In this beginner lesson, upper elementary students will be introduced to the Rubik’s Mini with attention to problem solving and other related STEM standards. This lesson is designed to give students early success with solving stages of the Rubik’s Mini in order to reach the larger, more difficult goal of solving the entire cube independently. Some students who solve the Rubik’s Mini may be inspired to solve the Rubik’s Cube (original 3x3). In addition, this lesson might be helpful first time teachers and beginning student users of the Rubik’s Mini. Several extension ideas using the Rubik’s Mini are shared at the end of this lesson.

**Grade level:** Third, Fourth, Fifth  
**Common Core Standards:**  
**Introduction**  
Grades 3, 4, 5 – Geometry. Focus:  
- Reason with shapes and their attributes  
Grades 3, 4, 5 – Mathematical Practices. Focus:  
1) Make sense of problems and persevere in solving them.  
2) Reason abstractly and quantitatively.  
6) Attend to precision.  
8) Look for and express regularity in repeated reasoning.  
**Related Goals:**  
- Informal Learning Opportunity for Inquiry, Problem Solving, and Scientific Process  
- Goal-Setting, 7 Mindsets (example: Everything Is Possible, Passion First)  
- Inspire Others  
**Objectives:** Students will complete small problem solving goals with the Rubik’s Mini in order to inspire them to solve the entire cube independently.  
**Materials:**  
- Rubik’s Mini cubes (one per student)  
**Procedure:** **Before class:**  
- Safety: Sanitize all Rubik’s Mini cubes.  
- Organize Rubik’s Mini cubes for distribution
With students:

1. Introduce “Experiment, Fail, Learn, Repeat” by discussing how this process is important in science. Ask students to share examples of this process in their everyday lives or hypothetically. Discuss the positive aspects of failure in science (ex. you can learn from failure, isolate variables, etc.). Share:

   “I have not failed. I've just found 10,000 ways that won't work.”
   - Thomas A. Edison

2. Introduce the Rubik’s Mini as an example of how to practice “Experiment, Fail, Learn, Repeat”. Before giving students the cube, discuss the following:
   - Try. Ask students to control frustrations and attempt the cube with simple goals (see below). Challenge students to discover at least one method for solving one face of the cube.
   - Respect for materials. Examples for discussion: no forceful turning of the cube, spinning, or turning the cube without focus. Explain that students who do not respect using the cube appropriately will immediately have it taken away.
   - Build knowledge. Watch a video (teacher choice) that shows the complete process of solving the Rubik’s Mini so students can see what is involved.

3. Distribute cubes and allow students to begin exploring methods for solving. Explain and encourage short term goals that allow students to become familiar with the motions of the cubes and low level problem solving. Examples (in order of increasing difficulty):
   - Solve one face for any one color. Try to solve for all six colors separately (in no particular order).
   - Solve for white and top pairs using the Rubik’s solution guide (Solve the Top Layer).
   - Solve the entire cube using any method (online video, solution guide, peer to peer, etc.). Encourage personal devices and use of technology for viewing “how to” videos, etc.

4. Lesson End / Class Discussion.
   - How were you inspired to complete any portion of the cube today? What goals have you set for yourself for solving the cube? etc.
   - Share examples of other Rubik’s puzzles for inspiration.
   - Video. Share the following video for inspiration: How a 15-year-old solved a Rubik’s Cube in 5.25 seconds by Vox link (YouTube)
Extensions. These extension ideas can provide on-going student opportunities for solving the Rubik's Mini.

- **Develop a game.** Allow students to create a game with the Rubik’s Mini. Example: Solve for any color the fastest. How many letters of the alphabet can be made using any one Rubik’s Mini face? Think creatively and determine how many other letters can be made with multiple cubes.

- **Art.** Using the Rubik’s Mini cubes you have available, either as individuals, small groups, or whole class, design, draw, and create a work of art. Share pictures of Rubik’s Cube mosaics.

- **Create Your Own Directions.** Create your own written directions and steps for solving any portion or color face of the cube. Include step by step directions and visuals. Share your directions with a friend and see if they can follow them successfully.

- **Model.** Become familiar with being able to solve the Rubik’s Mini yourself as the teacher, either using the Rubik’s Mini solution guide or from memorization of algorithms. Don’t hesitate to share with students what worked for you and what didn’t work for you when learning to solve the cube.

- **Inspire.** While students are solving, provide inspirational music and videos if possible. Example: *Rubik’s cube world records New Edit* by Xael 98 [link](https://www.youtube.com/watch?v=NewEdit) (YouTube)

- **Differentiate.** Help students understand that there is more than one way to learn how to solve the Rubik’s Mini. Share and compile strategies. Examples: Peer to peer, written solution guides with visuals, online videos (ex. YouTube/Vimeo), etc.

- **Celebrate:** A poster comes with the kit from the *You CAN Do the Rubik’s Cube* Lending Program, or you can create a poster for students who complete the cube to sign. This gives students recognition while also providing a peer contact for other students to learn from.

- **Don’t force it.** Ask students to try the Rubik’s Mini for at least 15 minutes. If you have students who are continually frustrated beyond this point, consider providing an alternative activity.

- **Practice.** Provide opportunities for students to continue to learn how to solve the cube. These could be unstructured times in your classroom (ex. when students complete their work), break times, etc.


This lesson created by: Colby Counter – Matt Elementary STEM Teacher in Cumming, GA