



Grade: 7

Subjects: Visual Arts and Mathematics

It's a Matter of Perspective: Scale Drawing and Understanding

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| <p>Lesson Overview</p> | <p>Prior to this lesson, students will receive instruction on the math concepts of scale and proportion. This lesson can be taught in a traditional in-person classroom setting, or as an online learning experience.</p> <p>Students will observe and discuss art through the lens of balance and perspective, then create scale drawings to incorporate new features and reinterpret how the addition shifts perspective, balance, and/or meaning. They will explore famous paintings from the collection at the Clark Art Institute, consider how scale and proportion influence the overall impact of these paintings, and reimagine an artwork with different sense of scale and proportion by adding elements and/or changing sizes. They will then consider the effect of these changes on the overall feeling communicated by the new, revised, work of art.</p> | | |
| <p>How the Arts Improve this Lesson</p> | <p>Some may not realize that math and art apply to each other. Artistic students may see themselves as “not good at math,” or may tell themselves the story that “I won’t need math if I’m an artist.” In fact, one of the many ways math is present in the visual arts is through scale and balance. By looking at artwork through this lens and considering how artists create meaning through utilizing this math concept, it legitimizes both the math skill and the art form. In addition, it offers a “way into” math or a “way into” art for students who tend to feel more comfortable with one than the other. Part of this lesson is student-driven, and each student has the chance to personally decide how to re-envision a chosen artwork. With students taking responsibility for their own learning, their engagement in the content is deeper.</p> | | |
| <p>Assessment of Student Learning</p> | <p>Massachusetts Learning Standards</p> | <p>Evidence</p> | <p>Collection Strategy</p> |
| | <p>Grades 7-8. Visual Arts. Creating. Generate and conceptualize artistic ideas and</p> | <p>Student’s discussion reflects understanding of defined principles</p> | <p>(Formative) Teacher observations of all discussions.</p> |

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| | <p>work. Generate artistic ideas that demonstrate differences in composition principles (e.g., balance, proportion, emphasis) and push the boundaries of what materials can do. (7-8.V.Cr.01)</p> | <p>of design, such as balance, movement, and proportion.</p> <p>Student's artistic creation is drawn to scale to demonstrate awareness of proportion.</p> | <p>Teacher collects student-created artwork to see drawing submitted with accurate scale and differences in proportion.</p> <p>Teacher collects written reflection.</p> |
| | <p>Grades 7-8. Visual Arts. Presenting. 2. Convey meaning through the presentation of artistic work. Match a piece of artwork with expressed intent (e.g., wanting the audience to feel tension between two positions). (7- 8.V.P.06)</p> | <p>Student's discussion reflects understanding of artwork's meaning through description of how the artist uses elements of art and principles of design to communicate.</p> <p>Student's written reflection describes how change in scale relationship can change the overall meaning of an artwork.</p> | <p>(Formative) Teacher observations of all class and group discussions.</p> <p>Teacher collects written reflection.</p> |
| | <p>Grade 7. Math. Geometry. A. Draw, construct, and describe geometrical figures and describe the relationships between them. 1. Solve problems involving scale drawings of geometric figures, such as computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.</p> | <p>Student correctly answers questions during conversations to describe the scale relationships.</p> <p>Student accurately completes Independent Work Questions sheet to solve problems involving scale.</p> <p>Student creates artwork (based on one of the three paintings) which accurately changes the scale between one character and another character or object.</p> | <p>(Formative) Teacher observations of all class and group discussions.</p> <p>Teacher collects Independent Work Questions sheet.</p> <p>Teacher collects student-created artwork to see drawing submitted with accurate scale.</p> |

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| Essential Questions | <p>How does scale influence the impact of a visual diagram and/or artwork?</p> <p>How do artists use scale and perspective to create balance or imbalance?</p> |
| Enduring Understandings | <p>Artists use mathematical skills such as scale drawing to create images in relationship to each other.</p> <p>Changing the scale and perspective changes the impression of the relationship between objects and characters in an artwork.</p> |
| Materials and Needs | <p>Clark Art Institute artwork links</p> <p>Principles of Design definition sheet</p> <p>Visual Thinking Strategies (VTS) prompts for discussion</p> <p>Reflection Writing prompt</p> <p>1:1 device with internet accessibility</p> <p>8.5 x 11" drawing paper</p> <p>Pencils/colored pencils</p> <p>Ruler or measuring tape</p> <p>Handout with math and art questions</p> |
| Advancing Vocabulary | <p>Balance</p> <p>Composition</p> <p>Constant of proportionality</p> <p>Emphasis</p> <p>Movement</p> <p>Pattern</p> <p>Perspective</p> <p>Proportion</p> <p>Repetition</p> <p>Rhythm</p> <p>Scale</p> <p>Variety</p> <p>Unity</p> |

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| Support & Accommodations Inspired by Universal Design for Learning | <p>UDL: Students choose on which painting to focus their study.</p> <p>UDL: Students choose how to demonstrate knowledge of scale by picking assignments.</p> <p>Teacher may provide a partially completed scale for students who benefit from such differentiation.</p> |
| Lesson Plan Progression Details | <p><u>Introduction:</u></p> <ul style="list-style-type: none"> ● Engage in Visual Thinking Strategy (VTS) with Frederic Remington’s painting <i>Friends or Foes?</i> (<i>The Scout</i>) from the Clark Art Institute’s permanent collection. <p>Questions for initial class discussion:</p> <ul style="list-style-type: none"> ● What’s going on in this painting? (DOK 1- students identify elements in the picture. DOK 2- students make inferences about what they see.) ● What do you see that makes you think that? (DOK 3- students cite evidence for inferences.) ● What else do you see? (DOK 1- students identify elements in the picture.) <ul style="list-style-type: none"> ● Then deepen the class conversation: <ul style="list-style-type: none"> ● Who is the main character? (DOK 2- students make inferences from image.) ● What is he thinking and feeling? (DOK 2- students make inferences from image.) ● How can you tell? (DOK 3- provide evidence from painting for inferences.) ● What is the relationship between objects and people in the painting? (DOK 2- students use math knowledge to describe artwork.) ● Which objects are bigger/smaller than others? How much bigger/smaller? (DOK 2- students compare elements in image.) <p><u>Academic Vocabulary Instruction:</u></p> <ul style="list-style-type: none"> ● Use the Pre-teaching Vocabulary in Seven Steps protocol (see appendix) to instruct on the art and math terms listed above. Emphasize use of terms in both artistic and mathematical sense, such as proportional relationship between numbers and proportion in a painting. (DOK 1- students repeat vocabulary words. DOK 2- students do think-pair-share to organize and interpret, and they practice applying definitions in written summaries.) <p><u>Teacher Modeling:</u></p> |

- (Teacher guided section) Looking at proportion and scale in *Friends or Foes? (The Scout)*, the teacher models how to measure with virtual ruler the Native American in the foreground and the distant fires. She records the proportional relationship.
- The original painting is 27 x 40 inches. Teacher says, “On my screen it measures ____ X _____. What is the proportion/scale here? Reduce to unit rate or constant of proportionality.” The class calculates together.
- *ENRICHMENT DISCUSSION: Teacher asks the class, “How tall might this man be in real life, sitting up on this horse? (Maybe nine feet because he’s on horseback.) What is the constant of proportionality? In other words, how many inches per foot tall? Or how many feet tall per inch? If we were to create a life sized model of this painting, and he was nine feet from ground, how tall would the background images be?” (DOK 2- students calculate and apply knowledge.)*
- Teacher asks, “How far from the distant community is the Native American? Who is closer to us as the viewers? How would this painting feel different if the proportion of the Native American to the distant community were different?” Students respond. **(DOK 1- students observe. DOK 2- students interpret and compare-contrast.)**
- (“We do” as the teacher guides creation of this scale drawing) Teacher asks, “What if we add a new character– a friend of his– halfway between where he is and the distant campsite? How big would he be? How would this change the feeling of the painting?” Students respond. **(DOK 2- students interpret and explain cause and effect.)**

Small Group Work:

- Students engage in VTS in breakout groups of three to four students examining two other paintings from the Clark Art Institute’s permanent collection: *Landscape with the Voyage of Jacob* by Claude Lorrain and *The Women of Amphissa* by Sir Lawrence Alma-Tadema.
- Breakout groups: Look at the assigned image and discuss using VTS.
Questions for discussion (in handout in Appendix):
 - What’s going on in this painting? **(DOK 1- students identify elements in the picture. DOK 2- students make inferences about what they see.)**

- What do you see that makes you think that? **(DOK 3- students cite evidence for inferences.)**
- What else do you see? **(DOK 1- students identify elements in the picture.)**

- Then deepen the group conversation:
 - Who is the main character? **(DOK 2- students make inferences from image.)**
 - What is he/she thinking and feeling? **(DOK 2- students make inferences from image.)**
 - How can you tell? **(DOK 3- provide evidence from painting for inferences.)**
 - What is the relationship between objects and people in the painting? **(DOK 2- students use math knowledge to describe artwork.)**
 - Which objects are bigger/smaller than others? How much bigger/smaller? **(DOK 2- students compare elements in image.)**
 - How do you know? **(DOK 3- provide evidence from painting.)**
- Teacher says, “select someone from your group to read aloud to the rest of the group the description of the painting from the website.”
- Discuss as a group: What could the artist have done differently in terms of scale that would have changed the meaning or feeling of this painting? **(DOK 2- students compare/contrast. DOK 3- students support opinions using concrete evidence.)**

Share Out:

- Back in the whole class group: One teammate from each group shares back conversation notes.

Independent Creating:

- (Independent work) Student’s assignment:
 - Select one of the three paintings we looked at today. Use the accompanying handout to record your observations about the painting, and to calculate scale from this painting to an 8 x 10 inch piece of paper. **(DOK 2- students summarize and apply skills of mathematical calculation.)**
 - Re-envision the artwork by creating a version of this painting that *changes* the relationship between the character(s) and object(s) in the painting by either:
 - adding another character, or
 - changing scale between one character and another character or object. **(DOK 4- students apply understanding to a new creation to extend mathematical and artistic thinking.)**

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| | <ul style="list-style-type: none"> ● <i>NOTE: Students' drawings may be simple and may not look exactly like original; however, the SCALE should be correct. In other words, if the scale is 6 inches = 2 inches and the original person is 8 inches tall, the student's version should be about 2.66 inches tall.</i> <p><u>Reflection:</u></p> <ul style="list-style-type: none"> ● Students complete the Reflection writing piece and submit all work via Google Classroom. (DOK 3- students interpret, explain, and provide evidence to support thinking.) |
| Resources | <p>Alma-Tadema, L. (1887). The women of Amphissa [painting]. The Clark Art Institute, Williamstown, MA, USA. https://www.clarkart.edu/artpiece/detail/The-Women-of-Amphissa</p> <p><i>An introduction to Visual Thinking Strategies.</i> (n.d.). The Thinking Eye. Retrieved December 01, 2020, from www.thinkingeye.org/what-is-vts</p> <p>Lorrain, C. (1677). Landscape with the voyage of Jacob [painting]. The Clark Art Institute, Williamstown, MA, USA. https://www.clarkart.edu/artpiece/detail/Landscape-with-the-Voyage-of-Jacob</p> <p>Massachusetts Department of Elementary and Secondary Education. (n.d.). <i>Vocabulary Strategy: 7 Steps for Pre-Teaching Vocabulary</i> [PowerPoint slides]. Massachusetts Department of Elementary and Secondary Education. https://www.doe.mass.edu/massliteracy/literacy-block/complex-text/7step-vocabulary.pptx</p> <p>Remington, F. (1902-1905). Friends or foes? (the scout) [painting]. The Clark Art Institute, Williamstown, MA, USA. https://www.clarkart.edu/artpiece/detail/Friends-or-Foes-(The-Scout)</p> <p><i>Understanding Formal Analysis: Principles of Design.</i> (2011). The J. Paul Getty Museum. Retrieved December 01, 2020, from https://www.getty.edu/education/teachers/building_lessons/principles_design.pdf</p> |
| Appendix | <p>VTS (Visual Thinking Strategy) Prompts for Discussion:</p> <p>Initial questions for discussion:</p> <ul style="list-style-type: none"> ● What's going on in this picture? ● What do you see that makes you think that? ● What else do you see? |

Then:

- Who is the main character?
- What is he thinking/feeling?
- How can you tell?
- What is the relationship between objects/people in the painting?
- What is bigger/smaller than another? How much bigger/smaller?

Pre-teaching Vocabulary in Seven Steps

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| <p>1. The teacher says and shows the word, and asks students to repeat the word three times. <i>This helps pronunciation and introduces the print version.</i></p> | <p>Say "manage" three times.</p> |
| <p>2. The teacher reads and shows the word in a sentence (context) from the text. <i>This helps the students remember the word in context when they begin to read.</i></p> | <p>Although many species <i>manage</i> to survive such extreme...</p> |
| <p>3. The teacher gives the dictionary or glossary definition(s). <i>This provides exposure to formal English and prepares students for dictionary use when they are more proficient.</i></p> | <p>(1) succeed in doing something difficult; (2) to be in charge of, to run: <i>manage a company.</i></p> |
| <p>4. The teacher explains the meaning with student-friendly definitions or gives an example that students can relate to. <i>The teacher uses simple language, familiar examples, pictures, props, movements, etc.</i></p> | <p>I <i>managed</i> to lose ten pounds by exercising.</p> |
| <p>5. The teacher highlights an aspect of the word that might create difficulty: <i>spelling, multiple meanings, false cognates, prefixes, suffixes, bases word, synonyms, antonyms, homophones, grammatical variations.</i></p> | <p><i>Manage</i> is a polysemous (multiple meanings) word. <i>Manejar</i> is the cognate.</p> |
| <p>6. The teacher engages all students in an activity to orally use or own the word and concept. <i>Writing the word, drawing, or other word activities should come later, after reading. First, students need to learn to use the word ten to twelve times orally.</i></p> | <p>Think-pair-share: What have you <i>managed</i> well lately?</p> |
| <p>7. The teacher assigns peer reading with oral and written summarization activities and explains how the new words need to be used or how students will be accountable for these words.</p> | <p>Remember to use <i>manage</i> in your summaries.</p> |

Adapted from <https://www.doe.mass.edu/massliteracy/literacy-block/complex-text/7step-vocabulary.pptx>

Independent Work Questions

Title of Artwork you selected: _____

Artist: _____

Bullet-point or Summary of Observations after Using the VTS Prompts for Discussion:

Height of Original Painting: _____

Height of Scaled Down Painting: 8.5 inches

Ratio of Original to Scaled Down Painting: _____: 8.5 inches

Width of Original Painting: _____

Width of Scaled Down Painting: 11 inches

Ratio of Original to Scaled Down Painting: _____: 11 inches

Use these ratios to fill in the chart below:

| Object/Character | Original Width | Scaled Down Width | Original Height | Scaled Down Height |
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Your NEW Vision:

Consider the relationship between two of the objects listed in the first chart. (For example, the scout and the distant fires.) Calculate that ratio here:

Object/character 1: _____ measurements (H/W): _____/_____

Object/character 2: _____ measurements (H/W): _____ / _____

Write as a ratio (H:H or W:W):

CHANGE that ratio by changing the size of ONE of those objects/characters.

(Example - what if instead of, say 2x as big, it is 4x as big? Or what if instead of $\frac{1}{3}$ the size, it is now 5x the size?)

Object/character you will change: _____

Now, use the new ratio to calculate the size of the object in your NEW VERSION.

New sizes: _____

CREATE: On your 8.5 x 11 paper, draw the original painting, using the ratios from the chart for all objects EXCEPT this one you chose. For this one, use the ratio YOU CREATED HERE ON THIS PAGE!

● *NOTE: Your drawings may be simple and may not look exactly like original; however, the SCALE should be correct. In other words, if the scale is 6 inches = 2 inches and the original person is 8 inches tall, your version should be about 2.66 inches tall.*

REFLECTIONS:

Look at your new creation-- an altered reproduction of the original. Respond in paragraph form or bullet points about the following:

- What's going on in this picture?
- What do you see that makes you think that?
- What else do you see?
- Who is the main character?
- What is she/he thinking and feeling?
- How can you tell?
- What is the relationship between objects and people in the painting?
- What is bigger/smaller than another? How much bigger/smaller?

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| | <ul style="list-style-type: none">● How does changing the proportional relationship of the objects/characters in the painting change the overall feeling, message, or impact of the painting? |
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Plan edited by BRAINworks Curriculum Review Committee