OLIVIA PETERSON

TRANSFORMATIONS WITHIN COMPOSITION: AN ARTISTIC APPLICATION TO GEOMETRIC TRANSFORMATIONS

8th Grade | Geometry & Design
UWM Lesson Plan Template
(adapted from PSOA Art Education Area)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Lesson Title:</td>
<td>Transformations within Composition: An Artistic Application to Geometric Transformations</td>
<td>Level/Grade/Age:</td>
<td>8th grade Geometry</td>
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</tbody>
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**BIG IDEA**
(Describe how the big idea is important to this age group in relation to student assets and the content area):

In this lesson on geometric transformations, students will be use the four basic types of transformations and their correspondence to shapes on the coordinate plane to create a work of art utilizing each of the different transformations. Prior to the project students will be presented with various examples of how this geometric concept is incorporated into art, especially in relation to the idea of repetition and perspective in artwork. Instructors will inquire and explore what each kind of transformation may be used for in contemporary artwork.

Upon completion students will have proficient comprehension and execution of geometric transformations in the plane, created a work of art representing these ideas in art, and produced a written description of their artwork including how they utilized the different transformations in their artwork. In addition, students will be asked to find a work of art and describe how it utilizes the different geometric translations in a short-written observation.

**OBJECTIVES AND NATIONAL STANDARDS:** [http://www.nationalartsstandards.org/](http://www.nationalartsstandards.org/)

*Art*

**Creating**

*Anchor Standard 2: Organize and develop artistic ideas and work.*

*Enduring Understanding: Artists and designers experiment with forms, structures, materials, concepts, media, and art-making approaches*

*How do artists and designers learn from trial and error?*
  - **VA:Cr2.1.8a**
    Demonstrate willingness to experiment, innovate, and take risks to pursue ideas, forms, and meanings that emerge in the process of art-making or designing.

*Enduring Understanding: People create and interact with objects, places, and design that define, shape, enhance, and empower their lives.*

*How do objects, places, and design shape lives and communities? How do artists and designers determine goals for designing or redesigning objects, places, or systems? How do artists and designers create works of art or design that effectively communicate?*
  - **VA:Cr2.3.8a**
    Select, organize, and design images and words to make visually clear and compelling presentations.
Presenting

Anchor Standard 4: Select, analyze, and interpret artistic work for presentation.

Enduring Understanding: Artists and other presenters consider various techniques, methods, venues, and criteria when analyzing, selecting, and curating objects, artifacts, and artworks for preservation and presentation.

What criteria, methods, and processes are used to select work for preservation or presentation? Why do people value objects, artifacts, and artworks, and select them for presentation?

- VA:Pr4.1.7a
  Compare and contrast how technologies have changed the way artwork is preserved, presented, and experienced.

Responding

Anchor Standard 8: Interpret intent and meaning in artistic work.

Enduring Understanding: People gain insights into meanings of artworks by engaging in the process of art criticism.

How does knowing and using visual art vocabularies help us understand and interpret works of art?

- VA:Re8.1.7a
  Interpret art by analyzing art-making approaches, the characteristics of form and structure, relevant contextual information, subject matter, and use of media to identify ideas and mood conveyed.

Connecting

Anchor Standard 10: Synthesize and relate knowledge and personal experiences to make art.

Enduring Understanding: Through art-making, people make meaning by investigating and developing awareness of perceptions, knowledge, and experiences.

How does engaging in creating art enrich people's lives? How does making art attune people to their surroundings?

- VA:Cn10.1.5a
  Apply formal and conceptual vocabularies of art and design to view surroundings in new ways through art-making.

Math

Common Core State Standards: Grade 8 Geometry

Understand congruence and similarity using physical models, transparencies, or geometry software.

CCSS.MATH.CONTENT.8.G.A.1
Verify experimentally the properties of rotations, reflections, and translations:

  CCSS.MATH.CONTENT.8.G.A.1.A
  Lines are taken to lines, and line segments to line segments of the same length.

  CCSS.MATH.CONTENT.8.G.A.1.B
  Angles are taken to angles of the same measure.

  CCSS.MATH.CONTENT.8.G.A.1.C
  Parallel lines are taken to parallel lines.

CCSS.MATH.CONTENT.8.G.A.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, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
CCSS.MATH.CONTENT.8.G.A.3
Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

CCSS.MATH.CONTENT.8.G.A.4
Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

LANGUAGE FUNCTION USED THROUGHOUT LESSON:

<table>
<thead>
<tr>
<th>Type of language function: <a href="http://www.eldstrategies.com/languagefunctions.html">http://www.eldstrategies.com/languagefunctions.html</a></th>
<th>Describing special relations, ask questions, classifying and identifying, analyzing, summarizing</th>
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<td>Emphasis of language function (describe the main purpose of using this language function for your lesson):</td>
<td>By describing the special relations that are present in geometric transformations students will be able to better relay their knowledge on this concept and its related ideas such as congruence and similarity and will also be able to more accurately represent these concepts on the coordinate plane. Students will be encouraged to ask questions to dispel misconceptions and to further their knowledge and curiosity. Classifying and identifying is the main function being asked of students in this lesson. By the end of this project students should be able to classify and identify the different transformations not only in artwork and images, but also on the geometric plane and in the real world. Students will be asked to analyze different works of art in order to pick out different transformations within the image. This will help enhance students critical thinking, reasoning and observation skills. This is also important because it gives students a chance to observe and analyze these occurrence in the real world, giving math a practical application. Summarizing their finding will help students solidify the information and relationships they have been working on finding.</td>
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<tr>
<td>Where language function will be practiced (i.e., through writing, speaking, art making):</td>
<td>Describing, classifying, and identifying will be done in classroom discussion about the different transformations. This is where it is important to show students various works of art in order for them to identify the transformations aloud themselves. They will also be analyzing and summarizing in their two written works to be turned in upon completion of their image.</td>
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**UNIT or LESSON DETAIL (provide for each lesson session):**

**Motivation/ introduction:** An introductory lesson will be given prior to introduce and familiarize students with transformations such as translations, rotations, reflections, and dilations. Examples of each can be drawn on board or shown in a power point. Reference to the coordinate plane can also be helpful as well as considerable mention and discussion of the first three before mention of dilations. Ask students to observe how the length of lines and segments, as well as angle measure, is preserved in the first three transformations. Use of transparent paper can be demonstrated to show how it can easily preserve the congruence of shapes when performing transformations on paper, specifically with reflections.
Students can be shown images similar to the bicycle image to see that this concept has relevant applications in design. Important emphasis can be made on the relationship between repetition and perspective and the geometric transformations. More artwork or examples of everyday objects can be shown to bridge the connection of this concept in art. A specific example could include work by Alan Kenny, first giving specific examples of the transformations used in art and then more broad pictures, giving students the opportunity to pick out the transformations themselves.

Examples that can be used as basic examples of reflection(left) and translations (right)
## Art Making:

### Supplies:
Students can use transparent paper to experiment with drawing the different transformations. Will require graph paper (or printer paper) for the final image as well as colored pencils, markers, or crayons that can be utilized as well as traditional pens and pencils for the final image. Access to computers may be necessary for finding reference images as well as an image to write a final observation on.

### Teacher instruction:
Give students the option to use either graph paper or printer paper to create a work of art that incorporates one of each of the four transformations. Each transformation should be utilized and specifically identifiable, except in the instance of a translation where students may pair a different transformation along with a translation.
Objective:
Create an image on either graph paper or printer paper that incorporates at least one element of each geometric transformation, translations, reflections, rotations, and dilations. Specific attention should be paid to the way in which the transformations lend themselves to the composition.

Students at work:
Students may want to experiment with transparent paper and draw preliminary sketches before starting on their final image, instructors may set up a check to ensure all transformations are used before beginning on the final image. Students will be asked to record and reflect on how each transformation is being used, it should be noted that transformations do not need to be limited to single object, as in reflections can be used in a water reflection like in examples shown. Their work can be abstract or representational.

Instructors may aid and provide examples of additional artwork or artists so that students have resources to find images to write their final observation on. Possibly a trip to the library or neighboring art museum may be a way of exposing students to different artworks. Students should be allowed designated research time to find images and consult with the instructor.

Closure:
Upon completion students will turn in their final image along with a written explanation of their artwork including how and where the different transformations were utilized. Students may wish to comment on the effectiveness of the transformations and how they lent themselves to the composition of the image. Students will also turn in an additional written observation made on a separate artwork where they identify where and how certain transformations were used, not all transformations are necessary, but and effective use of at least two (a translation plus one more) should be present in the artwork.

Components Embedded in the Lesson Procedure
Opening/Stimulus: A slideshow will be shown that introduces the idea of the geometric transformations in relation to design. Having an opening activity that lets students analyze artworks, identify the transformations within a piece, and experience the different uses of each transformation will get the students engaged and ready to create work of their own.

Students' Misconceptions: What are some possible misconceptions or difficulties that students will have with/about the material.

- Students may look at this assignment as two different parts, one being the mathematical part and one being the artistic part – and treat them separately – when in reality each aspect should be helping the student complete the other
- In order to succeed in the design process students will have to have proficient knowledge in the geometric transformation, particularly the related equations for each transformation. Use of graph paper in their final project would be able to help students accurately apply this knowledge.
- Students may have difficulty finding images and artists to utilize for their additional written observation.
- It is important for students to know that in creating their image different uses of the transformations can be utilized, it doesn’t simply have to be an image repeated, reflected, or rotated. Push students to develop a composition.

Questions to ask: Provide key thought provoking questions that might relate to student’s misconceptions or key questions to get students to focus on critical aspects of the activity. (From National Art Standards Above)

- How does learning about art impact how we perceive the world (and our thoughts on geometry)? What can we learn from our responses to art? Are you learning more about this topic by hearing other people talk about and present their experiences of this project?
- How does knowing and using visual art vocabularies help us understand and interpret works of art (or mathematical concepts)?
- How does knowing and using visual art vocabularies help us understand and interpret works of art?***
- How do artists and designers create works of art or design that effectively communicate (do they utilize these geometry concepts)?

Objectives/Assessment: What evidence will you be looking for that will tell you how the students have met the objectives of the lesson?

Many aspects of this project can be considered when looking for evidence of proficient understanding of the topics used in the lesson. The first is in the transformation identification activity during the opening slideshow. If students are able to accurately identify different transformations in complex compositions the student may have an easier time utilizing these same techniques in their own artwork. If students are able to do this it will also lend to a deeper understanding of how different mathematical concepts can be utilized in design and later in the real world.

Upon completion of the final image, if students are asked or choose to use graph paper the different points transformed with reflections, rotations, translations, and dilations can be properly assessed for accuracy. If students have properly placed points after a transformation it shows a greater understanding of how points are transformed in the plane, this information can be later utilized on tests and following lessons on more complex geometry material. In the final image a greater sense of composition can be looked for. If students have been able to successfully create a composition using the transformation it shows that they not only have master of transformations but also how they can lend themselves to a greater stylistic or interpretive meaning within a larger composition. Check for this verses a simple image moved across the page – however in this case a pattern may be the objective and that can also show greater understanding of how these mathematical concepts relate to the ideas of repetition, pattern, and possibly perspective in art.

The last aspect of this project to check for understanding is of course the two written reflections. The objective of the two reflections is to assess the students understanding of the ways there transformations are used in art, and more importantly, what these transformations do for the image. In the first reflection it is firstly important to check if each transformation has been used properly and also what it was used for. Does the transformation lend itself to the image or composition in any meaningful way? Has the student recognized that in their own work? Additionally, it is important in the second reflection to see how the student has picked up on these transformations outside of their own work. This second reflection can be seen as an extension to the first activity where students picked out transformations in artwork. What kind of image has the student chosen? How do they think the transformations lend themselves to the work of others? Did they see a trend in their research?