build day, every period opens with a five-minute floor plan sketch. I put the prompt on the board. Two minutes to draw, one to check with a neighbor, and the sheet goes in your project folder. There are eleven of them. You staple the stack in order with your name on the first sheet and turn it in with the project, and each one is scored complete, partial, or missing.” Hand out the prompt list (handout Part 5) so students know what is coming and an absent student can catch up. Then four minutes on the projector: open the browser floor plan tool, drag one wall, drop one bed, and show the software doing what they just did by hand. Say	Write the four sketches already done on the prompt list (1 and 2 from yesterday, 3 from today’s do now, 4 at the closure). Watch the tool. Ask what it costs and who uses it.	4 min

	what it does not do: it does not know the client.		
4. Closure and sketch 4 (Time: 2 min)	Slide 17. Set sketch 4: "Draw any room in this building from above, to scale, with one path shaded, in two minutes. Write one line under it: the one thing a floor plan can prove that a photograph cannot." Then desks apart, folders closed, handouts away for the check.	Draw sketch 4, write the line, file it, clear the desk.	2 min
5. CHECK: Design Vocabulary Check (Time: 12 min)	Hand out Assessment 04.2 - Design Vocabulary Check.md, one per student, face down. Read the directions aloud. Twelve items, twelve minutes, 24 points. Pencil, and a calculator is allowed on items 10 and 11. The unit word bank stays on the wall; the handouts and the folders go away. Collect at the bell, or at minute 12 on the timer for a class that needs the last minute to breathe.	Take the check.	12 min

The whole period Day 2 adds to 40 minutes: 4 plus 11 plus 7 plus 4 plus 2 plus 12.

Questions to ask

Monitor understanding:

- How many squares is a 12-foot wall at $\frac{1}{4}$ inch = 1 foot? How many squares is 36 inches?

- Which way does a bedroom door swing, and how do you show that on a plan?
- Look at the plan on the board. How do you know that room is a bathroom without a label?
- What is the difference between the sleep zone and the store zone in your own room?
- Show me the narrowest place in your path. Count the squares out loud.

Deepen learning (why and how, tied to their lives):

- Why does a firefighter want a floor plan of this building, and what would they look at first?
- Your bedroom plan has a path that is 22 inches wide. Who in a family would that stop, and who would not even notice?
- The software I just showed you can draw the room in ten seconds. Why did I make you do it by hand first?
- A landlord shows your family an apartment and hands you a plan. What three things would you check on it before you signed anything?
- Which is worse for a room, furniture that is too big or furniture that is in the wrong place? Defend it.

Check for understanding

Day 1: circulate during Step 3 with a two-line clipboard check for each team, “measured to the nearest half foot and wrote it down” and “the drawing matches the numbers (12 feet is 12 squares).” A team that drew a 24-foot room as 24 inches gets the conversion line on the board pointed at, not read to them. Day 2: a two-line clipboard check during Step 1, “scale written in the corner” and “door swing drawn into the room.” Then the check itself is the formal measure. The last item of the check (the short answer) is also the fastest read on whether the design vocabulary from Lessons 4.6 to 4.9 landed.

Closure (Time: 4 min Day 1, 2 min Day 2)

Written above inside each day’s procedure. Day 1 closes with sketch 2 and the folder set up. Day 2 closes with sketch 4 and one line comparing a plan to a photograph, then the desks go apart for the check.

Differentiation and supports

- ELL: the symbol legend is eleven pictures with one or two words each, which means a student can do Part 1 without reading a sentence; the handout margin carries scale, wall, door, window, closet, stairs, path, and zone in Turkish, Portuguese, and Spanish (from Vocabulary 04.md, marked [check with a native speaker]); the measuring task is numbers, not language, so an ELL student can hold the tape and be the recorder for the team; sentence frame for the Day 2 fix line: “I moved the ___ because the path was only ___ inches wide.”
- IEP and 504 (general): the room outline for Day 2 can be pre-drawn by me, with the student adding the door, window, closet, and furniture; pre-cut furniture pieces in an envelope for a student who cannot use scissors; a larger scale (1/2 inch = 1 foot on 11

by 17, two squares per foot) for a student with fine-motor or vision needs, which also previews the project scale; a student who cannot move around the room to measure is the team's recorder and calculator at the desk; extended time on the vocabulary check runs into the first ten minutes of Lesson 4.11, and the do now that day is a sketch, so the student misses nothing; the described bedroom on the handout removes any need to talk about home.

- Grade 6 support: Day 1 measures two walls instead of four and rounds to the nearest whole foot; Day 2 uses the described bedroom and the pre-cut bed, dresser, and desk only, and shades one path instead of every path.
- Grade 8 stretch: measure the classroom to the nearest inch and draw it at $1/4$ inch = 1 foot using half squares for the half feet; compute the classroom's floor area in square feet and the percent of the floor the desks cover; on Day 2, draw the bedroom's longest wall as an elevation (a straight-on view of the wall, not from above) at the same scale, which previews sketch 10 in Lesson 4.14; try the same room in the browser tool and say one thing the software did better and one thing it got in the way of.
- UDL checkpoint used: multiple means of representation (the same room arrives as a real space measured with a tape, as a symbol drawing, and as a screen in the CAD preview) and multiple means of action and expression (a student can prove the plan works by moving cut-outs, by measuring squares, or by walking the path in the real room).
- No-kitchen or no-machine alternative: this is not a lab, so no kitchen alternative is needed. Two material substitutions cover the room: if there are not enough tape measures, teams measure with a yardstick, or with a 12-inch ruler laid end over end and counted, which is slower and teaches the same thing; if graph paper runs out, the handout's Part 2 has a printable quarter-inch grid. If no browser tool is allowed on the network, skip Step 3's preview and give the four minutes to Step 2, and show one screenshot on the slide instead.

Assessment

Objective	Standards met	Learning task	Assessment (formative or summative; tool)
1. Identify eleven symbols and state the scale rule	EDM 2. b); National FCS 11.4.3; CDOS 3a Basic Skills	Handout Part 1 and the plan reading, Day 1 Steps 1 and 2	Formative; Part 1 checked at the desk during Step 2. Summative on Assessment 04.2 - Design Vocabulary Check.md, items 10 and 11 (the scale conversions)
2. Measure a real room and draw it to scale	EDM 2. b); PSI 2. b); CDOS 3a Basic Skills; National FCS 11.4.3	The measuring record table and the classroom plan, Day 1 Step 3	Formative; team clipboard check and the record table, scored complete,

			partial, or missing as daily work
3. Draw a bedroom to scale, zone it, and fix one traffic path	EDM 2. a), 2. b), 2. c); PSI 2. a) d. and h.; Std 2 PI B; National FCS 11.4.2, 11.2.4	The bedroom plan, the zones, the shaded paths, and the fix sentence, Day 2 Steps 1 and 2	Formative; clipboard check and the fix sentence. The bedroom plan is the practice run for the client plan in Lesson 4.12, which is scored summatively on Rubric 04 - Design a Room.md criterion 2

The topic's formal check is Assessment 04.2 - Design Vocabulary Check.md, given in the last 12 minutes of Day 2 (day 105), covering Lessons 4.6 to 4.10. Nobody is held out of the project for the score; the check tells me who needs two minutes at the elbow on day 106.

Homework

None. Optional, and useful: measure one wall of your own bedroom and the width of your bedroom door in inches and bring the two numbers. If you cannot measure, count your steps across the room and bring the number of steps.

Connections

Math: this is ratio and scale drawing, the grade 7 standard, done on a real room with a real tape. The measuring record table and the furniture cut-out sheet are a scale drawing problem set the math teacher can use as is, and the grade 8 stretch is area and percent. FACS gives the math room a reason the ratio matters; math gives FACS students who already know that a scale is a ratio. *[Sal: ask the math teacher in advance whether scale drawings have been taught by February; this lesson assumes the idea is not brand new to grade 7, and if it is, spend Day 1 Step 1 on the conversion and push the classroom measuring to Day 2.]* Technology or engineering: the browser tool preview is the same design process the technology teacher runs; share the language. Inside the building: the fire evacuation plan on the wall by the door is a floor plan a student walks past every day, and reading it once in this lesson is the cheapest real-world connection in the unit.

Sources

- NYS Middle Level CTE FACS Content Module 04, Environmental Design and Management (nyc-tecenter.org, June 2018), lines 2. a), 2. b), and 2. c). Copy in 02 Standards/NYS Module PDFs/.
- NYS Middle Level CTE Theme Module, Problem Solving and Innovation, line 2. a) sub-lines d. and h., and line 2. b). 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, FACS strand. Wording per the crosswalk, Part A.6. *[Sal: confirm against the NYSED PDF.]*
- National Standards for Family and Consumer Sciences Education 3.0 (LEAD FCS Education, 2018), competencies 11.4.3, 11.4.2, and 11.2.4, per 02 Standards/STANDARDS SOURCES - web research.md, section 4.11.
- Clearances: the 2010 ADA Standards for Accessible Design (ada.gov), section 403.5.1 (36-inch clear width) and section 304.3 (60-inch turning space). The 30-inch general path and the furniture dimensions on the cut-out sheet are common residential planning figures, not code lines, and the handout says so.
- Sal's own materials: Lesson Dups/Unit_1_Interior_Design/education_teachingwork_floor_plan_frenzy_2026_04.docx (the floor plan idea and the scale drawing of your own bedroom) and the Brentwood interior design packets in the same folder. The classroom measuring task, the eleven-symbol legend, the zones, and the daily sketch stack are new.

Teacher notes

- If Day 1 runs short, cut Step 2 to three items found on the real plan and keep the traffic path trace; if it runs very short, the classroom drawing finishes as sketch 2 and Step 4 becomes one hold-up. Never cut Step 3's measuring. Standing at a wall with a tape is the reason the scale becomes real, and Lesson 4.12 goes badly without it.
- If Day 2 runs short, cut the CAD preview first. The check is fixed at 12 minutes and the check is the topic's grade.
- The CAD preview is four minutes, and the unit plan's Section 2.5 now says four to match. Ten does not fit a 40-minute period that also carries a 12-minute check. If you want the full ten, it belongs at the end of Day 1 in place of Step 4's share, or in the first ten minutes of Lesson 4.11 before the client cards. *[Sal: your call, and update the unit plan's Section 2.5 line again if you move it.]*
- Common mistake: the door swing drawn into the hall. Interior bedroom doors swing into the room. Front doors usually swing in as well. Say it during the demo and again on Day 2.
- Common mistake: a student draws each square as one inch instead of one foot and produces a room the size of a shoebox. Catch it by asking one question: "How many squares is your longest wall, and how many feet is that?"
- Common mistake: measuring from the baseboard trim instead of the wall, or reading the tape upside down. Show the hook on the end of the tape and what it is for once, at the front, before teams scatter.
- Common mistake: a team measures the same wall twice and never does the fourth. Assign the walls by name before they stand up.
- The two conversions on the board (12 feet is 12 squares, 36 inches is 3 squares) stay on the board through Lesson 4.14. Lesson 4.12 doubles the scale and students will need to see both rules side by side.

- Keep three good classroom plans, no names, for next year's Day 1 Step 4 comparison. Keep one bad one too, with the student's permission, because the useful conversation is about the plan a stranger cannot read.
- *[Sal: if you can get one real plan from an architect, a designer, or a real estate agent with the address cut off, use that for Step 2 instead of the fire plan. Students read a stranger's real apartment with more attention than they read a diagram.]*
- *[Sal: your Floor Plan Frenzy packet already had students draw their own bedroom. The change here is the choice of a described bedroom instead, so no student has to put their home on a desk where a classmate can see it.]*