Math+Arts  • 1

Before the Lesson
Students should have been introduced to the concept of parallel lines.

Frame, Focus, and Reflection
Find a location inside or outside of your school building with a view which illustrates obvious perspective, such as a long hallway, a long view of a road or fence line, or a row of trees or cars. Ask students to describe the difference in the way that objects appear depending on whether they are close to you or farther away. Do they appear to be the same size or do the more distant objects appear smaller? What about the lines (the lines at the top and bottom of the walls in a hallway, the sides of the road, etc.)? You know that

Perspective Drawing
There are three options for this lesson, depending on class needs and time available:

1. Frame, Focus, and Reflection: students observe and discuss perspective in real life.
2. Short Activity: students use concepts of horizon and vanishing lines to create a simple landscape drawing.
3. Project: students use concepts of horizon and vanishing lines to create an original landscape drawing and add color (water soluble oil pastels, if possible).

Learning Targets

Math
I can discuss lines, rays, line segments, and angles in works of art.
I can discuss parallel and perpendicular lines.
I can draw and identify lines and angles.

Arts and Humanities
I can discuss how lines and shapes create perspective.
I can discuss how warm and cool colors can express season, time of day, and temperature in a landscape.
I can use the elements of art and principles of design to create a landscape.

Teaching Approach

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**A & H Background Information for Teachers**

Let’s Look at Art on pages 296-299 in the Visual Arts Toolkit binder and One-Point Perspective handout; review these before using with your students.

Responding to Art video segments 1-4

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they are parallel, but do they look as if they are converging? If possible, take photos of the view.

Back in the classroom, show, the video Lines and Angles from Discovery.

Show 2. Parallel Lines segment first, pausing at :44 to look at the lines on the porch. Point out that the way they appear in the photo is the way we see them and the way we would paint them. These lines are parallel in the real world but not in the 2D surface of the photograph.

Show the segment Introduction. Pause at :09 and :12 to observe and discuss how the parallel lines of the railroad tracks appear to be converging (coming together). Pause at 00:15. Use a yardstick or other straight edge to demonstrate how all the lines in this image, although parallel in real life, appear to be converging at one spot.

**Short Activity**

Distribute the One-Point Perspective handout and discuss how the drawing shows distances. Explain that artists must understand how to represent the way that parallel lines appear to us. To do this, they establish a horizon line and a vanishing point—the point at which all the lines that we see (in real life or in a photo) appear to intersect. Find the horizon line and the vanishing point in each drawing. Notice that the telephone poles appear to get smaller the farther away they are in the imaginary landscape, and the lines in the railroad track appear to come together. Point out how the artist has used a line at the top and bottom of the telephone poles to help plan for the size to make these poles. The poles could be replaced by trees or a fence.

Notice that the angles formed by the vanishing lines and each telephone pole are similar. Depending on your class needs and interest, you can just mention this or you can take the time to use protractors to show that this is so.

Distribute a sheet of printer paper and rulers. Students can work with the paper horizontal or vertical. Ask them to draw a horizon line across the paper somewhere above the middle of the paper. Have them mark a vanishing point somewhere along this line. If they make the mark in the middle, it will create the illusion that the viewer is looking straight down a straight road, railroad track, path, or river.

If they draw the mark to one side or the other, it will seem that the viewer is looking to one side or the other to follow the straight line with their eyes.

Have them draw two marks at the bottom of the paper. These will be the sides of their road, railroad track, path, or river. Explain that this is the foreground of their picture. From these two marks, they should use a ruler to draw two lines to intersect at the vanishing point. Tell them to add details that will indicate if they are drawing a road (use dotted lines), a railroad track (using perpendicular lines that are progressively smaller), a path (grass that becomes progressively smaller), or a river (curling marks to indicate water growing smaller in the distance). Tell them to draw a telephone pole, tree, bush, fence post or some other object to one side or the other, close to the bottom of the paper (in the foreground) that they can repeat along vanishing lines. Have them draw lines from the top and bottom of their object to intersect at the vanishing point using a ruler. Have them draw in progressively small repetitions of their object.

If they wish, they can draw a sun setting at the vanishing point on the horizon.
Ask them to label the horizon line, vanishing lines, and vanishing point. Have them save their drawing and the One-Point Perspective handout. If you want, you can have them measure and label the angles formed by the repeated object and the vanishing lines.

**Homework:** Ask each student to find at least one photo, drawing, or painting that illustrates perspective in a landscape. It can be their own photo, one in a magazine or newspaper, or one they download and print from the Internet or other source.

**Project**
Tell students they are going to watch a video about a Kentucky landscape artist who makes interesting use of perspective. He is also noted for his use of warm and cool colors. Stop the video as you watch to discuss different paintings. After viewing, go to Rollin’s website and look at his landscape paintings:

http://www.martinrollins.net/Photo-Gallery.html
http://www.martinrollins.net/Art-Gallery-2.html

Discuss his use of perspective in one or more drawings. Where is the horizon line? Which of the lines in the drawing would be parallel in the real world but appear to converge? Where are the vanishing point and the vanishing lines? Can you find vanishing lines besides the obvious ones that are the sides of the road or tracks? Are there objects that are repeated and get smaller into the distance?

Discuss his use of colors in one or more drawings. Explain that colors are categorized as warm and cool. Warm colors are yellow, orange, and red (think fire and sunlight). Cool colors are blue, green, and purple (think deep forests and lakes). Combining warm and cool colors skillfully can communicate a feeling of warmth or chilliness. Pick out one of Rollin’s paintings and discuss what time of day and what season it appears to be. Does it look like it would be warm or cool if you could step into the landscape? Notice that some of his paintings that have a wintry look actually include a lot of warm colors, but the skillful highlights of blue and the bare limbs of trees can almost make you shiver. Project a few images of snow from your collected images and point out the bluish tinge that makes snow look really cold.

Return to Rollin’s website and draw students’ attention to the medium Rollins uses. It is oil pastels. If you are able to provide pastel pencils, demonstrate how to use them. (They will come with instructions.) If not, tell students that you want them to work with crayons and/or colored pencils to try to achieve some of the subtle shading effects that Rollins achieves.

Distribute drawing paper and whatever art materials you have. Draw students’ attention to the texture of the paper, especially if you have some students who have never used drawing paper before. Explain that it is a better surface for drawing than printer paper. Invite students to experiment with the arts medium, making lines and shading, pressing hard or soft, creating texture, blending colors, etc. Have them save their experiment page.

Have students put the photos and pictures that they brought in (and add some of your own) on their desks. Invite all the students to get up and walk around the room looking at the different images. You could also have images projected on the board for them to consider. Tell students that you would like them to select an image for inspiration—not one to copy exactly, but one that will give them ideas for a composition of their own. They might alter the colors or add something original. Even creating the image in a different medium will make it uniquely their own. (Some students will want to work from an internal mental image, and that is fine as well.)
Have them get out their one-point perspective practice drawing and their color experiment page. Explain that you want them to create a landscape and that you have two criteria. One is that the landscape must include strong perspective as part of the central image. A second is that there must be some object that is repeated in gradually smaller dimensions. The third is that they should demonstrate an awareness of the use of warm and cool colors (and other elements like bare branches or blooming flowers) to give a sense of the season. Solicit their ideas for any additional criteria.

Distribute printer paper, drawing paper, rulers, pencils, and art supplies. Tell students they will begin their compositions as they did in their one-point perspective practice drawings by establishing a horizon line, a vanishing point, and the main vanishing lines for the composition, but this time, they should make their pencil lines as light as they possibly can so that they will either be covered or can be erased. Drawing lightly is a skill, so they should practice first on their printer paper. Give them time and encouragement to create original compositions.

Ask students to raise their hands if their favorite color is pink, green, blue, red, etc. Then ask them to raise their hands for their favorite flavor of ice cream—chocolate, vanilla, strawberry, etc. Point out that people have different tastes, and that in the same way, they have different responses to art. They are going to look at and discuss each other’s artwork and it is important that they do it in a supportive way. Every artist—and that means every student—deserves to be treated with respect.

Invite students to display their finished compositions on their desks and tell them they are now going to go on an “art walk.” They will need a notepad or paper and pencil. As they rotate through the room to see each other’s works, they should note which elements in each drawing give a feeling of perspective. Where is the horizon line? Where are the vanishing point and the vanishing lines? Is there a road or railroad tracks or a river? Are there trees that get smaller and smaller? They should also note what warm and what cool colors the artist used and whether the drawing gives them a feeling of the season. After the art walk, ask students to share positive comments about each drawing.

If possible, organize an exhibit in the school library media center, lobby, or hallway. You can create a more professional look if each drawing is mounted on a larger piece of construction paper to give the impression of a frame.

**Formative Assessment**

What are the indicators of student progress toward or achievement of each learning target?

**Math Assessment Problems**
Exit slip: What did you learn about parallel lines?

**Arts and Humanities**
Teacher observation of participation in discussions to monitor for grade appropriate understanding of terms and concepts of perspective.
Teacher observation of completed artwork with attention to how well the student met the criteria.
If you wish, you can design a rubric based on the criteria, craftsmanship, effort, and attention to instructions. See the lesson “Weaving Math” for an example.
Program Review

Where does this fit in? How should you document it?
This activity contributes to your school’s overall efforts in art programming in several areas, depending on whether you implement just the Frame, Focus, and Reflection portion or you implement the entire project.

Document with lesson plan and samples of student-generated problems and scripts. If possible, record performances or take pictures of performances.

Curriculum and Instruction: Aligned and Rigorous Curriculum
a) To what extent does the school ensure that the arts curriculum encompasses creating, performing and responding and is fully aligned with the Kentucky Core Academic Standards?
b) To what extent does the school ensure that the arts curriculum provides for the development of arts literacy in all four arts discipline and also utilizes the Common Core Standards for English/Language Arts?
c) To what extent does the school ensure that the school's curriculum provides opportunities for integration as natural cross-curricular connections are made between the arts and other content areas?
d) To what extent does the school ensure that the arts curriculum includes the study of representative and exemplary works of dance, music, theater and visual arts from a variety of artists, cultural traditions and historical periods?

Curriculum and Instruction: Instructional Strategies
a) To what extent do teachers systematically incorporate all three components of arts study: creating, performing and responding into the arts?
b) To what extent do teachers provide models of exemplary artistic performances and products to enhance students’ understanding of an arts discipline and to develop their performance/production skills?
c) To what extent do arts teachers provide for the development of artistic theory, skills, and techniques through the development of student performances or products that are relevant and developmentally appropriate for students?

Curriculum and Instruction: Student Performance
a) To what extent are students actively engaged in creating, performing and responding to the arts?
b) To what extent do students identify a purpose and generate original and varied art works or performances that are highly expressive with teacher guidance?
c) To what extent do students, with teacher guidance, routinely use creative, evaluative, analytical and problem solving skills in developing and/or reflecting in their artistic performances and products?
d) To what extent do students use written and verbal communication to objectively reflect on exemplary exhibits and live or technologically provided performances as classroom assignments?

Formative and Summative Assessment: Assessments
b) To what extent do teachers guide students to use developmentally or grade level appropriate peer review and critique to evaluate each other’s work?

Formative and Summative Assessment: Expectations for Student Learning
a) To what extent do teachers utilize exemplar/models to encourage students to demonstrate characteristics of rigorous work in the appropriate art form in most instructional lessons/units?
Formative and Summative Assessment: Assessment for Teaching
To what extent do students regularly reflect on, critique and evaluate the artistic products and performances of others and themselves as is grade level and age appropriate?

Curriculum Standards

Math

G1
Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines.
Identify these in two-dimensional figures.

Draw and identify lines and angles and classify shapes by properties of their lines and angles.

Arts and Humanities

AH-4-SA-S-VA1
Students will recognize and describe elements of art (line, shape, form, texture, color) and principles of design (emphasis, pattern, balance, contrast) using visual art terminology.

AH-4-SA-S-VA2
Students will use the elements of art and principles of design in creating artworks independently and with others.

AH-4-SA-S-VA3
Students will explore, describe, and compare elements of art (e.g., line, shape, form, texture, primary and secondary colors, color schemes) and principles of design (e.g., focal point, pattern, balance, contrast) in two and three dimensional artworks.

AH-4-SA-S-VA4
Students will identify a variety of subject matter.

AH-4-PCA-U-3
Students will understand that the arts provide forms of nonverbal communication that can strengthen the presentation of ideas and emotions.

AH-4-P A-S-V A1
Students will be actively involved in creating and artworks.

AH-4-P A-S-V A2
Students will use knowledge of the elements and principles of art and art terminology to describe and critique their own work and the work of others.

AH-4-P A-S-V A4
Students will demonstrate audience behavior appropriate to context and style of visual arts observed/viewed; discuss opinions with peers in a supportive and constructive way.

AH-4-P A-S-V A5
Students will describe personal responses to artwork; explain why there might be different responses to specific works of art.