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Learning Progression: Geometry

This learning progression was created for the intent of using it in a 10th grade geometry classroom with a majority of the students being visual learners. The Common Core State Standards for this learning progression are in the cluster pertaining to transformations. The CCSS-Math are HSG-CO.A.(1-5) and are all relating to experimenting with transformations. In this course, the students learn to apply their newly found knowledge of geometry and connect it with prior knowledge of both geometry and algebra.

The curriculum the students are learning is based off the textbook called *Geometry* by Mcdougal Littell. This unit on transformations is a relatively new concept to most of the students. The students may have little to no background on the topic of transformations on a coordinate plane, depending on their elementary and middle school math curriculum. The students will be learning about different forms of transformational geometry, specifically translations, reflections, rotations, and dilations.

The central focus of this learning progression is to have the students learn about the topics of transformations and be able to assess what each form of transformation looks like. To assess the students throughout the units in this learning progression, I will use some entry tasks and exit slips as well as formatively assess the students using Kahoot. The activities in each lesson will be based on the students' learning styles. Having visual representations in a math classroom and having a discovery-based lesson is related to Bruner's Constructivism theory that students need to actively connect with the new information they learn. This concept will accentuate the learning and allow the students to creatively express themselves. I will pair the students who might have a difficult time with these concepts with the more gifted students in the classroom.

Task 1:

For the first task, students will be getting into small groups and going over what they think rigid motion in a plane looks like. (This task will be in the first lesson of the unit.) They will discuss with their groups what they think, and then they will create a physical performance of what this type of motion

CCSS-Math:

HSG-CO.A.1-5 Congruence: *Experiment with transformations in the plane.*

This cluster of standards are used throughout this learning progression. Students will gain a better understanding of transformations in geometry and gain access to different forms of mathematical experimentation and problem solving.

Mathematical Practices

MP1: Make sense of problems and persevere in solving them**.**

MP4: Model with mathematics.

MP5: Use appropriate tools strategically.

These math practices are common with dealing with transformations and geometry. MP1 will be demonstrated when the students are formatively assessed during each lesson. MP4 will be demonstrated when the students physically model the different transformations during one of the math tasks. MP5 is used when there are specific tasks that need objects for manipulation and so forth.

Hinge Question Task 1:

In your own words, explain what rigid transformations on a coordinate plane look like. Building off of that definition, can you think of any other types of transformation?

looks like. I will be assessing the students' ability to come up with their own definition of what a rigid motion looks like as well as whether or not they participated in the task. This math task will touch on the CCSS-Math cluster as well as MP4. I will have the class paired up so the students who might have a harder time with this unit are paired with the more advanced students.

Task 2:

The next math task will be in the middle of this unit, when the students are aware of all types of transformations; translations, reflections, rotations, and dilations. This activity will mostly focus on the first three listed. The students will be put into groups again and each group will be given a picture that has a picture of a couple city blocks on it. The groups will have cutouts of three different colored cars. The groups will demonstrate the different types of transformations by "driving" the cars around the city blocks. This is a great task for the students to experiment with their new knowledge of transformations. I will be walking around checking in on each group, and I will assign each group a transformation to demonstrate to the class.

Task 3:

At the end of the unit, I will have a review day and I will have a short Kahoot quiz 15 minutes before the end of the lesson. This task will be connected to the entire cluster of standards represented in this learning progression. This will allow me to assess the students' abilities to connect their thoughts to an assessment.

*****For the first part of the unit, I will mostly be assessing through observation (during the task where the students will perform a rigid motion). I will give the students a short exit slip at the end of class, to make sure we are on the right track for the rest of the unit.

Hinge Question Task 2:

How many different transformations can you demonstrate by "driving" your cars on the roads? If you could "drive" the cars anywhere, i.e. off the roads or into the buildings, could this change that number of transformations?

*****The city blocks will have roads in between the building. Those roads will represent the x and y axis on a coordinate plane. I might also give the groups a cutout of a bird, to see how they move that (the cars should be driving in more rigid transformations whereas the birds could be flying in circles, representing more of a rotation).