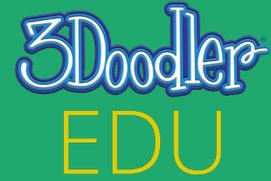


Lesson Plan



Platonic Solids Snowman Math Challenge

TIME REQUIRED: Five 60-minute class sessions plus additional build time

SKILL LEVEL: High intermediate to advanced

RECOMMENDED GRADES: 9th - 12th

LESSON SUMMARY:

Students will research and study the Platonic solids, then pick 3 different platonic solids to construct a snowman with the 3Doodler Create+ pen. Student groups will give a presentation on the solids they chose and share their snowman creations.

KNOWLEDGE

STUDENTS HAVE:

- Used 3Doodler Create+ pens or been given time to practice with them
- Experience using the Internet for research projects

OBJECTIVES

STUDENTS WILL:

- work together in teams to research Platonic Solids
- identify characteristics of 3 Platonic Solids, including faces, vertices, edges, and faces
- use 3Doodler pens to build models of each of the 3 selected solids
- Create a snowman "sculpture" using their 3 solids and embellishments (hat, buttons, nose)

MATERIALS

STUDENTS WILL NEED:

- 3Doodler Create+ Pen (1 per group)
- Filament
- 3Doodler DoodlePad
- Access to Internet sources for research
- Platonic Solids research chart worksheet
- Faces of Platonic Solids templates
- Platonic Solids Snowman Challenge Worksheet

INSTRUCTIONS

STEP 1

Introduce the history of Platonic Solids as representations of the 5 elements that were once defined in ancient times: earth, air, water, fire, and the universe.

STEP 2

Individual students will complete preliminary research on Platonic Solids. They will need to answer the following questions: What is a Platonic Solid? How many are there? Why is it impossible to make more Platonic Solids? Which one is most interesting to you? Why? Have student volunteers share their initial information with the class.

STEP 3

Break students into groups of 3, each one choosing a different Platonic Solid to research. The teams will be responsible for completing the entire **Platonic Solids research chart worksheet** by the end of the project but need only complete their individual Solids prior to presentations.

STEP 4

Upon completion of the research chart for the 3 Platonic Solids chosen by the team, students will share their information with their teacher. Upon teacher approval, teams will receive the materials needed to build their Platonic Solid models: a 3Doodler Create+, filament, a Doodle Mat, and templates. Students should begin constructing their models.

The teacher may want to share these tips:

- Remember how Platonic Solids are formed. You will not necessarily be able to draw your model in 3D form. You will have to build it using the polygon that makes the Solid's face.
- You will have to work together. It takes more than 2 hands to create a 3D model of a Platonic Solid.
- You will need to use your 3Doodler as both a "printer" and a "glue gun". The "printer" stage requires making the faces of your Solid. The "glue gun" stage requires using your pen like a hot glue gun.

Have students practice using 3Doodler Create+ pens: What is filament? What does it mean to extrude filament? What do the buttons do? How do you connect 2 pieces of extruded plastic? Students who have never used a 3Doodler before may want to practice extruding filament.

Pay particular attention to safety precautions while using 3Doodler Create+ pens, especially how to avoid burning yourself. Make sure students do not have pens plugged in across working/walking surfaces. Reinforce that pens should be turned off and unplugged when not in use to avoid potential burns. Keep pens from melting/burning countertops, etc. but setting them down appropriately. NEVER doodle on any surface other than the 3Doodler DoodlePad.

STEP 5

Once the snowmen are complete, groups should present their models, using the vocabulary in this lesson. During the presentations, teams should fill in their research chart for the remaining 2 Platonic Solids not covered by their own project.

WRAP UP

Students will share their presentations and receive feedback from their peers about the validity of the research on Platonic Solids. They can offer suggestions/critiques for the various models built.

ASSESSMENT

The teacher will assess students' work based on the chart, written responses on the worksheet, as well as verbal presentations. Additional consideration should be given to successfully built models as well as models submitted with explanations as to how to improve them/what went wrong.

POSSIBLE EXTENSIONS

- Students can design nets to wrap around their 3D models of platonic solids to demonstrate how they "unfold". They can use those nets to teach younger students about the properties of platonic solids.
- Have students research the "6th Platonic Solid" and discuss whether or not it should be recognized as a Platonic Solid based on their research.

VOCABULARY

PLATONIC SOLIDS — a regular, convex polyhedron in a three-dimensional space with equivalent faces composed of congruent convex regular polygonal faces

TETRAHEDRON — four equilateral triangles joined along six edges to form four vertices or corners

CUBE — six squares joined along 12 edges to form eight vertices

OCTAHEDRON — eight equilateral triangles joined along 12 edges to make six vertices or corners

DODECAHEDRON — has 12 pentagonal faces; has 20 vertices with three pentagonal faces meeting

ICOSAHEDRON — has 20 triangular faces; has 12 vertices with five triangular faces meeting

FACE — one 2 dimensional shape that makes up a side of a Platonic Solid

VERTEX (VERTICES) — corner; place where sides of a Platonic Solid meet

EDUCATIONAL STANDARDS

COMMON CORE

CCSS.ELA-LITERACY.WHST.9-10.7

Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating an understanding of the subject under investigation.

IN THIS LESSON

Students will research platonic solids in preparation for a presentation as well as building a model of several solids to create a snowman.

CCSS.ELA-LITERACY.WHST.9-10.9

Draw evidence from informational texts to support analysis, reflection, and research.

IN THIS LESSON

Students will base models of solids on their research.

CSTA

3A-IC-27

Use tools and methods for collaboration on a project to increase connectivity of people in different cultures and career fields.

IN THIS LESSON

Students will work on their research together, in a common document and presentation.

2-IC-22

Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact.

IN THIS LESSON

Students will create a presentation that incorporates the research collected from all group members.

1D

Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.

IN THIS LESSON

Students will reflect on the ease of use of the 3Doodler and consider the potential of making models for math class.

6A

Students choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.

IN THIS LESSON

Students will choose the platform best suited to sharing their research and presentation.

7B

Students use collaborative technologies to work with others, including peers, experts or community members, to examine issues and problems from multiple viewpoints.

IN THIS LESSON

Students will share their research with other team members to complete their projects.

7C

Students contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.

IN THIS LESSON

Students will work together to research platonic solids and create presentations.