Rotations, Reflections, & Visual Arts

8th grade Math and Visual Arts

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CORE SUBJECT AREA
Math

ART FORM + ELEMENTS
Visual Arts
Drawing
Line
Shapes
Space proportion

MSCCR STANDARDS
8. .G.1 Verify experimentally the properties of rotations, reflections, and translations. a. Lines are taken to lines, and line segments to line segments of the same length. b. Angles are taken to angles of the same measure c. Parallel lines are taken to parallel lines
8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two congruent figures, describe a sequence that exhibits the congruence between them
8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two dimensional figures using coordinates.

MSCCR CREATIVE ARTS STANDARDS
Cr1.1.8 Generate and conceptualize artistic ideas and work. a. Document early stages of the creative process visually and/or verbally in traditional or new media.

DURATION
1-2 class periods

OBJECTIVES
The student will know the difference between rotations, transformations, and translations

MATERIALS NEEDED
Projector
Document camera/ Overhead
Graph Paper
Patty Paper
Pencil
Colored pencils
Red Dice & White Dice

VOCABULARY
Angle, congruent, line segment, sequence, translation, transformation, pre-image, parallel line, perpendicular line.

LESSON SEQUENCE
Ever wonder what type of mathematics goes into creating your favorite video game? Think about the rapid movement your “player” makes when you move from one location to the next on the screen. How do video programmers slide a figure almost effortlessly as you push buttons on the game controller? It’s not just flips, slides, and turns, I tell you—it’s transformations!

The teacher will arrange student chairs along the walls of the classroom into 8 groups of 3-4 students each. Students are placed in like-ability groups to allow the teacher to target interventions at the onset of the lesson. One poster will be posted in front of each student group on the wall. [The teacher will keep these posters up throughout the unit as students learn about geometric transformations and reference them periodically.]

<u>Day 1:</u>

1. (Define transformation and translation). The teacher will place the word Transformation on the word wall and ask students to journal/write down a definition of what this word means/signals to them. S/he will also ask them

to write down 3 things in the environment that “fits” their definition. She will explain that a transformation signals that something has changed from one thing to another and, that today they will explore what that something is. S/he will allow a few students to share their definition and examples prior to providing the definition here. Transformation: a general term for four specific ways to change the location and size, and sometimes the shape of a figures/he will continue by discussing that the four transformations they will discuss over the next few days are translation, rotation, reflection, and dilation—with today’s lesson focusing only on translations.

2. (Perform an experimental translation and describe it). The teacher will instruct each student to locate a sheet of graph paper, patty paper, and a pencil. S/he will instruct the students to slide their patty paper on top of their coordinate plane. Using a pencil, students will create line segment AB with the following endpoints: A(0,5) and B(7,-2). The teacher will walk around during this time to ensure that all students have plotted each point in the correct location and have labeled their endpoints, A and B. [Note: the teacher will need to monitor which students may find working with patty paper difficult.] Next, the teacher will encourage the entire class to provide a list of other coordinate points that lie on AB . S/he will write each point on the overhead/document camera and show the location of each point as well. If students are not able to provide coordinate points that lie between two integers, the teacher should encourage them to do so through estimation. S/he will then instruct all students to slide their patty paper around to any location on their graph paper. Students are then asked to make an observation about the shape, size, location of their new endpoints, and the “movement” of the original figure. S/he will then define their original line segment, AB, as the pre-image and have students write this term on their patty paper next to it, as s/he does the same at the overhead/document camera. Next, the teacher will ask students to describe the new figure after they moved their patty paper around. S/he will listen for students to discuss the fact that the size, shape, and “direction” in which the pre-image goes (i.e. downward with a negative slope) remained the same, but the location of the endpoints has changed. She will define the movement that they have just completed as a “translation”.

Translation: a type of transformation of a figure that slides every point of a figure the same distance in the same direction.

3.The teacher will instruct students to translate AB horizontally 5 units to the left and to identify the coordinates of the endpoints. S/he will then instruct students to lift up their Patty Paper/transparency and recreate the newly-translated figure.

4. (Perform a vertical translation and identify key properties). The teacher will now ask students to get out a fresh sheet of patty paper and to recreate their original line segment AB . S/he will now ask students to vertically translate this graph 4 units down. S/he will instruct students to complete the process outlined previously by using their coordinate plane to recreate the image A'B' . Students will calculate the slope of AB and A'B' and the distance between each line segment endpoints to verify congruence. The teacher will monitor student progress and precision as s/he walks around.

Day 2

1. Review the definitions from the previous day.

2. The teacher will then show a picture of geometric abstract art and show the shapes and lines they created the previous day are the same as the picture.

3. The teacher will show Frank Stella's art work and explain that he is an artist whose work does not bear any pictorial illusions.

4. (Translations, and Group Work) Students will get in the small teams from the previous class day. [Remember,

there were 8 teams of 3-4 students each.] While in their teams, the teacher will pass each student graph paper and a pair of red and white dice.

5.Students will take turns throwing the dice to create 10-12 unique translations. They will record their translations and verify that each student has the accurate image prior to allowing the next student to throw the dice. Students will have approximately 1-2 minutes to complete their translation and all group members will show their X-Y graph paper to the entire group at the same time and then color the different shapes.

SOURCES

http://www.mde.k12.ms.us/ESE/math/lesson-plans