

INSTRUCTIONS FOR USING REMOTE LEARNING PROJECTS

These materials were developed with the intention of easing the transition between in-class and temporary remote learning. Learning experiences are aligned with curricular outcomes and assessment tools have been included with each project.

Note:

1. The teacher either sends a link to the appropriate project or sends the document itself.
2. The teacher ensures that parents/caregivers receive any required school supplies (bin with pencils, markers, paper, etc.).
3. The teacher reassures parents/caregivers that communication will be maintained between home and school.
4. The parents/caregivers may access additional resources at:
 - My Learning at Home (www.edu.gov.mb.ca/k12/mylearning)
 - My Child in School (www.edu.gov.mb.ca/k12/mychild/index.html)

PROJECT OVERVIEW

Grade :	8
Main Subject :	Science
Big Idea :	Optics, Surface Area, & Volume
Title :	PERSPECTIVE
Cluster :	Optics
Duration :	2 weeks
Materials :	Pencil, paper, ruler, scissors, tape, art supplies (such as pencils, charcoal, markers, or paint), box board, science textbook or research materials (needed for those without good internet access). Optional items: light source (e.g. flashlight) found objects/materials from around home (e.g., mirrors, shiny metal, tin foil, glass, clear plastic, etc.), camera
Short description :	A project-based unit using perspective to help us understand the characteristics and properties of light, surface area, and volume. Activities based on the multiple intelligences are used to develop understanding of these topics that culminates in a design project. Included in this plan are some suggestions for introductory synchronous instruction. Teacher check-ins and student sharing of learning is encouraged throughout the unit.

LEARNING OUTCOMES

Science: www.edu.gov.mb.ca/k12/cur/science/scicurr.html

8-2-01, 8-2-03, 8-2-04, 8-2-06, 8-2-09, 8-2-10, 8-2-11, 8-0-1c, 8-0-1d, 8-0-3d, 8-0-3e, 8-0-4b, 8-0-5b, 8-0-5c, 8-0-6d, 8-0-6e

Mathematics: www.edu.gov.mb.ca/k12/cur/essentials/docs/glance_kto9_math.pdf

8.SS.2, 8.SS.3, 8.SS.4, 8.SS.5

ASSESSMENT													
LANGUAGE ARTS					MATHEMATICS			SCIENCE			SOCIAL STUDIES		
COMP. Listening & Viewing	COMP. Reading	COMM. Speaking & Represent.	COMM. Writing	Critical Thinking	Knowledge and Understanding	Mental Math & Estimation	Problem Solving	Knowledge and Understanding	Scientific Inquiry Process	Design Process & Problem Solving	Knowledge and Understanding	Research and Communication	Critical Thinking and Citizenship
					x		x	x		x			

Original concept created by: Denise Smith

LEARNING EXPERIENCES AND ASSESSMENT

Question:
How does perspective help us understand 3D objects? (Math)
How do artists create perspective? (Art)
How does light affect our perspective? (Science)

Teacher’s instructions:
Introductory Activities

The start of the unit sets the stage for the unit. These suggested introductory learning activities are designed to provide students with basic background information of the concepts or essential understandings that comprise this unit. As you assess student products, conversations and/or observations during this stage, students should be able to obtain an understanding of the essential understandings in the first one or two columns of the rubric.

Opening the Unit: To open this unit begin with an opening activity to introduce the topic of ‘perspective’. You might do this by asking students, “What does perspective mean?” Students can respond in the chat box in your online platform. Choose some students to share more about what they wrote. Students can respond to each other using emojis.

You can follow up with “What questions do you have about perspective?” The results of this sharing can then be compared with the Essential Questions and rubric for the unit. It is important to recognize the questions the students have and that adjustments to this unit could be made based on their questions.

Background Activities: The remaining suggestions of activities are meant to provide students with the foundational knowledge of the concepts being studied to prepare them for further investigation. They should allow students to be able to reach the first and second columns of the rubric. (Students can begin working on their Independent Learning experiences even if you have not done all of these with your students.) These suggestions are based on the Essential Questions, you may need to adjust these activities based on the questions the students came up with in the opening activity.

1. Before a synchronous session with students, have students find a 3D object that they will bring to the session. During the session, students will have their 3D object hidden from camera view. Students can take turns describing the features of the 3D shape of their object for their classmates to guess without naming the object or its shape (e.g., It has 6 square faces). Use this as an opportunity to review and highlight vocabulary as needed. Students would use a mic for describing and the chat box for guessing.
2. Project some images of nets of 3D shapes and have students explain what 3D shape the net represents.

3. Mini lessons on math concepts to review area of rectangles, triangles, and circles and to introduce concepts of surface area and volume.
4. Share a variety of art pieces done with different media. Have students share ideas for how the artists create perspective as well as identify different media used to create perspective.
5. Have students view short videos that introduce students to the basic properties of light – light travels in straight lines, refraction, reflection, and color theory. This could be done asynchronously. (Students will have opportunities to play with these concepts and investigate them further later in the unit.) Sample video
<https://www.youtube.com/watch?v=Pc8CINudWEU>

Project Learning Experiences

Below is an outline and a few notes on the learning experiences that are designed for students to investigate the topics they have been introduced to in the introductory activities. Actual task cards for students to use follow the planner. Encourage students to explore and think about the prompt before beginning the tasks.

Students would be expected to complete as many tasks as possible. Students would not be penalized if they don't complete all of the tasks. Students need to demonstrate their understanding of the concepts and may be able to do this without necessarily completing all tasks. Students could suggest alternate assignments if desired. **These activities can be done in any order and not all activities take the same amount of time.** Student work on these activities should allow students to develop their thinking and to move to the second and third column on the assessment rubric.

Assessment of student thinking should include products, observations, and conversations as much as possible. Some of this may take place during individual meetings with students. These will encourage students to develop their critical and creative thinking skills and prepare them for the final stage of the unit.

During synchronous sessions with the whole class or small groups you should have students share their learning on the various learning experiences. This will provide some scaffolding for those who need support and a prompt for others to go deeper when they attempt the task.

Project Learning Experiences Outline:

Verbal Linguistic	-develop formula/method for calculating volume and/or surface area of cylinders and triangular prisms, write a step-by-step guide for how to calculate the surface area or volume (OR musical-rhythmical) – <i>can assign students which calculation and shape or leave it open</i>
Visual/Spatial	-how do artists use shading to make objects appear 3D in a 2D representation – <i>provide pieces of art besides the ones linked in the student page</i> -examine cubes drawn in one-point and two-point perspective, share findings, reproduce technique – <i>provide additional images or perhaps a video, may need to scaffold some students with direct instruction if needed</i> -create a piece of art that depicts refraction and reflection (OR bodily-kinesthetic)

Logic/ Mathematical	<p>-examine the best shape for a container to hold 4500-5500 cm³ cereal.</p> <p>-create an animation or video to demonstrate the properties of light. (OR see bodily-kinesthetic for maze activity)</p> <p>-create a Venn diagram to compare and contrast additive and subtractive color theory</p>
Bodily/ Kinesthetic	<p>-build 3D shapes from nets, sculpt 3D shapes, make nets for 3D objects</p> <p>-create a dance to illustrate the properties of light</p> <p>-using materials found at home, create a maze for light to travel through</p>
Musical/ Rhythmical	<p>-write a song or rap about how to calculate the surface area and volume of a 3D shape</p>
Intrapersonal	<p>-journal entries reflecting on what they have learnt. How does the shape of an object affect how you determine the surface area/volume?</p>
Naturalistic	<p>-examine perspective in nature; go for a walk and take pictures - investigate the lines that create perspective using photos or sketches from nature walk/observation</p> <p>-investigate natural light phenomena – <i>encourage students to do different phenomena</i></p>

Final Learning Experience

The final learning experience is designed to continue to deepen students' understanding of the concepts. The learning experience is an opportunity for students to apply what they have learned through the earlier tasks while connecting many of the concepts involved in this unit. This final task should provide opportunity for students to reach the third and fourth columns of the rubric. Continue to assess student products, conversations and observations.

How to Use the Rubric

1. The rubric is to be used throughout the learning experiences. There is no need for individual criteria or rubrics for each task. Students will use each task to further their understanding of the essential understandings. Students will be demonstrating this through a variety of modalities.
2. As you collect evidence of students' level of understanding, highlight or check off their progress on the rubric. You should notice your students move across the rows as their understanding develops throughout the experiences. Do not average your check marks or highlights. Student obtain their highest level of understanding. It does not matter where they start.

Step-by-step instructions for students:

See below or see *Perspective Student Copy PowerPoint*

Learning Experiences – Student Copy

During these learning experiences we will be examining the following questions:

- How does perspective help us understand 3D objects?
- How do artists create perspective?
- How does light affect our perspective?

Below you will find a number of learning experiences that will allow you to develop your understanding and help you to answer the above questions. You may do them in any order and if you have another idea of something you would like to do please connect with me to discuss your ideas.

Before you start each task, take some time to consider the thinking prompt. This will help prepare you for the task.

As you work through these experiences you will assess your depth of understanding using the assessment rubric. Use that as a guide as you choose tasks to ensure that you are able to answer the questions by the end. During class sharing and individual check ins you will have opportunities to demonstrate your understanding and we will discuss your progress.

I hope you will enjoy these learning experiences and I look forward to discussing your learning with you.

Verbal- Linguistic/Musical- Rhythmical	<p><u>Thinking Prompt:</u> How do you calculate the surface area and volume of 3D shapes? What are the steps involved with calculating the surface area and volume of a 3D object?</p> <p><u>Do:</u> A step-by-step guide provides a list of steps one must do to complete a task. It breaks a complicated task down into smaller chunks. What features besides words can be used to make a guide useful for the user? Write a step-by-step guide to calculate the surface area and volume of a 3D shape.</p> <p>OR</p> <p><u>Do:</u> Write a song or a rap to tell how to calculate the volume and surface area of a 3D shape.</p>
Visual-Spatial	<p><u>Thinking Prompt:</u> Look at the artistic representations of 3D shapes. (Sample images: https://brianchoportfolio.wordpress.com/geometric-shape-shading/) How do artists make 2D drawings of objects appear 3D?</p> <p><u>Do:</u> Choose a medium (e.g. pencil, crayon, markers, paint, etc.) of your choice and make an artistic drawing/sketch/painting of one or more 3D objects.</p>

<p>Visual-Spatial</p>	<p><u>Thinking Prompt:</u> Examine the artifacts showing cubes drawn in one-point and two-point perspective. (Sample one-point perspective: https://sites.google.com/a/robynbriggs.com/teaching/architectural-drawing-1/one-point-perspective and sample two-point perspective: http://makingartfun.com/htm/f-maf-art-library/two-point-perspective.htm) How are the drawings the same? How are they different? What clues are there showing you how the artists created the drawings?</p> <p><u>Do:</u> Using a medium (e.g. pencil, crayon, markers, paint, etc.) of your choice, reproduce techniques the artists used to create a cube in one-point and two-point perspective.</p>
<p>Visual-Spatial/ Bodily-Kinesthetic</p>	<p><u>Thinking Prompt:</u> How are refraction and reflection the same? How are they different?</p> <p><u>Do:</u> Create a piece of art that depicts the similarities and differences between refraction and reflection.</p> <p>OR</p> <p><u>Do:</u> Create a dance to depict the similarities and differences between refraction and reflection.</p>
<p>Logical-Mathematical</p>	<p><u>Thinking Prompt:</u> In stores we see all different shapes and sizes of containers. Why is there a variety? Are some shapes better suited for different products? What are some pros and cons of different shapes as containers?</p> <p><u>Do:</u> Create a container to hold 4500-5500 cm³ cereal. Be prepared to justify your choice of shape and dimensions.</p>
<p>Logical-Mathematical/ Bodily Kinesthetic</p>	<p><u>Thinking Prompt:</u> How does light travel? What can cause light to deter from its path?</p> <p><u>Do:</u> Create an animation or video to demonstrate the properties of light.</p> <p>OR</p> <p><u>Do:</u> Using materials found around your home, create a maze for light to travel through.</p>
<p>Logical Mathematical</p>	<p><u>Thinking Prompt:</u> What are the additive and subtractive color theories? How are they the same? How are they different?</p> <p><u>Do:</u> Create a Venn diagram or other visual organizer to compare and contrast additive and subtractive color theory.</p>

Bodily Kinesthetic	<p><u>Thinking Prompt:</u> Nets are a method of representing a 3D shape so that all of the surfaces can be seen at one time. How would you create a net for another 3D shape?</p> <p><u>Do:</u> Choose a block or 3D object found around home and draw the net for the block/object. Drawings should include accurate shapes and measurements. Your net should either be drawn to match the actual size of the 3D object or be drawn according to a scale if it is large. Once it is drawn, try building it to make sure it works.</p>
Intrapersonal	<p><u>Thinking Prompt:</u> How is finding the surface area of different shapes the same? How is it different? How is finding the volume of different shapes the same? How is it different? How does the shape of a 3D object affect how you calculate the surface area and the volume of that object?</p> <p><u>Do:</u> Write a journal entry explaining your thoughts to this question.</p>
Naturalistic	<p><u>Thinking Prompt:</u> When we look around, how do objects that are further away compare to objects that are closer to use? How can photographers play with this view to create interesting photos? How do artists use how we view depth to help them draw depth on a flat surface?</p> <p><u>Do:</u> Examine perspective in nature - go for a walk and take pictures or make sketches that show depth. Use your photos or sketches to investigate the lines that create perspective. Use a medium/method of your choice to present your findings.</p>
Naturalistic	<p><u>Thinking Prompt:</u> How do rainbows appear in the sky? Why is the sky blue? What causes a Sun Dog, mirages, etc.? How are natural phenomena connected to the characteristics of light?</p> <p><u>Do:</u> Choose a natural light phenomenon and investigate how it works. Choose a medium/method of your choice to share your findings.</p>

Final Learning Experience:

Create a prototype or draw a detailed plan for a device such as a toy or entertainment device that uses the characteristics of light. As well, design a package or container to display and market your device. Justify your design choices for both your prototype/plan and its packaging.

APPENDIX (PRINTABLE SUPPORT MATERIALS INCLUDING ASSESSMENT)

- PowerPoint: Student Copy
- Assessment Rubric

Assessment Rubric

	Essential Understanding	Limited	Basic	Good	Very Good to Excellent
Mathematics Knowledge & Understanding	3D shapes can be classified and analyzed according to their unique characteristics	Identify 3D shapes using their unique characteristics.	Sketch 3D shapes using their unique characteristics.	Discriminate 3D shapes according to their unique characteristics.	Constructs 3D shapes according to their unique characteristics.
	Measurements can be used to solve problems related to 3D objects.	Distinguish between surface and volume of 3D objects.	Applies formulas to calculate surface area and volume.	Explains measurements that can be used to calculate surface area and volume of a 3D shape.	Formulates measurements that can be used to solve problems containing 3D objects.
	3D shapes can be represented in different ways.	Names different ways to represent 3D shapes.	Matches representations of 3D shapes with the real shape.	Produces different representations of 3D shapes.	Justifies the choice of representation of 3D shapes.
Mathematics Problem Solving	Knowledge, skills & understandings can be used to solve problems.	Identifies knowledge, skills, & understandings needed to solve problems.	Gives examples of knowledge, skills, & understandings needed to solve problems.	Applies knowledge, skills, & understandings to solve problems.	Justifies the choice of knowledge, skills & understandings used to solve problems.

Visual Arts	Artists have specific techniques to create the illusion of perspective in drawings and paintings.	Lists techniques artists use to create the illusion of perspective.	Identifies techniques artists use to create the illusion of perspective.	Recreates techniques used by artists to create the illusion of perspective.	Creates art that demonstrates perspective.
	Artists use their medium to communicate their perspective.	Names media that artists use to communicate.	Restates examples of how artists use their medium to communicate their perspective.	Compares the use of medium to communicate perspective.	Considers how the medium is used to communicate an artist's perspective.
Science Knowledge & Understanding	Light has specific characteristics that can create various natural phenomena.	Names phenomena that are created by light.	Describes the characteristics of light.	Explains how light can create natural phenomena.	Simulates how light creates various natural phenomena.
	Light can be manipulated for specific purposes.	Names ways light can be manipulated.	Describes the effects of manipulating light.	Dissects how light can be manipulated for specific purposes.	Develops a plan to manipulate light for a specific purpose.
Science Design Process and Problem Solving	Scientific knowledge can be used to solve practical problems.	Retells a situation where knowledge about light was used to solve a problem.	Recognizes a problem that could be solved using scientific knowledge about light.	Demonstrates use of scientific knowledge to solve a problem.	Designs a solution based on scientific knowledge of light to solve a problem.