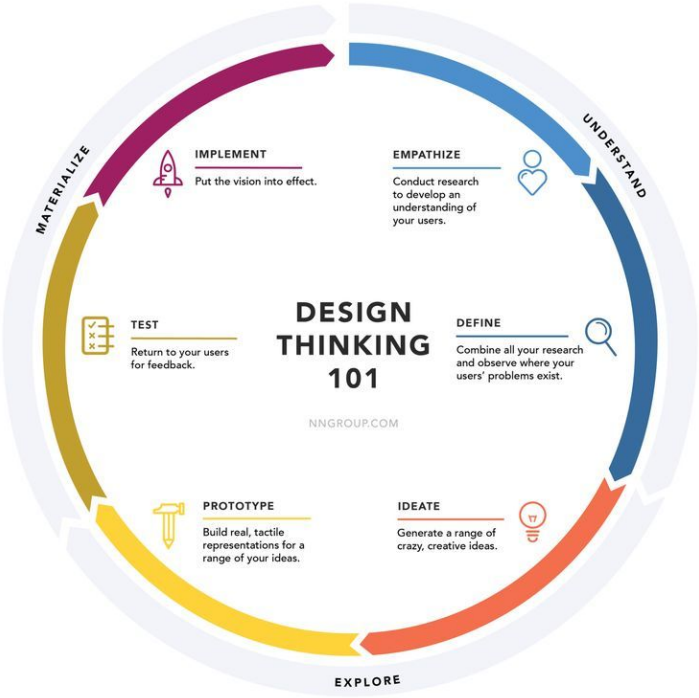
Design Thinking in the Makerspace



Lesson Outline

Purpose Statement: Students will be able to identify, label, and build various landforms and bodies of water.

Task Goal: Students will create a model of a landscape which will include many landforms and bodies of water. Students will map out where they would put a road to navigate around each body of water and landform. Students will label their bodies of water and landforms appropriately and be able to articulate their reasoning for why roads were placed in specific locations.

This lesson has been adapted from one on TeachEngineering: https://www.teachengineering.org/activities/view/cub_earth_lesson6_activity1

Step 1: Understand

- Empathize- "To build infrastructure for transportation, engineers must understand the landforms and the geology of the Earth. Engineers are responsible for deciding where to put roads, highways, train tracks, tunnels and bridges. Engineers are also involved in city planning and determining the locations of water and power resources for cities and communities along the way. This can sometimes be very challenging in areas with mountains, hills, waterways and dense forests." - Taken directly from engineering connection on Teach Engineering site (see link above)

- Define-
    - Problem Statement: Today you will be creating a model of a landscape. Within your landscape you first need to build at least 1 example of a mountain, valley, plateau, plain, and hill. Please label these. You should include at least 2 bodies of water in your models as well which could include an ocean, lake, stream, river, or pond. After you have created your landscape, you will need to place a road that travels across your entire landscape (from one side of the landscape to another). Be sure to think about what engineers might have to consider as you place your roads. You should not place your roads until AFTER you have built your landscapes! Remember that landforms were here first - and then people built roads, navigating them around the landforms and water already there.

Step 2: Explore

- Ideate- Discuss possible tools that students might use to create their models. Have students share out and then brainstorm with their partners their possible solutions. You may wish to use the Winding

Roads Worksheet (attached separately on Schoology) as a brainstorming page for students as the think through their models.

- Prototype- Build/ Create your solution
    - Supplies needed: Various materials in the MakerSpace - use your discretion what would work best! Ideas could include Legos, Kevas, Spheros (to navigate the road path, for example), Ozobots (to draw landforms and then navigate the road path around), consumables.

Step 3: Materialize

- Test- Give students plenty of time to brainstorm with their partners/teams how they will build their landscapes, the materials they will use, and challenges they might encounter. Then, students should have plenty of time to build their models and roads.
    - Reflection- After plenty of work time, allow a "museum share" within your class. Have students share out their landscapes - naming each landform and body of water. Have students discuss the challenges they faced when they were building their roads.
        - What made it hard for you to build your roads?
        - What challenges might construction workers and engineers face when they are mapping out where to put roads in a particularly mountainous region?
        - Would it be easier to put a road in the mountains or on a plain? Why?
        - What challenges might an engineer encounter when trying to build a road near a body of water? What possible solutions might engineers have for building roads on water? What have you seen in real life?

- Implement-
    - Have students watch videos of engineers and their thought processes behind placing roads in certain places in a landscape. If possible, invite a construction worker in to come (or Skype) and discuss the challenges of placing roads in mountainous regions.
    - Digger building a road in the mountains: https://www.youtube.com/watch?v=-F8PebAhCNY
    - Building a bridge in the mountains (across a valley): https://www.youtube.com/watch?v=1CatI2yS03A (stop at 4 minute mark - no need to go further)