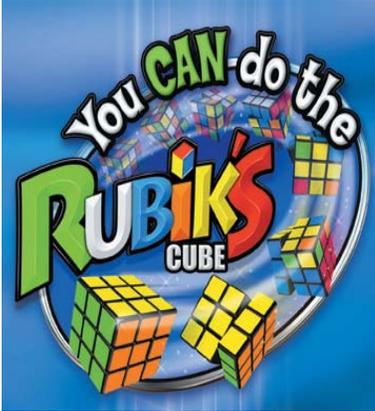


STEM Lesson-Rubik's Cube-Elementary



STEM Alignment

- 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
- Engineering
 - Students will apply scientific, mathematic, and practical knowledge to design and build a structure.
- Mathematics
 - Lesson aligned to Common Core Standards (see below)

Common Core Standards

GRADE 3

3.MD: Measurement and Data

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

8. 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.

GRADE 4

4.MD: Measurement and Data

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

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

National Standards

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

STEM Lesson-Rubik's Cube-Elementary

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



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.



Materials

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



Procedure

- Begin by holding up a Rubik's Cube and asking students if they know what it is.
- Ask them if they know how it works, then take the cube apart in front of them.
- As you put the cube back together again, show students the small pieces that make up the larger Rubik's Cube.
- 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 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 side. (It's important to remember when

STEM Lesson-Rubik's Cube-Elementary

solving the cube, center pieces do not move and they represent the color of the side.)

- Ask the student how many pieces (smaller cubes) make up the Rubik's Cube. (26)
- 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
- 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.
- 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!
 1. **Identify problem** – *We need to build our own Rubik's Cube!*
 2. **Analyze problem** – *What are some different ways we can build this cube?*
 3. **Generate potential solutions** – *Should our group assign jobs to different members and a timeframe to accomplish the task?*
 4. **Select and plan solution** – *How did our group decide to go about creating our cube?*
 5. **Implement solution** – *What was our process for building the cube?*
 6. **Evaluate solution** – *How does our cube look? Is it correct? How could it be better? How could we have been more efficient?*
- Remind students they must develop the ability to conduct investigations using prior knowledge and experiences.



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.



Extension Activities ~ Technology

- Direct students to www.YouCanDoTheCube.com and ask them to click "Join" at the top of the page. After students have joined the community, guide them in editing their profile.
 - Click "Edit Profile" at the top of the page.
 - Students will be asked to upload a photo, write a brief biography, and fill in boxes under "Common Profile Options".

STEM Lesson-Rubik's Cube-Elementary

- Direct students to www.YouCanDoTheCube.com after they have joined the Rubik's Cube community (see above) and invite them to navigate the website.
 - Click "Secrets Unlocked" at the top of the page.
 - Students may click on "Solution Guide" to view all six steps to solve the Rubik's Cube.
 - Students may click on "Rubik's Cube Starts" to view celebrities having fun with the Rubik's Cube.
 - Students may click on "Teach Friends and Win" to learn how to earn points and get free stuff by teaching friends to solve the Rubik's Cube.
- Direct students to www.YouTube.com/user/RubiksCubeSolution and watch several videos. Invite students to comment on their favorite videos.
 - Under "All Comments" at the bottom of the page, write your response to the video in the given text box.
 - Click "Post" under the text box to post your comment.
- Direct students to www.YouTube.com/user/RubiksCubeSolution and invite them to upload their own video involving the Rubik's Cube!
 - Click "Upload" then select "Upload video" or "Record from Webcam".
 - Choose location of video (if uploading) or follow directions on screen for recording directly from a webcam.
 - Give your video a title and briefly describe your video in the given text box.
- Direct students to <http://twitter.com/rubiksonline> and invite them to follow Rubik's Online!
 - Students must sign in or create a Twitter account to "follow" (get short, timely messages from Rubik's) Rubik's Online.
 - Once signed in, students just click "follow" and they're instantly connected to the Rubik's Cube 24/7!

