Scenario: The students will build a residential community of affordable single family houses in the suburban area of Washington, DC. The developer would like to build a community of one story houses that would appeal to first time homebuyers or small families and maximize the acres to produce the largest number of houses. The students must work in teams of 3-4 students to design, construct, test, and redesign the house whose requirements and codes must meet.

Engagement	
Slide presentation Engineering process video Vegetable Garden Design Quiz	
Exploration: EDP Stage 2: Generate Ideas	
Checklist	**Materials**
Start by building a prototype 2D design blueprint using Kami or Google doc	Kami (Viewer) (Student copy) Google doc (Viewer) (Student copy) Housing Design Measurements Worksheet for 2D and 3D designs
Students read guidelines for building their 3D prototype in TinkerCAD or SketchUp	Tinkercad (Instructions) (Tutorials) (Video) SketchUp (Tutorials) (Video)
Students open an example project (default) ?	Tinkercad example SketchUp example
Verify / double-check their design against requirements	**Requirements**: ● One story (no basement) ● 30' D x 40' W ● At least two exterior doors (optional: the back door may be a sliding door) ● Pitched roof ● Rooms, windows, & doors to code (see below for code guidelines) Required spaces: 2 bedrooms, kitchen, living room, dining room, laundry room, 1 full bathroom (includes bathtub w/shower), closets in bedrooms Landscape, Decks, Patios, & Fencing (optional for those who finish early) **Code guidelines**: ● All habitable rooms (living, dining, & bedroom) are to have an area of no less than 70 square feet with a minimum of 7 feet in any dimension.

	● Smallest habitable rooms may be 7 x 10 feet. o Closet dimensions are not included in bedroom space. ● Kitchens, bathrooms, closets, halls, and laundry spaces are not considered habitable rooms so they're exempt. ○ No smaller than 10'x12', 11'x11', or 9'x13' Possible Bathroom Sizes: o Minimum size for full Bathroom (includes bathtub, sink & toilet) = 5' x 7' o Minimum sizes for half Bathroom (includes sink & toilet) = 4' x 5' OR 3'x 7' (door must be in middle of 7' wall) All livable spaces must have minimum ceiling height of 7' All hallways must be a minimum of 36" or 3' wide. Each habitable room (living, dining, bedroom) must have at least one standard size window to the outside. Rooms larger than 150 square feet should have two exterior windows. Window size – Windows in habitable rooms must be a minimum of 5.7 square feet and include a minimum height of 24" and minimum width of 20". Also, windows may not be placed more than 44" off the floor. Door & Doorway sizes: o Exterior Doors = 3' wide by 6'8" tall directly to the outside o Interior Doors & Openings = 2.5' wide or 30" Each level, bedroom, and space outside the sleeping area must have a smoke detector hard wired with battery back-up.
Explanation: EDP Stage 2: Generate Ideas and Stage 3: Select a Solution	
Present their online prototypes to the class for user testing and in the following activity	Students should be prepared to introduce their one story home project and explain the constraints that were determined in the

create prototype iterations based on feedback.	brainstorming stages of the design process.
Elaboration: EDP Stage 4: Build the Item	
Housing Design Measurements Worksheet How to frame a scale model house video	
Evaluation: EDP Stage 4: Build the Item	
Use OpenTutor, rubric and criteria D for final eval.	OpenTutor: Housing Design Technology Final Rubric: Develop a prototype Criteria D evaluation

References

- Housing Design Challenge: https://drive.google.com/file/d/1bbUs9T2AH6IBE-4h2yyROc9ZYAyr7n-6/view?usp=sharing
- Better Lesson: https://betterlesson.com/lesson/512266/constructing-a-house-plan-day-1
- eGFI Dream Up the Future: http://teachers.egfi-k12.org/design-process/
- Mr. Fleming Science: https://www.mrflemingscience.com/engineering-design-process.html
- Science buddies: https://www.sciencebuddies.org/science-fair-projects/engineering-design-process/engineering-design-process-steps
- Teach Engineering: https://www.teachengineering.org/activities/view/cub_creative_activity5
- Try engineerings: https://tryengineering.org/teacher/design-dome/
- VistaThink: https://www.vistathink.com/engineering-design-process-example/