



National Standards

STEM Lesson- Build a Rubik's Cube

Elementary



Instructional programs from pre-kindergarten through grade 12 should enable all students to:

Analyze properties and determine attributes of two- and three-dimensional objects

- Visualize three-dimensional objects and spaces from different perspectives and analyze their cross sections
- Use geometric models to gain insights into, and answer questions in, other areas of mathematics

Science

NS.K-4.1 Science as Inquiry

- As a result of activities in grades K-4, all students should develop
 - Abilities necessary to do scientific inquiries
 - Understandings about scientific inquiry

Technology - Extension Activities

ISTE NETS ~ NT. K-12.3 Technology Productivity Tools

- Students use technology tools to enhance learning, increase productivity, and promote learning

State Standards

CCSS.MATH.CONTENT.3.MD.D.8:

Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.

Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.

CCSS.MATH.CONTENT.4.MD.A.3

Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

Apply the area and perimeter formulas for rectangles in real world and mathematical problems.

www.YouCanDoTheCube.com

21st Century Skills

Learning and Innovation Skills

Critical Thinking and Problem Solving

- Exercising sound reasoning in understanding
- Understanding the interconnections among systems
- Identifying and asking significant questions that clarify various points of view and lead to better solutions
- Framing, analyzing and synthesizing information in order to solve problems and answer questions

Creativity and Innovation

- Acting on creative ideas to make a tangible and useful contribution to the domain in which the innovation occurs

Life and Career Skills

Initiative & Self-Direction

- Defining, prioritizing and completing tasks without direct oversight
- Utilizing time efficiently and managing workload

Leadership & Responsibility

- Using interpersonal and problem-solving skills to influence and guide others toward a goal
- Rubik's Cube (one for each group to look at and possibly take apart)
- Scissors
- Markers (red, blue, green, yellow, orange)
- Glue Sticks
- Copies of cube patterns for each group

Materials

Objective

In this activity students will learn the names of the different pieces of the Rubik's Cube and how it is built by creating their own cube.

Notes to Teacher

This lesson will take approximately three 45-minute class periods.

You can make multiple copies of the cube pattern so the students just cut each of them out or you can just give them one pattern made from tag board and ask them to trace the others they will need on another sheet of paper.

Supply tape in case the glue isn't holding the cubes together well.

As noted, it is not necessary to take apart a Rubik's Cube at the beginning of the lesson. Do not do this if your cubes are from You CAN Do the Rubik's Cube's lending library, and only do it with your own Rubik's Cube if you are confident you can reassemble it in front of the students.

Procedure

1. Begin by holding up a Rubik's Cube and asking students if they know what it is.
2. Ask them if they know how it works, then take the cube apart in front of them.
3. As you put the cube back together again, show students the small pieces that make up the larger Rubik's Cube.
(OPTIONAL- this lesson works without taking a Rubik's Cube apart, and you should not take one apart if it is from the You Can Do the Rubik's Cube Lending Library.)
4. Go over the name of each piece (this is how each cube is identified in the solution guide). Write on board in front of students:
 - **Edge Pieces:** Pieces with two colors - There are 12 Edge Pieces in each cube, located in the middle of the rows.
 - **Corner Pieces:** Pieces with three colors – There are 8 Corner Pieces in each cube, located at the corners.
 - **Center Pieces:** Pieces with one color – There are 6 Center Pieces in each cube, located in the center of each face. (It's important to remember when solving the cube, center pieces do not move and they represent the color of the face.)
5. Ask the student how many pieces (smaller cubes) make up the Rubik's Cube. (26)
6. Remind students that Center Piece colors are always opposite each other. (Show them on the cube.)
 - White is opposite Yellow
 - Orange is opposite Red
 - Green is opposite Blue
7. Place students in groups of 3 or 4 and invite them to create their own Rubik's Cube! They will be building their group's cube from the 26 pieces (smaller cubes) just discussed.
 - Students may want to use an additional small cube in the center to anchor the 26 cubes. These pieces will be built from a cube pattern (see attached).
 - Students should build and color (markers or paint work well) 12 Edge Pieces, 8 Corner Pieces, and 6 Center Pieces. The pieces will be glued together (unlike the real Rubik's Cube), but special attention must be paid to where each side is placed (White is opposite Yellow, and so on...).
 - Be sure to tell students the cube does not have to be functioning and they may want to include a cube in the center to stabilize the 26 cubes.

8. After each group has completed their cube, discuss the six-step problem-solving process and how each group used this process in creating their cube without even realizing it!
 - Identify problem – We need to build our own Rubik’s Cube!
 - Analyze problem – What are some different ways we can build this cube?
 - Generate potential solutions – Should our group assign jobs to different members and a timeframe to accomplish the task?
 - Select and plan solution – How did our group decide to go about creating our cube?
 - Implement solution – What was our process for building the cube?
 - Evaluate solution – How does our cube look? Is it correct? How could it be better? How could we have been more efficient?
9. Remind students they must develop the ability to conduct investigations using prior knowledge and experiences.

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Cube Pattern

