

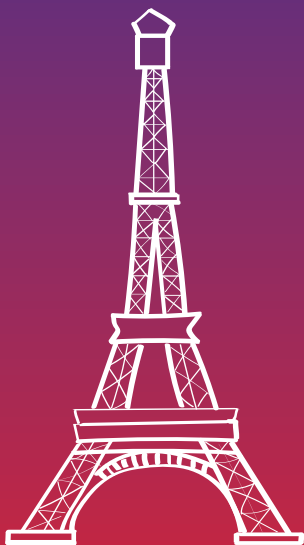
DREAM. BUILD. BECOME.

ACE METAL
FOUNDATIONS

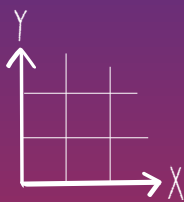
By IACMI

Stick Structures

2D SKETCH



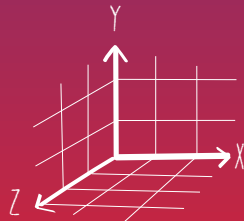
2D PLANE



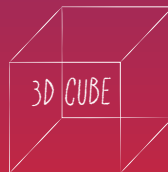
2D SQUARE



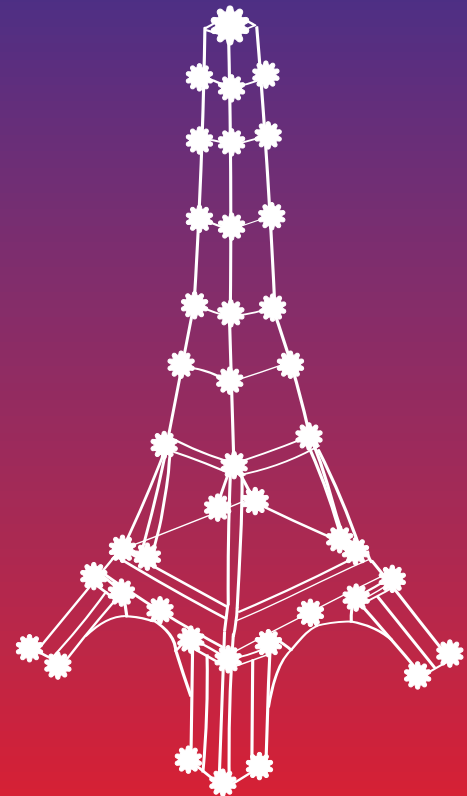
3D PLANE



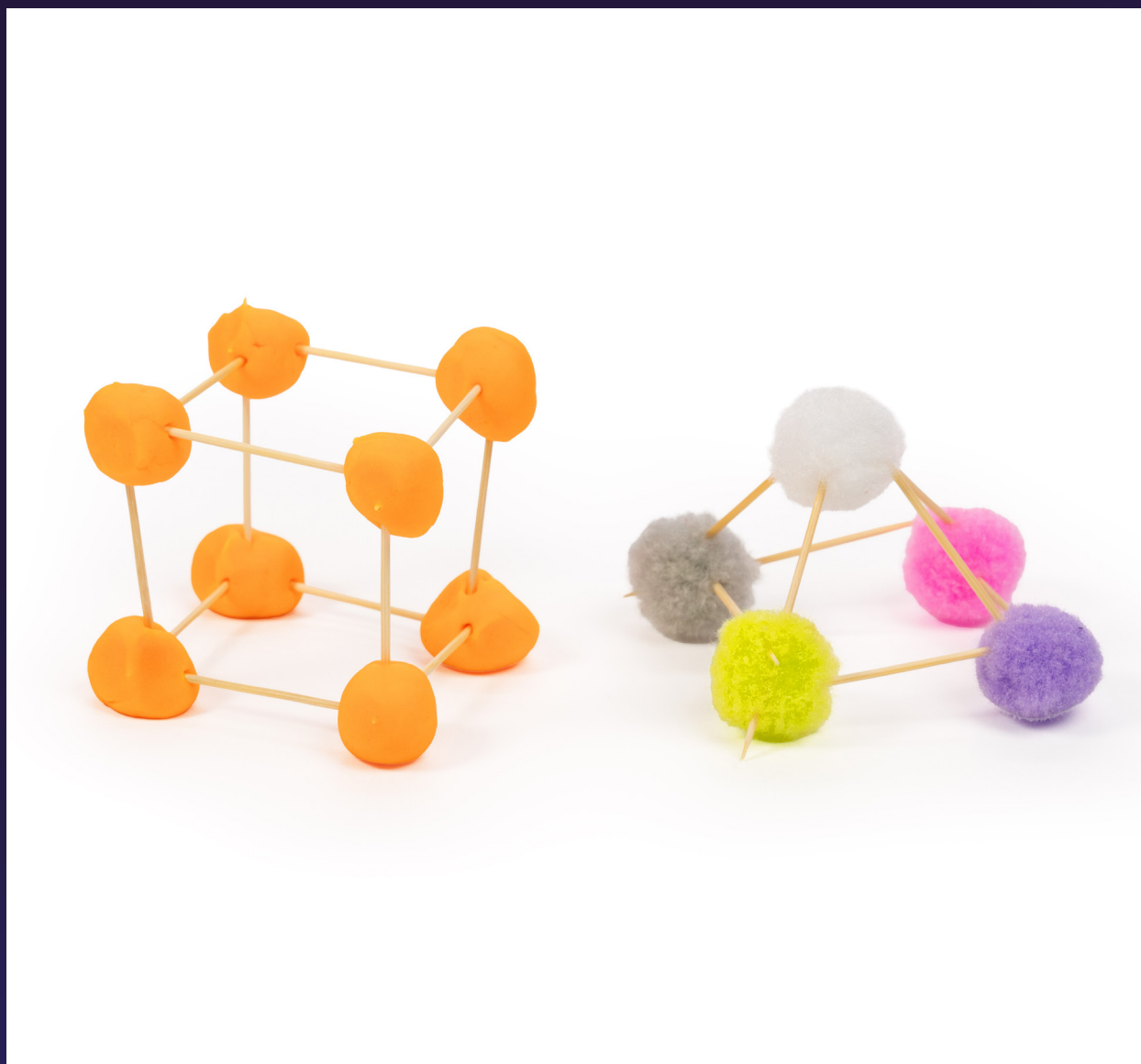
3D CUBE



3D STRUCTURE



Stick Structures



Prior Knowledge

Students should be able to follow simple, multi-step directions, use classroom materials safely with guidance, and work with classmates.

Stick Structures

Lesson Overview

In this activity, students build simple structures using pom-poms, play dough, and toothpicks.

Students create towers, bridges, or other designs and test whether their structures stay standing. As they build, students explore how shapes, materials, and balance affect whether a structure stands up or falls over.

Students test their structures, make changes, and try again. The activity focuses on building, observing, and improving a design through hands-on exploration.

Vocabulary

Structure: Something that is built or put together using different parts, like a tower or bridge

Shapes: The form of something, such as a triangle or square

Balance: How something stays steady without tipping or falling

Corner: A place where two or more parts meet



Figure 1: The Eiffel Tower's iron framework spreads weight evenly, providing strength and stability.

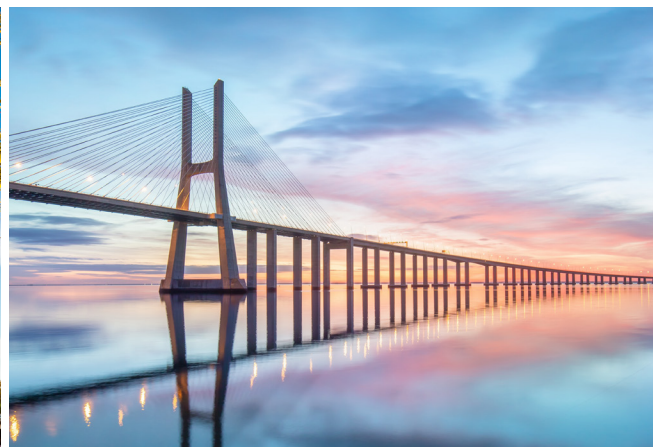


Figure 2: A bridge balances by turning downward weight into pushing and pulling forces that are safely carried through the structure and into the ground.

Stick Structures

The Foundations of Building Shapes and Structures

Have you ever built something fall and watched it fall over? Some structures stand up easily, and others need to be changed to stay standing.

Builders use shapes to make structures, like towers and bridges. Flat shapes can be connected and built upward to make structures that have height. How shapes are stacked and connected can help a structure stay standing.

Materials matter, too. Some materials are soft and squishy, and other materials are firmer, and hold their shape. In this activity, you will build using pom-poms and play dough to see how different materials affect the balance and strength of your structure.

As you build, test, and make changes, you will notice which shapes and materials help your structure stand better. Builders and engineers do the same thing when they design and improve real structures.



Figure 3: A wooden house frame forms the home's structural skeleton, supporting the roof, walls, and floors while distributing weight safely to the foundation.



Figure 4: Unlike wood framing, a steel structure provides greater strength and allows commercial buildings to span larger spaces with fewer supports.

Materials

Materials Supplied in Kit

Per Student

- Up to 40 toothpicks
- Up to 40 pom-poms

Shared

- Play dough (for rolling into small dough balls)



Stick Structures

Activity Directions

Part 1: Build a 3D tower together (guided build)

Step 1: Make the Base

- Give each student three pom-poms (or three small play dough balls) and three toothpicks
- Place the three pom-poms or play dough balls on the table in a triangle shape
- Push one toothpick between each pair of pom-poms or play dough balls to connect them

Step 2: Add Height

- Give students three more pom-poms or play dough balls and six more toothpicks
- Push a toothpick upwards out of each pom-pom or play dough corner of the base
- Push a pom-pom or play dough ball into the top of each vertical toothpick
- Connect the new layer of pom-poms or play dough balls by pushing toothpicks between each of them

Step 3: Repeat Step 2 to make the structure taller

Part 2: Free Build

- Now that students have the basics of making a 3-dimensional structure using corners and connectors down, it is their turn to design their own structures. Their structure should stand on its own and have connected pieces.



Figure 5: Construction workers assemble a skyscraper's steel framework, creating the structure that supports the building's weight and resists wind forces.

Stick Structures

Discussion Prompts or Reflection

- What did you build?
- What helped your structure stay standing?
- Was there anything that made your structure fall or lean?
- Which shapes did you use to build your structure?

Variations and Enrichment

- Have students build the same structure using pom-poms first and then play dough. Compare which structure is taller or more stable
- Challenge students to build the tallest structure that can stand on its own, or a structure that is strong enough to hold a small object
- Encourage students to use different shapes, such as triangles, squares, or rectangles, and observe which shapes help their structure stay standing

Foundation Exploration

- **Builders and construction workers** connect pieces together to make sure buildings do not fall over. They pay attention to corners and how parts are joined
- **Designers and engineers** decide what shapes to use when building things. They test their ideas and change them if something tips or falls
- **Woodworkers** build things out of wood, and carefully consider corners, connections, and balance when making things