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## **Artists in All Subjects: Integrating Art Into the Content Areas**

Katherine Panning

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**Artists in All Subjects: Integrating Art Into the Content Areas**

by

Katherine Panning

A Senior Project in Fulfillment of the Requirements of the Honors Program

St. Catherine University

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## **Abstract**

The state of Minnesota provides statewide expectations of what students in grades K-12 should know in public schools by the end of the school year. There are standards in all subjects, including art. However, not all schools have an art professional to teach these standards. Fine art programs are often the first programs to be cut from schools due to budget restrictions. This project has two main goals. First, to address the misconception that art is expensive to include in the classroom, whether the general teacher's classroom or by having an art teacher to lead the instruction. Second, to show that art education can be integrated into all content areas and can make learning for students richer and provide more meaningful connections. This honors project consists of interdisciplinary mini units, meaning across multiple subjects, grounded in the visual arts for students in kindergarten through fifth grade. The mini units also integrate social justice, social emotional learning, collaboration opportunities, and project based learning with the arts being the heart of these lessons. This project shows that art is for the youngest students as well as students in upper elementary and beyond. By having learning that occurs across disciplines, students are more engaged, they participate in higher level thinking, and it shows connections between disciplines to the real world.

## **Acknowledgements**

This project would not have been possible without the support of my professors, family and peers. There are some people that I would especially like to thank and acknowledge for their involvement in my project.

My advisor, Dr. Mary Hedenstrom and my committee, Dr. Suzanne Kaback and Charlotte Todd for your endless guidance and wisdom. We were an excellent team and I am incredibly grateful you all agreed to be a part of this process. You helped my project be an enjoyable experience and your brilliant comments and suggestions helped shape this project into the best version possible. Your support carried me through all stages of my project, from the initial researching stages, through presenting my final draft.

The honors program director, Dr. Rafael Cervantes for your flexibility with my project timeline and allowing me to create and research a project that was meaningful to me.

My parents, brother, and my Grandma Skoglund for listening through all my challenges, ideas, and providing any technical support I needed. I do not know what I would have done without you cheering me on the whole way through.

## **Contact Information**

Each unit has materials associated with it. All of the resources are attached at the end of the unit where it is used or it is linked. For access to digital files of the slides, packets, or other materials find contact information for the author below.

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# Caring for Ourselves and Others: Kindergarten Literacy Mini Unit

<b>Grade:</b> Kindergarten	<b>MN State Standards</b>
<b>Subject:</b> Literacy, Art and Social Emotional Learning (SEL)	<b>0.1.1.1</b> With prompting and support, ask and answer questions about key details in a text.
<b>Time:</b> Four - 30 Minute Lessons	<b>5.0.2.3.2</b> Identify safe procedures for using materials and tools while making art.
<b>Prior Knowledge:</b>  Students should have experience participating in an interactive read aloud. However, if they do not, students will still be successful in this unit.	<b>Learning Targets:</b>  I Can... <ul style="list-style-type: none"> <li>- Ask questions about key details in a text with prompting.</li> <li>- Answer questions about key details in a text with support.</li> <li>- Identify safe procedures for using materials and tools.</li> <li>- Demonstrate safe use of tools and materials while making art.</li> </ul>
<b>Vocabulary:</b> <ul style="list-style-type: none"> <li>- Kindness</li> <li>- Swagger</li> <li>- Miraculous</li> <li>- Salaam</li> </ul>	
<b>Materials:</b> <ul style="list-style-type: none"> <li>- <i>Each Kindness</i> by Jacqueline Woodson</li> <li>- <i>The Cool Bean</i> by Jory John</li> <li>- <i>Beautifully Me</i> by Nabela Noor</li> <li>- Kindness bingo board (linked where needed)</li> <li>- Bowl</li> <li>- Water</li> <li>- Stones or some small pebbles</li> <li>- Large poster paper or a whiteboard</li> <li>- Crayons</li> <li>- Watercolor paints</li> <li>- Black sharpies or black markers</li> <li>- <i>The Cool Bean</i> booklet (linked where needed).</li> <li>- Rubric (attached at the end)</li> <li>- Parent letter (attached at the end)</li> </ul>	

**Assessment:**

**Pre-Assessment:** Students will be asked to share what it means to be kind or what are some ways they are kind. This information can be used to help share the discussions and will tell you what students already know about kindness.

**Formative Assessment:** Students will be assessed for the literacy standards based on their participation during discussion and if their responses are aligned with the meaning of the text.

**Summative Assessment:** Students will complete an art project at the end of the unit to demonstrate their understanding of the art standard. In terms of the literacy standard, students will be assessed based on their formative assessment results from the discussions.

**Additional Resources:**

“A Guide to Using Books About Feelings and Emotions in Your Classroom” (article is in cell C1 of the spreadsheet) <http://bit.ly/3kylPJU>

*Each Kindness* Book Guide <http://bit.ly/3kBjDkR>

## Daily Plan

**Day 1: Introduce Unit and Read *Each Kindness***

1. Explain to students that today we are going to be reading about kindness and completing some activities over the next couple of days.
2. Before posing the questions below, now is a good time to review large group discussion guidelines. Some things to review could be but are all dependant on preference:
  - Raise your hand when you have something to share.
  - Demonstrate the turn and talk strategy. This is when students turn to a partner (can be pre-assigned) and talk about their thoughts. This can be extended to a think - pair - share strategy where students take an additional step to share their ideas out loud with the class.
  - Make sure the discussion is respectful and we are being kind to ourselves and everyone in the room.
  - Reviewing any sentence frames that might be helpful for students. For example: I agree with \_\_\_\_\_ because or I think \_\_\_\_\_.
3. Ask students, what does it mean to be kind? Or to put it a different way, think about ways you are a kind friend? What are those ways?
4. Give students time to think and have them turn and talk with a partner. After all students have had time to share with their partner, invite students to share aloud with the whole class the ideas they thought of that are ways to be kind or what kindness is.

This will be the pre-assessment for this mini unit.

5. Introduce *Each Kindness* by Jacqueline Woodson. Ask students, while showing them the cover, “What do you think this book will be about?” Give students time to think and then have them raise their hands and share.
6. Read the book. As you are reading, stop and ask the following questions. Possible student responses are listed below each question. Make sure to provide enough think time and maybe even have students turn and talk in partners before sharing aloud.

#### Questions to Ask While Reading:

- Page 4: (After reading all of the page) How do you think Maya is feeling? How do Maya’s new classmates perceive her?
  - Maya is feeling \_\_\_\_\_.
    - Sad
    - Angry
    - Mad
    - Lonely
    - Scared
  - Maya’s classmates perceive her \_\_\_\_\_.
    - Old clothes
    - Spring shoes
    - Broken strap
    - Feeling (sad)
- Page 10: (After reading all of the page) We have seen how Chloe, the person telling the story and Chloe’s classmates treat Maya. What are the different ways so far Maya has been treated?
  - One way Chloe and her classmates treat Maya is \_\_\_\_\_.
    - Not saying hi
    - Not smiling
    - Being mean
    - Ignoring her or looking away
    - Whispering secrets
- Page 19: (After reading all of the page, ask this question for a comprehension check) How is kindness like dropping the stone into the water?
  - Kindness is like dropping a stone into water because \_\_\_\_\_.
    - It ripples
    - Each little thing we do goes out like a ripple into the world
    - Kindness spreads
    - One small act can cause others to do the same
- Page 23: (After reading all of the page) Make a prediction: Will Maya come back to school? Yes or No
  - Students answer with a thumbs up for yes, thumbs down for no, or maybe they are unsure and that is alright
- Page 27: (After reading all of the page) How is Chloe feeling right now?
  - Sad
  - Angry



- Upset
- Lonely
- Disappointed
- How am I supposed to know how she is feeling?

7. Begin to wrap up the discussion. After reading, ask students what are ways that Chloe could have shown kindness to Maya?

Possible Student Responses:

- Including her in the games
  - Standing up for Maya
  - Talking to her
  - Smiling
  - Chloe was not a kind friend, but I do not know how she could have shown kindness
8. Thank students for sharing and explain that we always need to show kindness even if it is something as small or as simple as saying hello, holding the door open or including someone in the game you are playing.
  9. Tell students, just like Chloe's teacher did, we are going to see how our kindness is like a ripple. Have a bowl of water at the front of the room with a bowl of rocks or pebbles nearby.
  10. Since there is a transition here, now is a good time to take a brain break. Brain breaks are 3-5 minute quick breaks in a lesson. Choose an activity that best meets the needs of your students or one that they already are familiar with. Have students finish their brain break by moving back to their spots.
  11. Ask students to think of one act of kindness they have done. Give students time to think. Tell students once they are ready to share to give you a thumbs up.
  12. Have students gather around the bowl and one at a time have them share one act of kindness they have done. Then they can drop the stone you just handed to them in the bowl. If students need help thinking of kind things, have them think back to what you all discussed about ways Chloe could have been kind.
  13. After all students have had a chance to share, begin to wrap up the lesson.
  14. Explain to students that today we read a story about being kind, and we talked about different ways we are and can be kind. Now is the perfect opportunity to share what students have said. For example, Timmy shared that he showed kindness when he \_\_\_\_\_ or Shea shared how she was a kind friend because she \_\_\_\_\_. Well, these are all examples of how we can be kind and even a small act of kindness can change the world.
  15. Conclude the lesson by explaining that today's lesson helped us practice answering and asking questions about a story and give a preview to tomorrow's lesson explaining to students that tomorrow we will keep reading and learning about kindness and how it is "cool" to be kind. Send home the letter. Explain to students that at the end of this unit they will be working on a project using words to describe themselves. On the letter there is a space to tear off and return to school. The bottom should be filled out and brought back to school on or before the last day of the unit.

## Day 2: Review from Yesterday and Read *The Cool Bean*

1. Review what was discussed yesterday. Ask students questions like:
  - What was the book about that we read yesterday?
  - How is kindness like a ripple?
  - What are ways that you are a kind friend?
2. After reviewing the book from yesterday, talk about the learning goals for today. Explain to students that yesterday they worked on them and today we will continue working on them as well as tomorrow. The learning targets are:
  - Ask questions about key details in a text with prompting.
  - Answer questions about key details in a text with support.
  - Identify safe procedures for using materials and tools.
  - Demonstrate safe use of tools and materials while making art.
3. Introduce today's book. "Today we will be reading a book titled *The Cool Bean* by Jory John. Yesterday I shared with you that today's story would be about how it is cool to be kind. As we read, I want you to think about the story we read yesterday and the ways Chloe was kind, or the ways she was not kind and see if you see any similarities with this book and the ways the "cool beans" are or are not kind."

**Teacher Tip:** Write these questions on the board or somewhere so students can see and recall what they are supposed to be thinking about.

4. Start reading *The Cool Bean*. As you are reading, here are some discussion questions to ask with possible student responses. Make sure to provide enough think time and maybe even have students turn and talk with a partner before sharing aloud.

### Questions to Ask While Reading:

- Page 3: (After reading all of the page) We know nothing about these beans, yet they have been called cool two times! What do you think makes these beans cool?
  - Their clothes
  - Type of bean
  - How they walk
  - They are not cool beans... we should not base coolness off of appearance.

Tell students "Let's read on to see if your predictions on what makes these beans cool is right."

- Page 4: (After reading all of the page) What does the word swagger mean?
  - Strut
  - Walk
  - Why would I know
  - Walk with confidence
- Page 7: (After reading all of the page) How do you think the narrator bean is feeling?
  - Sad
  - Lonely

- Confused
- Alone
- Mad
- Wishes he had friends
- Misses his friends
- (Or you might have a student say he looks happy, which you could follow up with why they think that)?
- Page 9: (Ask after reading all of the page) Think back to your predictions from the beginning, were they right? Would you change your answer?
  - Thumbs up- yes
  - Thumbs down- no
- Page 12: (Ask after reading all of the page) Why does the narrator think he is uncool?
  - Walks into stuff
  - Balls hit him on the head
  - Clothes don't fit
  - Snorts when laughing
  - Picked last
  - Sad all of the time
- Page 18: (Ask after reading all of the page) What does the word miraculous mean?
  - Something extraordinary or extra special
  - Helping someone
  - A feeling
  - I don't know
- Page 18: (After reading all of the page) How was what the cool bean do miraculous?
  - He helped someone
  - He was kind
  - He was nice
  - It was really not that special
- Page 21: (After reading all of the page) Is this a kind way to respond?
  - Thumbs up- yes
  - Thumbs down- no
  - No response
- Page 21: (After reading all of the page, ask this after the previous question) What would have been a better way to respond?
  - Not laugh
  - Help him out
  - Tell him what the teacher asked
- Page 23: (After reading all of the page) What have been the three small gestures? (You can define gestures. A gesture is an action that shows feelings or intent)
  - Repeated the question
  - Gave a band aid
  - Helped him clean up his lunch
- Page 25: (After reading all of the page) How have the small gestures made the narrator feel?
  - Happy
  - Confident

- Proud
- Makes him feel better

5. Begin to wrap up the discussion. Ask students: The narrator learned an important lesson. What did he learn? What does it mean when we say kindness is cool?

Possible Student Responses:

- Learned that kindness is cool.
- Coolness is not defined by what you have but by how you act.
- When you are kind, it makes an impact on those around you.
- It is cool to be kind!

6. Thank students for sharing and conclude the discussion by explaining to students that it is cool to be kind because one kind act can make a big difference in someone's day.
7. After the discussion is wrapped up, introduce the activity that goes along with the book. For the activity to pair with the book, students will complete a kindness bingo game. There are different versions of the card so students can get bingos at different times. To access the different versions, you need to go to the original resource which is linked below. This resource is from Counselor Kerri. The bingo card from here: <http://bit.ly/3R9RtcX>.
8. Students go around completing kind acts during the school and they can mark off the space once they completed the kind act. Once students get a bingo or blackout (up to teacher) students can feel proud of all the ways they were kind. To start the activity, students could have time set aside during morning meeting to complete one square. (If desired, students could get a cool bean kindness sticker for completing their card but that is up to the discretion of the teacher). This activity could be an anchor for the expectation of kindness and respect all year. This also could be an activity that is sent home over a break or over a weekend so students can also complete the activity at home.
9. If there is time, as a class, complete one of the spaces on the bingo card.
10. After the bingo cards are passed out, wrap up the lesson. The bingo card activity can take place throughout the day or even throughout the unit. Talk about how practicing our asking and answering questions about a story is helping us get closer to mastering our learning targets. Provide a brief introduction to tomorrow's story. Tell students that tomorrow we are going to talk about how it is super important to be kind to others, but it is also important to be kind to ourselves. Remind students of the letter they took home about this unit. Explain that in two days they will need to bring it back if they have not already done so with the words filled out at the bottom.

### **Day 3: Review from Yesterday and Read *Beautifully Me***

1. Review what was covered yesterday. You could ask questions like the following to help students recall content.
  - What did the narrator learn in the book we read yesterday?
  - Why is it cool to be kind?

- What were some ways that the “cool beans” were kind?
- 2. After reviewing the book from yesterday, talk about the learning goals for today. Explain to students that yesterday they worked on them and today we will continue working on them as well as tomorrow. The learning targets are:
  - Ask questions about key details in a text with prompting.
  - Answer questions about key details in a text with support.
  - Identify safe procedures for using materials and tools.
  - Demonstrate safe use of tools and materials while making art.
- 3. Introduce today’s book. “Today we will be reading a book titled *Beautifully Me* by Nabela Noor. While reading, I want you to pay attention to the different ways the main characters as well as other characters in the book are kind, or are not kind to themselves.”

**Teacher Tip:** Write these questions on the board or somewhere so students can see and recall what they are supposed to be thinking about. Use visuals when writing the questions.

- 4. Start reading *Beautifully Me*. As you are reading, here are some discussion questions to ask with possible student responses. Make sure to provide enough think time and maybe even have students turn and talk with a partner before sharing aloud.

#### Questions to Ask While Reading:

- Page 1: (After reading all of the page) What does Salaam mean?
  - Hello
  - Goodbye
  - I have no clue
  - It is a respectful greeting in many Arabic speaking and Muslim communities
- Page 7: (After reading all of the page) Why does Zubi feel sad?
  - Her sister says she is not pretty
  - Her mom is not being kind to herself
  - Everyone around her is concerned about their appearance
  - Those around Zubi are sad so she feels sad too.
- Page 15: (After reading all of the page) What happened during recess?
  - The students were playing
  - Nothing happened to Zubi
  - Zubi said another classmate being made fun of because of the clothes they were wearing
  - Zubi said it was fine, so we should believe her
- Page 20: (After reading all of the page) Why is Zubi crying?
  - Lots of reasons
  - The way clothes look
  - A large is not good
  - Tummy too big
  - She doesn’t want other kids to make fun of her
- Page 21: (After reading all of the page) Who can remember why today was a special

day?

- It was the first day of school
  - Page 30: (After reading all of the page) What are ways you can make the world more beautiful?
    - Being a kind friend
    - Taking care of the Earth
    - Being nice to ourselves
    - (The answers for this question are endless- the focus is on how we can make the world a better place)
  - Page 34: (After reading all of the page) What does it mean to make the world a bit more Zubi?
    - It means to show more kindness
    - To be forgiving
    - To be loving and understanding
5. Begin to wrap up the discussion and point out to students that it is important to be kind to others and ourselves. Ask students, what lessons does Zubi learn on her first day of school? Are they similar or different to lessons you learned on your first day of school?

Possible Student Responses:

- You need to be kind yourself!
- How we treat ourselves impacts those around us.
- Kindness is cool!

For the similarities and differences question, student response will probably vary but try to connect student response to the book or even prior books as much as possible.

6. Thank students for sharing and conclude the discussion by explaining to students that it is not only important to be kind to those around us but to ourselves as well.
7. Explain to students that now having read three different books about kindness, we are going to start an art project that will help us see kind things in ourselves.
8. Before passing out any materials, review how we use the materials, explain the directions as well and write the directions on the board so students can review them as needed. You can also ask students to share ways they can be safe while working on their project like walking and using materials properly. Project idea is from Soul Sparklettes. Directions can be found here: <http://bit.ly/3yKjMWV>, but I would follow the adapted version found in the directions for day four which would work better for kindergarten. Below are the expectations for using materials. These can be adapted as necessary.
- Review marker etiquette. Remind students they are not for drawing on skin, on one another or on the desks. They are for using on paper.
  - Talk about using water colors. This might be a new medium for students. Show students that all they need is a little water to add to a paint pallet and then they can add it to the watercolor cake and put the paint on their paper. Again, paint goes on paper, nowhere else.
  - Crayon usage: before students paint, they can draw with crayons and then paint

over the crayon to have neat designs. Some points to discuss: where we can draw with crayons, do we eat crayons, amount of pressure to use so the crayons do not break, and anything that might be applicable for the students.

9. After reviewing the material expectations, close the lesson. Review the learning targets and ask students to share ways they are meeting their learning goals. Explain to students that tomorrow they will have the entire time to work on their project and that they can start thinking of positive words that describe themselves. Remind students of the letter they took home about this unit. Explain that tomorrow they will need to bring it back if they have not already done so with the words filled out at the bottom.

#### **Day 4: Review Content from Previous Lessons and Complete Art Project**

1. Review the three books read in class the previous days. Ask students what all the books have in common. (They are all about kindness!)
2. Review the art tools and safe practices. Below are the expectations for using materials. These can be adapted as necessary.
  - Review marker etiquette. Remind students they are not for drawing on skin, on one another or on the desks. They are for using on paper.
  - Talk about using water colors. This might be a new medium for students. Show students that all they need is a little water to add to a paint pallet and then they can add it to the watercolor cake and put the paint on their paper. Again, paint goes on paper, nowhere else.
  - Crayon usage: before students paint, they can draw with crayons and then paint over the crayon to have neat designs. Some points to discuss: where we can draw with crayons, do we eat crayons, amount of pressure to use so the crayons do not break, and anything that might be applicable for the students.
3. Introduce the art project. Directions below are adapted from the Soul Sparklettes activity that can be accessed here: <http://bit.ly/3yKjMWV>.
  - Explain to students that they will be completing an all about me ladder. The first thing students need to do is to write their name on the back of the paper. To make this project developmentally appropriate for kindergarten, have the lines already drawn on the paper. For clarification or more directions on how the ladders should look, see the original resource here: <http://bit.ly/3yKjMWV> or the sample in the family letter.
  - Next students fill the shapes with words that students would use to describe themselves. Students should have a list of words to describe themselves that was brought from home. Students can copy these words into the spaces. If students do not have a list, the teacher can assist with spelling and coming up with a list. Ultimately, if students have no list, they sound out words to the best of their ability.
    - After students have written the words in the spaces (they do not have to use all of the words), they now can take a crayon and draw anything they would like in the empty spaces to add some texture and additional detail to their final project.
    - Once students have had a chance to add any details with crayons, now they can use the watercolors and fill their page. I recommend encouraging students to not use the water color on top of their letters, but they are the artists and they

can make their own choices.

- After students are done, see rubric at the end to grade students for the learning targets for the unit.
  - Display student artwork in the classroom to help continue developing a sense of community and to remind students about the importance of kindness.
4. This entire class time is dedicated to working on the art project. If students finish early, there is a booklet based off of *The Cool Bean* that students can cut out, color and write kind acts on. This resource is from Counselor Keri. The booklet can be found here: <http://bit.ly/4030oB1>.
  5. Before passing out this activity, reviewing scissor safety would be a great teacher move! It is recommended talking about what we use scissors to cut. Scissors are used to cut paper, yarn, etc. They are not used to cut hair, clothes, one another, etc.
  6. Conclude the lesson by reviewing the learning targets and asking students to share how they met the learning targets. Students can also share one way they can be kind.



## Caring For Ourselves and Others: Rubric

**Note:** This is a single point rubric. Students either meet the criteria or they do not. Whichever category they fall into, mark in the met or did not meet column.

Did Not Meet	Did you?	Met
	Answer key details in a text with prompting and support.	
	Ask about key details in a text with prompting and support.	
	Follow the classroom discussion etiquette.	
	Identify safe procedures for using tools and materials.	
	Demonstrate safe use of tools and materials while making art.	

Additional criteria can be added, but these points align with the learning targets. (Discussion etiquette is not a learning target, but is reviewed in the lesson and is a student expectation.)

Dear Kindergarten Families,

This week in class we are talking about kindness and how it is cool to be kind to ourselves and others. At the end of this unit, your child will complete a project that will include words that describe them. Attached is a sample project to see an idea of what we are making.



By the end of the week, please return the bottom portion of this letter filled out. Please have a discussion with your child about words to describe themselves like confident, brave, strong, kind and so on. We will use these words to fill out the project so it matches each student individually. The purpose of you having this discussion at home not only shows the importance of kindness and includes everyone in our learning community but also allows for students to have the correct spelling for their final project.

Please feel free to contact me if you have any questions.

Your Student's Teacher

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Please return this portion by the end of the week:

Six words to describe me are...


# Sample Project

Project created by Katherine Panning 2023



# Map it Out:

## 1st Grade Location and Mapping Unit

<p><b>Grade:</b> 1st Grade</p>	<p><b>MN State Standards</b></p>
<p><b>Subject:</b> Social Studies, Art and Literacy</p>	<p><b>1.3.1.1.1</b> Create sketch maps to illustrate spatial information about familiar places; describe spatial information found on maps.</p>
<p><b>Time:</b> Four - 30 Minute Lessons</p>	<p>For example: Spatial information—cities, roads, boundaries, bodies of water, regions. Familiar places—one’s home or classroom.</p> <p><b>1.3.1.1.2</b> Use relative location words and absolute location words to identify the location of a specific place; explain why or when it is important to use absolute versus relative location.</p> <p>For example: Relative location words—near, far, left, right. Absolute location words — street address (important for emergencies, mail).</p> <p><b>5.1.2.3.1</b> Identify and use symbols when creating <i>art</i>.</p> <p><b>5.1.2.3.2</b> Practice safe use of art materials and tools while making art.</p>
<p><b>Prior Knowledge:</b></p> <p>Students should know what is meant when discussing different types of landmarks such as mountains, water, roads. If they do not, an explanation is included in the lesson.</p>	<p><b>Learning Targets:</b></p> <p>I Can...</p> <ul style="list-style-type: none"> <li>- Define what a map is.</li> <li>- Define and apply map vocabulary ( boundaries, relative location words, absolute location words).</li> <li>- Create a map of a familiar place.</li> <li>- Explain why or when it is important to use absolute versus relative location.</li> <li>- Create a map key and identify what the symbols mean.</li> <li>- Use materials safely while making</li> </ul>
<p><b>Vocabulary:</b></p> <ul style="list-style-type: none"> <li>- Near</li> <li>- Far</li> <li>- Left</li> </ul>	

- Right
- Relative Location
- Absolute Location

maps.

**Materials:**

- Student workbook (can be accessed here: <http://bit.ly/3Ti21HX>)
- *The Three Little Pigs* book (any version works)
- *There's a Map on My Lap! All About Maps* by Tish Rabe
- Crayons
- Markers
- Colored pencils
- Rubric
- Project directions (attached at the end)
- Scissors
- Videos (linked where needed)
- Computer
- Projector
- White board or anchor chart paper
- Parent letter (attached at the end)

**Assessment:**

**Pre-Assessment:** There is a pre-assessment in the student workbook that will be completed at the beginning of the unit to help the teacher understand what students already know.

**Formative Assessment:** Students will be assessed in a variety of ways. They will be assessed through their participation in the discussion and through a workbook that will be reviewed daily to check for student understanding.

**Summative Assessment:** Students will create a map of a place of their choosing. The map will be evaluated using the rubric found at the end of this unit and students will have a copy of the rubric and directions in their packet.

**Additional Resources:**

Map Your Route <http://bit.ly/3Wxzb6t>

*The Boy Who Loved Maps* by Kari Allen

*Martha Maps it Out* by Leigh Hodgkinson

*Looking at Maps and Globes* by Rebecca Olien

*Keys and Symbols on Maps* by Meg Greve

*North, South, East, and West* by Meg Greve

## Daily Plan

### Day 1: Unit Introduction and What is a Map?

1. Pass out the packet. Briefly walk students through each page of the packet. (As you work on each page, you will explain more in depth what the directions are - now is just an overview).
2. Have students complete the pre-assessment located on page one of the packet.
3. After completing the pre-assessment, have students turn and talk and share what they already know about maps? Some questions you can use to support students who might not know where to begin could be...
  - What are maps?
  - What do we use maps for?
  - Can you name some different types of maps?
4. After students have had time to turn and talk, have them share aloud with the class and write student responses on three different anchor charts that have each of the questions written on the top. You could also have another anchor chart for ideas that do not fit under the three questions.
5. Once all students have had time to share, read aloud the book titled *There's a Map on My Lap! All About Maps* by Tish Rabe. Below are some questions to ask before, during, and after reading.

Before:

  - Does anyone know what a map is?
  - Have you ever used a map to learn directions?

During:

  - Could you travel the world in one day?
  - How do maps help us?

After:

  - After reading this book and from our discussion today, what do you think we are going to be studying during this unit?
6. After reading, show students two videos about maps. They are both short and introduce maps so students have some information for working in their packets.
  - Video One: What are Maps? <http://bit.ly/3JbrFLG>
  - Video Two: How to Make a Map <http://bit.ly/3Jdt0l6>
7. After watching the videos, have students turn to page two in their packets and work on the focused cloze. To do this, read the sentence aloud, and then ask students what word from the word bank would make the sentence true. Below is an answer key for the focused cloze.

A map is a drawing or a picture of all or just a small part of the surface of the Earth. People use maps to know where things are located. Maps can



show us visual things like trees, houses, and bodies of water. Maps can also show us things that we can not see like temperature and boundaries. Maps are typically flat.

8. After reviewing the answers, introduce some map vocabulary: map keys or map legend, compass and scale.
9. Practice reading and using a map key. Have students complete the worksheet titled “Reading a Map” from [www.education.com](http://www.education.com) . Read the directions to students and work as a group to answer the first question. Then have students work in groups, partners or individually to finish the rest of the questions.
10. After all students have had time to finish answering the questions, review questions for the worksheet to make sure all students are understanding the concept of a map key.
11. After students have had some time to complete the “Reading a Map” worksheet from education.com, have students practice using a compass. Using the worksheet on the following page, also titled “Reading a Map” from [www.superteacherworksheets.com](http://www.superteacherworksheets.com) , guide students through labeling the compass and then demonstrate how to read the compass to answer any of the questions. After modeling one question, have students work in groups, partners, or independently to finish.
12. After all students have had time to finish answering the questions, review questions for the worksheet to make sure all students are understanding the concept of a compass.
13. Begin to wrap up the lesson for the day by having students name the three map tools they learned about today and give a brief introduction for the next lesson. Let students know that during the next lesson they will be making a map of a fairy tale.

## **Day 2: Fairy Tales and Maps**

1. Begin the lesson by reviewing the map skills taught in the previous lesson. Some key points to review:
  - Map key or map legend
  - Compass and the cardinal directions
  - Map scale
2. Read the book titled *The Three Little Pigs*. Any edition of this book will do. If you do not have access to a physical book, you can use a recorded read aloud. The book being used in the recording is *The Three Little Pigs* written and retold by Claire Lloyd and can be accessed at this link: <http://bit.ly/3ww6Jr2> .
3. After reading, have students draw a map that includes a straw house, brick house, stick house, family home, pig one, pig two, pig three, road, trees, wolf, and a stream. The map should include a compass, map key, and title. Student directions and drawing space can be found on page five in their workbook.
4. After students have had time to work on their map, watch a video on absolute and relative location titled “Absolute vs Relative Location - Definition for Kids” found here: <http://bit.ly/3Db3qta> . Ask students when they should use absolute vs relative location.
5. Introduce the final project. Directions for the final project can be found in the student workbook, but are also described in the next step.
6. For the final project students will create a map of their favorite place. Below are the

directions that are also in the student workbook.

- To show what you have learned from this unit, you are going to make a map of one of your favorite places. This could be a map of our school, a park, the library, your home or anywhere you like to go. This place should be familiar to you and is somewhere you could use lots of detail and accurately draw different items on your map like bodies of water, buildings, trees, roads and so on.
- As you are working on your map, make sure to use the checklist below to make sure you have everything included on your map or what will be assessed.

Students will be assessed by the teacher and will self assess themselves using the rubric found at the end of the lesson.

7. Before passing out any materials, review how we use the materials. Ask students to share ways they can be safe while working on their project like walking and using materials properly.
8. The rest of class time is dedicated to project work time.
9. Wrap up the lesson by reviewing the learning targets and tell students that you are getting closer to being able to answer all of the learning targets. Remind students that it is alright if they did not finish their project, they need to do their best work and they will have more time over the next two days to keep working on their maps.

### **Day 3: Treasure Maps and Final Project Work Time**

1. Review what has been covered in the previous lesson. Ask some students to share what they did in class yesterday. Explain that today we are continuing our work on maps and we will have some more time to work on the map project.
2. Introduce the treasure hunt activity. This activity is from Curriculum Castle. The activity can be found in the student packet or by viewing the link: <http://bit.ly/3WF9GjP>.
3. Before passing out this activity, reviewing scissor safety would be a great teacher move! It is recommended talking about what we use scissors to cut. Scissors are used to cut paper, yarn, etc. They are not used to cut hair, clothes, one another, etc.
4. First direct students to page seven in their packet and read the directions on the page. (Go over directions before passing out the hand out that students will cut). Students will cut out six landforms and glue them onto their map found on page eight in their packet. The landforms are found at the end of the lesson so students are not cutting out of their work book.
5. Then they can color their landforms, or this can wait until after they are all done gluing. After students are done coloring, they need to cut and glue the treasure chest under one of the landform flaps to hide the treasure..
6. Then they need to cut and glue the “try again” under the other landform flaps.
7. After students have finished cutting, gluing and coloring their map, they need to fill out the clue sheet found on page nine of the packet. They should write three clues so a



partner could try and find their treasure. Students should use the cardinal directions (north, south, east and west) and the landforms they picked to write clues.

8. Once their clues are written, have students trade maps with three different people to see if they can find where the other person's treasure is. In their packets is a space to write who they traded maps with, if they were able to find the treasure, and if they did find it where it was.
9. Have students make their way back to their spots and give students the remainder of the lesson time to work on their final map project which was introduced on day two.
10. Wrap up the lesson by having a discussion on the treasure map activity. Ask students if they found or did not find their partner's treasure. After students have shared, let students know that tomorrow is the last day for working on their map for the final project.

#### **Day 4: Final Project Work Time**

1. Begin the lesson by reviewing the directions and expectations for the final project and what the work time will look like.
2. Students have the remainder of the class time to work on their maps. If students finish early, they can check to make sure their entire packet is complete. If their whole packet is complete, have them go back to their map and ask them where they can add more details.
3. When there is about five minutes left of class, have students regroup and ask them to share aloud what is one thing they learned in this unit or why maps are important. Show students the learning targets and how they accomplished each one.
4. Students' final projects can be displayed around the room when students are finished.

## Map it Out Rubric:

**Note:** This is a single point rubric. Students either meet the criteria or they do not. Whichever category they fall into, mark in the met or did not meet column.

No	Does the student have....	Yes
	A sketch of their map	
	A map key with 5 items	
	A compass rose	
	A title	
	A neatly colored map	
	My name on their map	
	A final copy of their map	
No	Did the student....	Yes
	Use materials and resources safely	
	Use detail on their map	

## Map it Out Directions and Checklist:

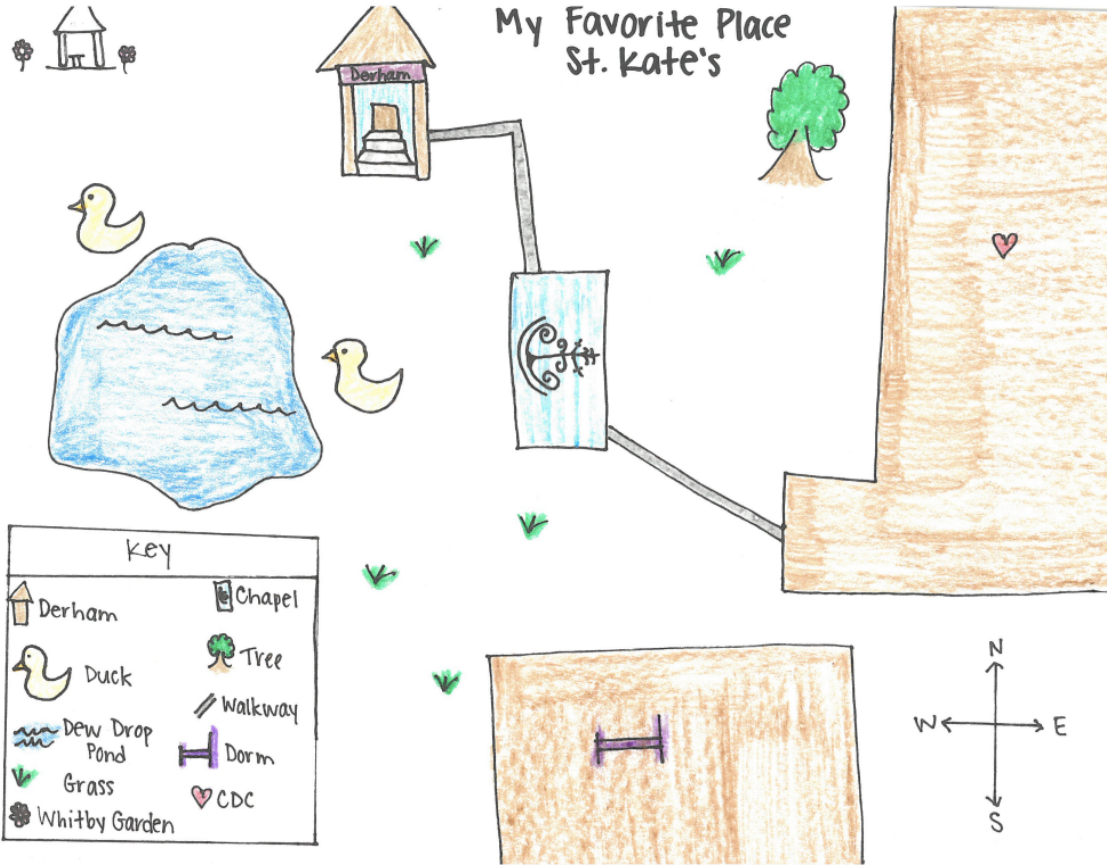
To show what you have learned from this unit, you are going to make a map of one of your favorite places. This could be a map of our school, a park, the library, your home or anywhere you like to go. This place should be familiar to you and is somewhere you could use lots of detail and accurately draw different items on your map like bodies of water, buildings, trees, roads and so on.

As you are working on your map, make sure to use the checklist below to make sure you have everything included on your map or what will be assessed.

No	Do I have....	Yes
	A sketch of my map	
	A map key with 5 items	
	A compass rose	
	A title	
	A neatly colored map	
	My name on my map	
	A final copy of my map	
No	Did I....	Yes
	Use materials and resources safely	
	Use detail on my map	

Make sure to check off as you go so you have everything your map needs.

# Sample Project



Project created by Katherine Panning 2023

# Measure Up!

## 2nd Grade Measuring Mini Unit

<p><b>Grade:</b> Second Grade</p>	<p><b>MN State Standards</b></p> <p><b>2.3.2.2</b> Demonstrate an understanding of the relationship between length and the number on a ruler by using a ruler to measure lengths to the nearest centimeter or inch.</p> <p><b>5.2.2.3.1</b> Create art that represents natural and constructed environments.</p>
<p><b>Subject:</b> Math and Art: Measurement</p>	
<p><b>Time:</b> Five - Forty Five Minute Lessons</p>	
<p><b>Prior Knowledge:</b></p> <p>Students do not need to have any prior knowledge of what a ruler or measurement is.</p>	<p><b>Learning Targets:</b></p> <p>I Can...</p> <ul style="list-style-type: none"> <li>- Identify what a ruler is.</li> <li>- Use a ruler to measure in both centimeters and inches.</li> <li>- Explain what length is.</li> <li>- Explain the relationship between length and the numbers on a ruler.</li> <li>- Create a project that represents a constructed/natural environment while meeting the guidelines and showing creativity.</li> </ul>
<p><b>Vocabulary:</b></p> <ul style="list-style-type: none"> <li>- Ruler</li> <li>- Watercolors</li> <li>- Measurement</li> <li>- Inches</li> <li>- Centimeters</li> <li>- Constructed vs Natural</li> <li>- Length</li> </ul>	
<p><b>Materials:</b></p> <ul style="list-style-type: none"> <li>- Packet (can be accessed here: <a href="http://bit.ly/3mUmQNw">http://bit.ly/3mUmQNw</a>)</li> <li>- Computer</li> <li>- Projector</li> <li>- Videos (linked where needed)</li> <li>- Watercolors</li> <li>- Large white cardstock or watercolor paper (size is about preference)</li> <li>- Crayons</li> <li>- Rulers</li> <li>- Monsters (can be accessed here: <a href="http://bit.ly/3Ti5gPR">http://bit.ly/3Ti5gPR</a>)</li> <li>- Measuring flashcards (can be accessed here: <a href="http://bit.ly/3JFGaaw">http://bit.ly/3JFGaaw</a>)</li> </ul>	

## Assessment:

**Pre-Assessment:** There is a pre-assessment in the student workbook that will be completed at the beginning of the unit to help the teacher understand what students already know.

**Formative Assessment:** Students will turn in a daily work packet that will be assessed for student understanding.

**Summative Assessment:** There will be two different summative assessments. The first is a project that will be completed in class. Students will have guidelines for the project that will allow them to demonstrate their understanding of measurements. The project is creating a house and then adding natural landscape around the house. For the other assessment, students will complete a quiz on measurements.

## Daily Plan

### Day 1: Unit Introduction and Measurement Tools

1. Pass out the packet. The packet can be accessed here: <http://bit.ly/3mUmQNw>. Briefly walk students through each page of the packet. (As you work on each page, you will explain more in depth what the directions are- now is just an overview).
2. Have students complete the pre-assessment located on page one of the packet.
3. After completing the pre-assessment, have students turn and talk and share what they already know about measurements? Some questions you can use to support students who might not know where to begin could be...
  - What does measure mean?
  - What kinds of things can we measure?
  - What are some examples of measuring tools?
4. At this point, you are on page two of the packet. You have two options for this activity. You can either use images of different measuring tools or you can bring in physical objects to show the students. Go through the objects one at a time and have students categorize them as either time, length, weight, temperature, or volume and then have them draw a picture in the box and write what the object is. Repeat until the chart is filled out. As you are doing this activity, make sure students are placing objects correctly under what they measure.
5. Explain to students that those are all standard units of measurement – meaning that they are consistent if they measure or if I were to measure something. There are also non- standard units of measurements.
6. Watch the video called “Measuring!” <http://bit.ly/3XCCqLo>.
7. At this point you are trying to see what students remember. Using non - standard units was something they should have done in 1<sup>st</sup> grade. On page three, there is a table. Have students fill out the table using the non-standard units. As the teacher, you should also be completing this so you can make a point about how sometimes these units can be

- helpful, but you do not get the same answer every time.
8. After everyone has filled out the chart, have students share with a partner and then have them share their observations out to the whole class.
  9. Now it's time to take a deep dive into the ruler. Have a ruler handy so students can see what it looks like. Then show them that there are different parts to a ruler. At this point, you can pass rulers out to students - but lay out the ground rules of using them.
    - Rulers are tools. They are not swords or anything else. Use them as they were made to be used.
    - Any other rules that are applicable to your situation can be included at this point.
  10. Using a ruler, explain to students that the distance between points (like 1 and 2) tells us how long something is.
  11. If you want, you could have students re-measure the objects they measured using non-standard units to bring home the point of the benefits of standard units. Or, you could model a couple of examples to be mindful of the time.
  12. Now on page four of the packet there is a table numbered one - twenty-five. Every day of the lesson, you will fill in five boxes. As the teacher you will pick whatever number prompt is for the day, and project it on the board to have students answer the question. Prompts can be accessed here <http://bit.ly/3JFGaaw>. Prompts will have students measuring objects using standard units.
  13. Review everything that was done today and prepare students for what you are doing tomorrow. Make sure there are no questions or any confusion. Explain to them what the activity will be to help build excitement for the next lesson.

## **Day 2: Measurement Practice and Unit Introduction**

1. Review what was done in the previous lesson. Address any questions or misconceptions now. Key points to review:
  - What a ruler is
  - Standard vs non – standard units of measurement
  - Different measurement tools
  - Centimeters vs inches and what these units tell us (length)
2. Start by completing up to number ten on the prompt calendar (page four).
3. Pass out rulers and have students complete page five called “Cactus Coloring”. Note that the coloring sheet might not be to scale in the packet. The original coloring sheet is from: <http://bit.ly/3Hv7FSN>.
4. After students finish the measurement coloring sheet, ask students what they colored and have them demonstrate to the class how to measure. Have students come to the front of the room and measure one portion of the worksheet.
5. Now have students complete the musical instrument measuring worksheet that is adapted from [www.education.com](http://www.education.com).
6. Once students finish the worksheet, introduce the final project explaining that they are going to be making a building (representing a constructed environment) that will have natural features around them. Now is the time to explain the difference between constructed and natural. Have students write these definitions in their packet on the

directions page.

- Constructed: Environments made by humans like bridges and houses.
  - Natural: Environments that have natural features like trees and rocks.
7. Point out to students the space in their packet that includes these directions, definitions and a space to sketch out what they want to make.
  8. The rest of the class time can be dedicated to having students sketch and begin working on their final project. The inspiration for this project is from Soul Sparklettes La Casita art project. There is an example of the house from Encanto if students need ideas. Directions for this project can be found here: <https://bit.ly/3yARYnY>. Note: This example might not have the measurement requirements needed.
  9. Review what was completed for today, answer any questions, and point out to students the learning targets so they can keep focused on the goals for the unit.

### **Day 3: Monster Measuring and Project Work Time**

1. Review what was done in the previous lessons.
2. Complete numbers eleven - fifteen on the prompt calendar (page four)
3. Introduce what students will be completing today. Explain that half the class will be working on their project, and the other half will be completing the monster measuring activity.
4. For the monster measuring activity here are the directions.
  - Locate the monsters that can be accessed here: <https://bit.ly/3Ti5gPR>. If desired, you can adjust the size of each monster or leave them at their current size which is already varied.
  - Once printed off, place monsters around the room so students are not going to end up clustered at one spot.
  - Have students walk around the room measuring in centimeters and in inches.
  - Students repeat this until all monsters have been measured.
  - Once finished, they can return to their seat to finish any work that is unfinished for this unit.
5. Directions for the unit project can be accessed here: <https://bit.ly/3yARYnY> or in the student workbook.
6. Once about 15-20 minutes has passed, switch groups.
7. Have students regroup and ask them to each share one thing that they accomplished on their project for today. Answer any questions and point out the learning targets to students so they can keep focused on their goals.
8. Introduce an at home extension activity that they all need to complete by the end of the unit. Students will be completing a measurement scavenger hunt at home looking for certain objects that are a certain length.

### **Day 4: Scavenger Hunt Check In and Project Work Time**

1. Review what was done in previous lessons.
2. Complete numbers sixteen - twenty on the prompt calendar (page four).



3. Ask students to share what progress they have completed so far on their scavenger hunt activity. Provide any support if needed and answer any questions.
4. After all questions are answered, transition to the project. The rest of class time is dedicated to students having work time and catching up on any work that is not finished.
5. With about five minutes remaining, have students regroup. Ask students to each share one thing they accomplished for today. Revisit the learning targets and tell students that they are still working on meeting their goals. Tell them tomorrow is the last day of this unit. There will be a quiz and the rest of class will be project work time so they can do their best work.

### **Day 5: Measurement Quiz and Project Work Time**

1. Review what was done in previous lessons.
2. Complete numbers twenty-one - twenty-five on the prompt calendar (page four). If any students are missing prompts, review them.
3. Ask students what questions they have about the unit before you pass out the quiz. Tell them they have been doing great work in this unit and you can see that they are learning.
4. Pass out the quiz attached at the end of this lesson. Once students are finished with the quiz, they can use the rest of the time to complete their project or any unfinished work.
5. With about five minutes left of class, have students regroup and share one thing they learned in this unit. Show students the learning targets and how they accomplished each goal.
6. Students' final projects can be displayed around the room once they are dry (if needed).

## Rubric:

Does the project include the following...

\_\_\_ Sketch of project

\_\_\_ A door that is at least 1 inch tall

\_\_\_ A plant that is 5 centimeters tall

Which plant is it? \_\_\_\_\_

\_\_\_ The building is taller than 7 inches

Which part is it? \_\_\_\_\_

\_\_\_ A window that is 5 centimeters tall

Which part is it? \_\_\_\_\_

\_\_\_ Any part of the constructed environment that is 3 inches in length or width

Which part is it? \_\_\_\_\_

\_\_\_ Any part of the natural environment that is 6 centimeters

Which part is it? \_\_\_\_\_

\_\_\_ Shows creativity

\_\_\_ Fills the paper

\_\_\_ Demonstrates understanding of constructed and natural environments

Score:

For each item, the student either has it or does not. If they have it, include a check on the line and for the items that ask which part it is, students have filled this out in their workbook.

## Measurement Quiz

Name: \_\_\_\_\_

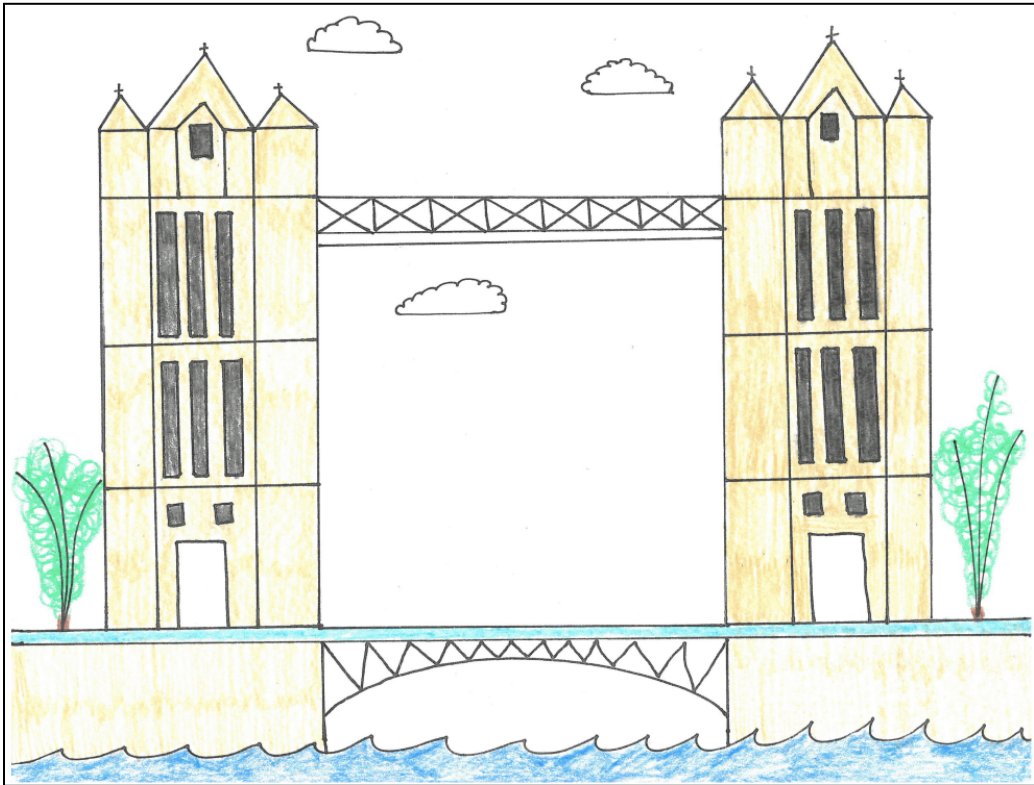
1. Find the length of the line below. Write your answer in inches and in centimeters.

\_\_\_\_\_ inches  
\_\_\_\_\_ centimeters

2. What is a ruler? Draw a picture of a ruler.
3. What is the relationship between length and the numbers on a ruler?
4. Define the following terms: constructed environment and natural environment.

# Sample Projects

Projects created by Katherine Panning 2023



# Out of This World: 3rd Grade Space Mini Unit

<p><b>Grade:</b> Third Grade</p>	<p><b>MN State Standards</b></p> <p><b>3.1.1</b> Students will be able to develop, revise, and use models to represent the students' understanding of phenomena or systems as they develop questions, predictions and/or explanations, and communicate ideas to others.</p> <p><b>5.3.2.4.1</b> Create visual representations of places or systems that are a part of everyday life using artistic foundations.</p>
<p><b>Subject:</b> Science , Literacy, and Art</p>	
<p><b>Time:</b> Five - Forty Five Minute Lessons</p>	
<p><b>Prior Knowledge:</b></p> <p>Students should have a basic understanding of what a planet is. Students should also know how to annotate in the margins.</p>	<p><b>Learning Targets:</b></p> <p>I Can...</p> <ul style="list-style-type: none"> <li>- Identify each of the planets in the solar system             <ul style="list-style-type: none"> <li>- Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune</li> </ul> </li> <li>- Describe how the Earth as well as the other planets orbit the sun.</li> <li>- Describe how the Moon orbits the Earth.</li> <li>- Create a model of the solar system and be creative while doing so.</li> </ul>
<p><b>Vocabulary:</b></p> <ul style="list-style-type: none"> <li>- Solar System</li> <li>- Orbit</li> <li>- Planets             <ul style="list-style-type: none"> <li>- Mercury</li> <li>- Venus</li> <li>- Earth</li> <li>- Moon</li> <li>- Mars</li> <li>- Jupiter</li> <li>- Saturn</li> <li>- Uranus</li> <li>- Neptune</li> </ul> </li> </ul>	
<p><b>Materials:</b></p>	

- Packet (can be accessed here: <http://bit.ly/3ZOEukn>)
- Computer
- Projector
- Videos (linked where needed)
- Readings (linked when reading would be used)
  - Note about the readings: To access the links, you need to make a free ReadWorks account)

### **Assessment:**

**Pre-Assessment:** There is a pre-assessment in the student workbook that will be completed at the beginning of the unit to help the teacher understand what students already know.

**Formative Assessment:** Students will turn in a daily work packet that will be assessed for student understanding.

**Summative Assessment:** Students will complete a final project that will be done in and out of the classroom. Students will create a solar system model that includes all the planets, as well as the sun and moon. This project will extend beyond the 4 days of the mini unit.

### **Additional Resources:**

Planet Readings <https://www.readworks.org/>

*Our Universe* by Stacy McAnulty

*The Fascinating Space Book for Kids: 500 Far-Out Facts!* by Lisa Reichley

*The Girl Who Named Pluto: The Story of Venetia Burney* by Alice B. McGinty

*Mae Among the Stars* by Roda Ahmed

*There's No Place Like Space: All About Our Solar System* by Tish Rabe

*Hidden Figures: The True Story of Four Black Women and the Space Race* by Margot Lee Shetterly

## **Daily Plan**

**Day 1: The Sun & Unit Introduction**

1. Pass out the packet. The packet can be accessed here: <http://bit.ly/3ZOEukn>. Briefly walk students through each page of the packet.
2. Have students complete the pre-assessment located on page one of the packet.
3. After completing the pre-assessment, have students turn and talk and share with their partner what they already know or want to know about the solar system. Ask students to share aloud. Address any misconceptions as they come up. Some misconceptions might be, but are not limited to...
  - The solar system consists only of the sun, moon, and Earth.
  - All planets are the same size.
  - Mercury is the hottest planet since it is the closest to the sun.
4. Watch the video called “Solar System: The Dr. Binocs Show” <http://bit.ly/3ZWxN0p>.
5. Transition from the video back to the packet. Explain how you are going to cover parts of the solar system each day. Remind students that the solar system is so large, it wouldn't do it justice if you learned about it all in one day.
6. Turn to page two in the packet titled” Day 1: The Sun and The Moon”. Read aloud the passage from [www.education.com](http://www.education.com) that is in the packet and have students independently answer the comprehension questions at the bottom of the page. After students have had time to answer the questions, have them turn to their partner and check their answers. Then, discuss as a whole class to make sure everyone is on the same page.
7. Turn the page to the passage about “The Moon and the Earth”. Have students read the passage found in their packet with a partner that is from [www.EasyTeacherWorksheets.com](http://www.EasyTeacherWorksheets.com) . After reading the passage, have students write down three key details in the margin. Students should already know how to do this.
8. After students have finished reading and writing three key details in the margin, come back as a large group and have students share key details from the text. As students share, write them down on the teacher's copy.
9. Review everything that was done today and prepare students for what you are doing tomorrow. Explain to them what the activity will be to help build excitement for the next lesson. Also, introduce the final project. For the final project, explain to the students that they will be making a model of the solar system. You will talk about it with them every day and the directions are in their packet.

## **Day 2: The Inner Planets & the Moon- Mercury, Venus, Earth, Mars**

1. Begin the lesson by reviewing the previous lesson on the sun and the moon. Key points to cover...
  - The planets orbit the sun.
  - The moon orbits the Earth.
2. Watch the video called “Explore the Solar System: The Rocky Planets”<http://bit.ly/3HtfA00>.
3. Have students open to page four in their packet. Explain to them that around the room, there are readings for each of the planets listed on the page (Mercury, Venus, Earth, Mars). This time is for them to become space researchers and learn more about each of the planets. Split students into groups and have them rotate and do a sort of station-like activity. Each group will spend approximately five minutes reading the brief article and

answering the questions in the packet.

- Links for readings
  - Mercury: <http://bit.ly/3WEoXS3>
  - Venus: <http://bit.ly/3XDnvAG>
  - Earth: <http://bit.ly/3WEPtKO>
  - Mars: <http://bit.ly/3XZh0rp>

4. Have students rotate so they will have read all four articles and have answered all of the questions.
5. Regroup and have students share with the class what they learned. An activity you could do in addition to having students confirm their answers is to have students go around the room and share one thing they have learned so far in this unit. They cannot share the same thing as anyone else.
6. Review everything that was done today and prepare students for what you are doing tomorrow. Explain to them what the activity will be to help build excitement for the next lesson. Also, remind students of the final project. For the final project, explain to the students that they will be making a model of the solar system. You will talk about it with them every day and the directions are in their packet. If students want, they can begin working on their project.

### **Day 3: The Outer Planets – Jupiter, Saturn, Uranus and Neptune**

1. Begin the lesson by reviewing the previous lesson about the inner planets: Mercury, Venus, Earth and Mars.
2. Watch the video called “Explore the Solar System: The Gas Giants”  
<http://bit.ly/3WBi43F>
3. Students will be completing an activity just like they did from Day 2. Below are the instructions again.

Have students open to page five in their packet. Explain to them that around the room, there are readings for each of the planets listed on the page (Jupiter, Saturn, Uranus, Neptune). This time is for them to become space researchers and learn more about each of the planets. Split students into groups and have them rotate and do a sort of station-like activity. Each group will spend approximately five minutes reading the brief article and answering the questions in the packet.

- Links for readings
  - Jupiter: <http://bit.ly/3kJSHjf>
  - Saturn: <http://bit.ly/3wz0liI>
  - Uranus: <http://bit.ly/3HvTKMn>
  - Neptune: <http://bit.ly/403jPJR>

4. Have students rotate so they will have read all four articles and have answered all of the questions.



5. Regroup and have students share with the class what they learned. An activity you could do in addition to having students confirm their answers is to have students go around the room and share one thing they have learned so far in this unit. They cannot share the same thing as anyone else.
6. Review everything that was done today and prepare students for what you are doing tomorrow. Explain to them what the activity will be to help build excitement for the next lesson. Also, remind students of the final project. For the final project, explain to the students that they will be making a model of the solar system. You will talk about it with them every day and the directions are in their packet. If students want, they can begin working on their project as they now have all the information they need to complete their project.

#### **Day 4: Project and Lesson Wrap Up**

1. Briefly review content from the previous three lessons.
2. Have students complete the worksheet on page six of their packet in pairs.
3. Bring students back to the large group and review the answers.
4. Have students complete the comprehension check on the last page of the packet, page seven. This check should be completed independently. You will use this as a part of the formative assessment.
5. The rest of the lesson time is dedicated to students working on their solar system model. Directions for the project are listed below:
  - For the final project, you will create a model of the solar system that includes all eight planets, the asteroid belt, the moon and the sun. You need to label the inner and outer planets. Each planet should be labeled by name as well as how many miles it is from the sun and show orbit lines. Anything extra on your model, like asteroids, comets or meteors will count as extra credit. Be creative! You can use a shoebox, a circular mobile, foam balls, popsicle sticks, print outs anything to make your model. If you need any materials, let me know and I will help get them for you.
6. Review the learning targets and point out the different ways the students are meeting the learning targets. Let students know tomorrow is exclusively a work day to finish their project. If they do not finish, they will have to finish it at home.

#### **Day 5: Work Time**

1. The entire day is dedicated to work time. Remind students that this is the last day to work on their project. If students do not finish, they will have to finish their project at home.
  - For the final project, you will create a model of the solar system that includes all eight planets, the asteroid belt, the moon and the sun. You need to label the inner and outer planets. Each planet should be labeled by name as well as how many miles it is from the sun and show orbit lines. Anything extra on your model, like asteroids, comets or meteors will count as extra credit. Be creative!

You can use a shoebox, a circular mobile, foam balls, popsicle sticks, print outs or anything else to make your model. If you need any materials, let me know and I will help get them for you.

2. With five minutes left of the lesson, have students go around and share one thing they learned during this unit. If students did not finish their project, they will need to finish it at home. If the majority of the class did not finish, you can add extra in class work time.

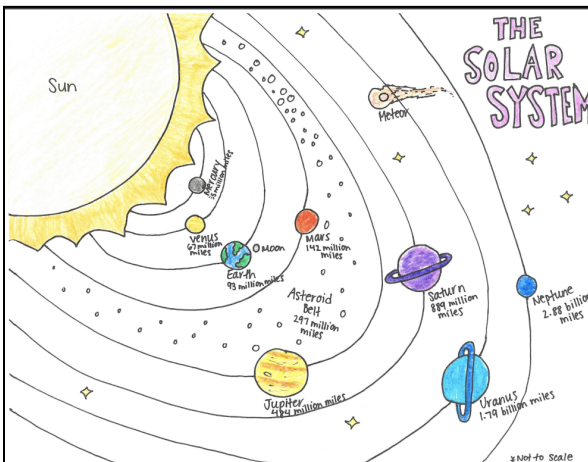
# Solar System Project

Dear 3<sup>rd</sup> Grade Families,

This week we are starting our mini unit on space. Throughout the unit, students will complete an independent project that will be completed during class time. For the final project, they will create a model of the solar system that includes all eight planets, the asteroid belt, the moon and the sun. They need to label the inner and outer planets. Each planet should be labeled by name as well as how many miles it is from the sun and show orbit lines. Anything extra on the model, like asteroids, comets, or meteors will count as extra credit.

Be creative! Students can use any materials they want to create the project. They can use a shoebox, a circular mobile, foam balls, popsicle sticks, print outs, things found or anything they can think of to make their model. If you need any materials, let me know and I will help get them for you.

The model does not have to be to scale but it needs to include everything above. The model does need to show how the planets orbit the Sun and how the moon orbits the Earth. Do they orbit in a square shape, a line? This can be shown doing something as simple as drawing orbit lines.



Here is an example of a project that meets all of the requirements. We went over these ideas in class, but if your student wants to look at them again, they are here. One thing to keep in mind is that these are just ideas, students will need to follow the directions to make sure they have everything labeled.

Please let me know if you have any questions on this project or need help finding materials for this.

Your Student's Teacher,

# Solar System Model Project

Name: \_\_\_\_\_

Directions:

At the end of the unit, you will complete an independent project. For the final project, you will create a model of the solar system that includes all 8 planets, the asteroid belt, the moon and the sun. You need to label the inner and outer planets. Each planet should be labeled by name as well as how many miles it is from the sun and show orbit lines. Anything extra on your model, like asteroids, comets, or meteors will count as extra credit. Be creative! You can use a shoebox, a circular mobile, foam balls, popsicle sticks, print outs or anything else to make your model. If you need any materials, let me know and I will help get them for you.

Your model does not have to be to scale but it needs to include everything above. You also need to show how the planets orbit the Sun and how the moon orbits the Earth. Do they orbit in a square shape, a line?

**Labels needed:** Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Inner Planets, Outer Planets, asteroid belt, sun, Earth's moon

This project is worth 50 points.

Score: \_\_\_\_ / 50

## Rubric:

\_\_\_/5 Mercury

\_\_\_/5 Venus

\_\_\_/5 Earth

\_\_\_/5 Mars

\_\_\_/5 Jupiter

\_\_\_/5 Saturn

\_\_\_/5 Uranus

\_\_\_/5 Neptune

\_\_\_/5 Sun

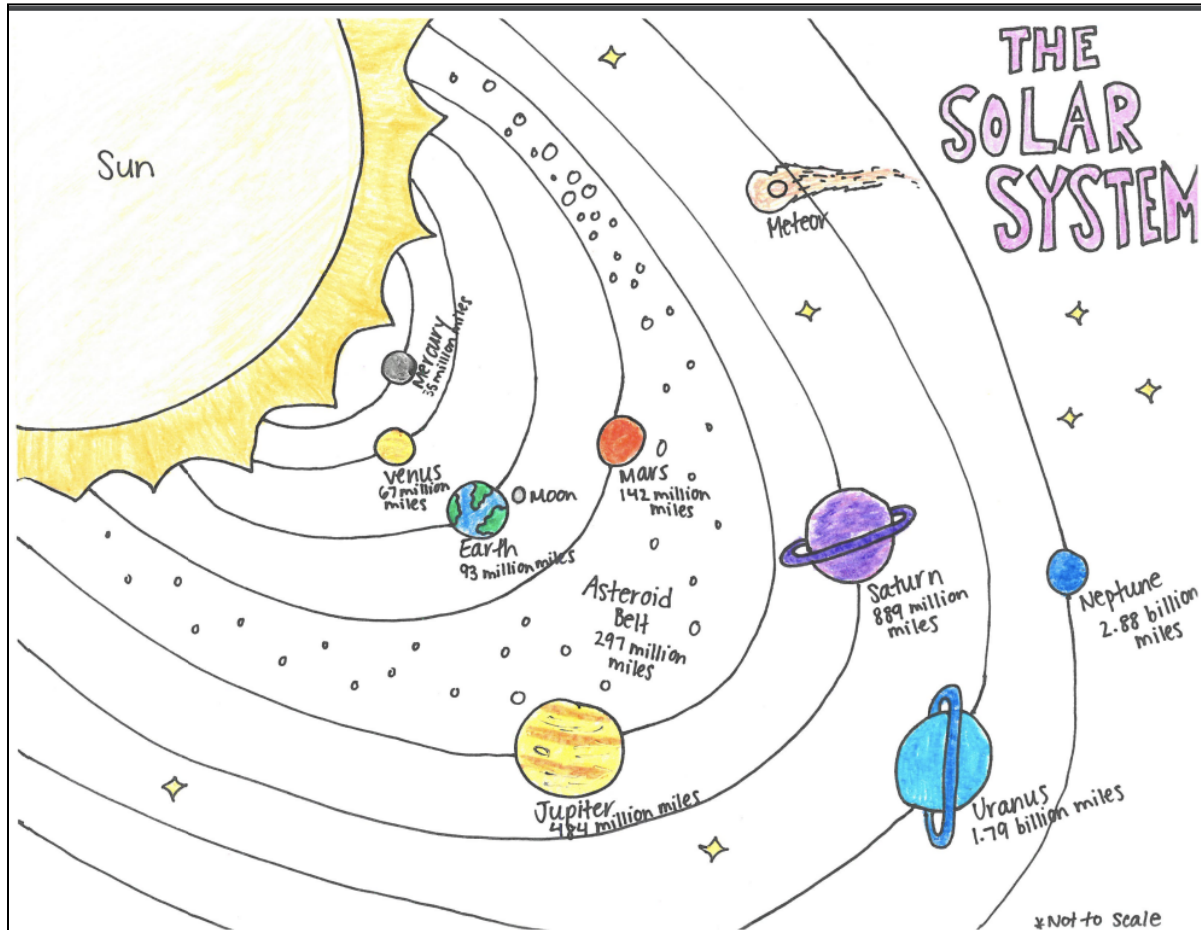
\_\_\_/5 Moon

TOTAL: \_\_\_/50 points

Points Breakdown:
<b>2 Points:</b> Correct Labels (including planet name and miles from the sun and inner or outer planets if applicable)
<b>1 Point:</b> Planet or Sun or Moon Included
<b>2 Points:</b> Creativity

# Sample Project

Project created by Katherine Panning 2023



# A Part of Art: 4th Grade Math Mini Unit

<p><b>Grade:</b> 4th Grade</p>	<p><b>MN State Standards</b></p> <p><b>4.1.2.1</b> Represent equivalent fractions using fraction models such as parts of a set, fraction circles, fraction stripes, number lines and other manipulatives. Use the models to determine equivalent fractions.</p> <p><b>4.1.2.2</b> Locate fractions on a number line. Use models to order and compare whole numbers and fractions, including mixed numbers and improper fractions.</p> <p><b>5.4.2.3.1</b> Create art that is representational and <u>non-representational</u> using artistic foundations.</p>
<p><b>Subject:</b> Math and Art: Fractions</p>	
<p><b>Time:</b> Four - Forty Five Minute Lessons</p>	
<p><b>Prior Knowledge:</b></p> <p>Students should be able to identify common factors and multiply numbers so they are able to find equivalent fractions. They should also know that fractions are parts of a whole.</p>	<p><b>Learning Targets:</b></p> <p>I Can...</p> <ul style="list-style-type: none"> <li>- Represent fractions using fraction models like fraction circles and number lines.</li> <li>- Determine equivalent fractions.</li> <li>- Locate fractions on a number line.</li> <li>- Order and compare fractions.</li> <li>- Explain who Piet Mondrian is and how his art uses shapes and color to create fractions.</li> <li>- Create a piece of art that is non-representational.</li> </ul>
<p><b>Vocabulary:</b></p> <ul style="list-style-type: none"> <li>- Fraction</li> <li>- Numerator</li> <li>- Denominator</li> <li>- Equivalent Fraction</li> <li>- Improper Fraction</li> <li>- Mixed Number</li> <li>- Non-Representational Art</li> <li>- Primary Colors</li> </ul>	
<p><b>Materials:</b></p> <ul style="list-style-type: none"> <li>- Slideshow (linked here: <a href="http://bit.ly/3XVbfen">http://bit.ly/3XVbfen</a>)</li> </ul>	

- Worksheets (linked where needed)
- Math Measurement Masterpiece (linked in additional resources)
- Computers (preferably one per student, but at least one for a small group of students)
- Videos (linked where needed)
- Projector
- Crayons
- Markers
- Post it notes
- Colored pencils
- Graph paper (linked here: <http://bit.ly/3ZOGVTQ>)
- White paper (preferably cardstock or construction paper)
- Rulers
- Black markers

**Assessment:**

**Pre-Assessment:** To see what students already know, there is a quick write on day one. Students are asked to explain what art and fractions have in common and where can you see fractions outside of math class. These questions are also asked at the end of the unit.

**Formative Assessment:** Students will be assessed through their worksheets, their participation in discussions and guided practice, and through the warm up and wrap up questions at the beginning and end of each lesson. Students will write their response to warm ups and wrap ups on sheets of paper that can be collected to track student understanding.

**Summative Assessment:** Students will complete a final project in the style of Piet Mondrian. The project directions and rubric are attached at the end of the lesson. This project will demonstrate students' understanding of representing fractions using models and who Piet Mondrian is.

**Additional Resources:**

Math Measure Masterpiece: Using Art as a Platform for Math <http://bit.ly/403s1tW>

Virtual Manipulatives <http://bit.ly/3DgjObP>

IXL Comparing Fractions <http://bit.ly/3R9ZsXI>

IXL Fractions on a Number Line <http://bit.ly/3XUb8Qr>

Mondrian Fractions <http://bit.ly/3R31Jnr>

*Meet Piet Mondrian* by Read With You Center for Excellence in STEAM Education



# Daily Plan

## Day 1: Unit Introduction and Exploration

**Note:** This lesson goes along with a presentation that is linked here: <http://bit.ly/3XVbfen> and at the beginning of the lesson in the materials section.

1. Start the lesson by having students complete a quick write (slide two). Students will have a post it note to answer the following questions:
  - What do fractions and art have in common?
  - Where do we see fractions outside of math class?
2. Have students share their answers aloud with the class. Use the discussion as a transition to the learning targets and introducing the unit.
3. Share the learning targets with students (slide three). Listed at the beginning of the lesson is the full list of learning targets for the unit, but each day is broken down by the specific targets that will be met for that lesson. The targets are presented in the format of - today we are working on... followed by I know you learned what I taught by... There will be questions that students should be able to answer if they have mastered the learning targets. Here are the learning targets for day one:

Today we are working on..

- Representing fractions using models like fraction circles and number lines.
- Locating fractions on a number line.

I will know you learned what I taught you by answering the following questions:

Can I...

- Show fractions using different manipulatives?
- Use a number line to represent different fractions and name those fractions?

4. Now it is time to go over some vocabulary that is important to know (slide four). Students should already be familiar with the vocabulary, but lesson one of the unit is set up as a review and is designed to support and extend student learning by reviewing concepts previously taught and by gradually easing into new skills. The vocabulary words are:

Fraction: a part of a whole

Numerator: the number above the line in a fraction

Denominator: the number below the line in a fraction

5. Once all vocabulary has been presented to students, watch a short video on fractions titled "Fractions!" from Scratch Garden linked here: <http://bit.ly/3WDEFMY> (slide five)
6. After watching the video, present some examples to students about how fractions can be shown using models (slide six). On slide six, there is an example of a fraction circle, number line, fraction bar and array model. Ask students if there are other ways they can show fractions? (Students should have enough background to be able to answer

- this question, but if not, put students in small groups so they can collaborate).
7. Move to reading fractions (slide seven). On this slide there is a fraction ( $\frac{3}{4}$ ). Walk through the process of the denominator telling us how many parts a model needs to be broken into and then the numerator is how many of those parts are filled in. Model this with a fraction circle and a fraction bar. If students need more practice, the next slide titled guided practice (slide eight) is a blank slide that you can write in a fraction and work through some guided practice with numbers of your choosing.
  8. For the rest of the lesson, students will have time to practice (slide nine). Split the class into two groups. One group will be playing the game “Bump It” which is from here: <http://bit.ly/3JipRAv>. The other group will be working with the teacher working on using a number line to represent fractions (slides 10- 13) Students will then work on some guided practice followed by a worksheet (slide 15). The worksheet is titled “Number Line Riddle”. It is from education.com and can be accessed here: <http://bit.ly/3j2LQAK>.

**Teacher Note:** For the students working with the teacher, the slides are set up for you to be able to write on them and explain and model how to read and write fractions on a number line. The steps listed on the slide are from IXL, and they show step by step how you would complete the skill. This resource can be found here: <http://bit.ly/3XUb8Qr>. It is recommended to review this guide prior to teaching the skill if you are not sure on how to teach reading and writing fractions on a numberline.

9. After each group has had 15 minutes, switch groups and repeat steps seven and eight. Once both groups have had time to complete the game and work with the teacher, transition to wrapping up the lesson for the day.
10. Wrap up the lesson by asking students what the riddle was on their worksheet. The answer to the riddle is “jelly beans went into space”. If students are confused, review some of the worksheet to address any confusion. After reviewing the worksheet, end the lesson by watching a Number Rock titled “Fractions on a Number Line” which can be accessed here: <http://bit.ly/3WF3iZT>.

## Day 2: Ordering and Comparing Fractions

**Note:** This lesson goes along with a presentation that is linked here <http://bit.ly/3XVbfen> and at the beginning of the lesson. Day two starts on slide sixteen.

1. Have students complete a warm up (slide sixteen). Students are answering two questions on a piece of paper. Students are asked to write the fraction that the model is showing and to write the fraction  $\frac{5}{9}$  on a number line. Both questions were covered in the previous lesson. Once students have had time to answer the questions independently. Ask some students to share with the class their answers. Have students turn in their warm up.
2. Share the learning targets with students (slide seventeen). Here are the learning targets for day two:

Today we are working on...

- Locating fractions on a number line.
- Ordering and comparing fractions.

I will know you learned what I taught you by answering the following questions:  
Can I...

- Identifying fractions on a number line.
- Compare and order fractions using models along with greater than, less than, or equal to signs to show the comparisons.
- Order fractions from least to greatest and greatest to least.

3. Remind students what they did yesterday (slide eighteen) and show students the plan for today (slide nineteen).
4. Review important vocabulary for the lesson (slide twenty). The vocabulary words are:

Equivalent Fraction: when fractions have different numbers in them, but have the same value, they are called equivalent fractions

Improper Fraction: a fraction that has a larger number in the numerator than the denominator

Mixed Number: a number that consists of a whole number and a proper fraction

5. Once all vocabulary has been presented to students, watch a Number Rock video (slide twenty-one) called "Equivalent Fractions" which can be accessed here: <http://bit.ly/3kDYaIa>.
6. After watching the video, work on some guided practice problems (slide twenty-two). Work with students to match equivalent fractions. You can either move the images to be next to each other to show matches, you could draw lines to show matches, or do whatever works best for your classroom set up. If students need more practice with equivalent fractions, now would be the time to practice some more problems. These can be problems you create yourself and write on the board.
7. Once students can successfully determine equivalent fractions, share different strategies for comparing fractions (slide twenty-three). Three strategies will be shared in class, but there are more than these ways to compare fractions. Below are the three ways students will be taught to compare fractions:

Fractions With Like Denominators: When two fractions have the same denominator, the fraction with the greater numerator is the greater fraction.

Fractions with Like Numerators: When two fractions have the same numerator, the fraction with the smaller denominator is the greater fraction

Fractions With Unlike Numerators and Denominators: To compare fractions with unlike denominators and numerators, make equivalent fractions.

8. Pass out the worksheet from Super Teacher Worksheets titled "Comparing Fractions". The worksheet can be found by accessing the website here: <http://bit.ly/3Ra0zXo>.
9. Work on problem one as a whole class. This problem is on the guided practice slide (slide twenty-four). If students are showing confusion after this problem, work through another problem found on the worksheet.
10. Release students to work independently (slide twenty-five). Students should finish the

worksheet and then once they are finished, they can turn in their worksheet and play the game “Galactic Space Fractions: Comparing Like Denominators” from education.com which can be accessed here: <http://bit.ly/3WwrUUE> .

11. Students can play the game until there is about five minutes left of math time. Once there is about five minutes left of class, have students put their computers away and turn in the work they have done.
12. To wrap up the lesson, students are going to play “Beat the Clock” (slide twenty-six). Students have one minute to answer the question “name and order these fractions from least to greatest”. The fractions are  $\frac{1}{2}$ ,  $\frac{7}{8}$ , and  $\frac{3}{4}$ . The fractions are shown on fraction circles. When students are ready, start the timer. Once the timer goes off, have students share their answers and review what the order would be as a class.

### **Day 3: Piet Mondrian and Math’s Connection to Art**

**Note:** This lesson goes along with a presentation that is linked <http://bit.ly/3XVbfen>, at the beginning of the lesson, and is attached at the end of the lesson in a pdf. Day three starts on slide twenty-seven.

1. Have students complete a warm up (slide twenty-seven). For the warm up, have students answer the questions on a piece of paper. Students are comparing a fraction to a model and then are ordering fractions from least to greatest. Have students share aloud what they got for answers. Answer any questions and then have students turn in their answers.
2. Share the learning targets with students (slide twenty-eight). Here are the learning targets for day three:

We are working to be able to...

- Represent fractions using fraction models like fraction circles and number lines.
- Explain who Piet Mondrian is and how his art uses shapes and color to create fractions.
- Create a piece of art that is non-representational.

I will know you learned what I taught you by answering the following questions:

Can I...

- Explain who Piet Mondrian is?
- Represent fractions using different models?
- Show how math and art are connected by creating a piece of non-representational art?

3. Introduce some important vocabulary (slide twenty-nine). The vocabulary word for day three is listed below:

**Non-Representational Art:** Work that does not depict anything from the real world (figures, landscapes, animals, etc.) Can be lines, shapes, colors and can also express

things that are not physical like emotions or feelings

4. Watch the video on slide twenty-eight that is titled “Representational and Non-Representational - Art Vocab Definition” that can be accessed here: [https://youtu.be/BI3PO\\_s9cSM](https://youtu.be/BI3PO_s9cSM)
5. Switch to the slide titled “Who is Piet Mondrian?” (slide thirty). Introduce the artist Piet Mondrian to students going over some basic information about him. Below is some information to cover - this information is also listed on the slide.
  - Dutch artist who lived from 1872-1944
  - Known for his abstract paintings
    - Abstract art is a art that does not show things that are recognizable
    - Mondrian is often considered the founder of neoplasticism, a style of abstract art.
  - Often used primary colors (red, yellow, blue) in his paintings
  - He never used a ruler to draw lines.
6. On the bottom of the slide are some examples of Mondrian’s work. The names of the pieces from left to right are:
  - Far left: *The Gray Tree, 1912*
  - Middle: *Composition with Color Planes, 1917*
  - Far right: *Broadway Boogie-Woogie, 1942-1942*
7. If additional resources are needed, one site attached here: <http://bit.ly/3HvaL9D>, is a resource. This is a great resource to continue learning about Piet Mondrian and his work.
8. After introducing Mondrian, show students Piet Mondrian’s *Composition in Red, Yellow, and Blue, 1921* (slide thirty-one). Ask students to look at the picture and share what they notice. Ask them what math and art terms they see. Give students a few minutes and then have them share aloud. Some things that should be discussed is that the lines are black and they are horizontal and vertical. The lines are parallel and vertical. Primary colors (red, blue, and yellow) are used and there are a variety of sizes used. This observation activity was adapted from Math Measurement Masterpiece Using Art as a Platform for Math. The observation activity along with any relevant materials from the lesson will be attached at the end. The full document can be accessed in the additional resource section of the lesson.
9. Once students have had time to observe the art, ask if any of them have seen Mondrian’s work or have heard of him. Share with students that the image on the slide is one piece of Mondrian’s work that uses primary colors and is done in this style.
10. Transition to introducing the final project (slide thirty-two). Directions, a student checklist, and a rubric for the project can be found at the end of the lesson. Students would receive a copy of the directions, checklist, and rubric. On slide thirty-two are simplified directions taken from the directions handout. Review the directions, checklist, and rubric and answer any questions students might have. Below is a copy of

the directions as well.

At the end of the unit, you will complete a final project showing what you learned about the artist Piet Mondrian and fractions. Throughout the unit you learned how to represent fractions using a variety of models along with comparing and ordering fractions. Using that knowledge, along with what you know about Mondrian, you will create a piece of artwork in the style of Mondrian's *Composition in Red, Yellow, and Blue*, 1921.

Your project can only use the colors, red, yellow, blue, white, and black. Like discussed in class, the key components of Mondrian's art must be included in your piece. Those components are listed below:

- Horizontal and vertical black lines
- Primarily red, yellow, and blue in color

In addition to showing artistic understanding, you must show an understanding of fractions. Below are the items you need to include to demonstrate your understanding of fractions.

- 3 fraction bars that are split into 4 parts
- 5 fraction bars that are split into 2 parts
- 1 fraction bar that is split into 8 parts
- 2 fraction bars that are split into 3 parts.
- Any other fraction bars that fit you can include.

This project is worth 50 points and is what will be used to demonstrate your mastery of the fraction skills and art knowledge taught in the unit. There is no test or quiz for this unit.

Score: \_\_\_\_ / 50

Use the checklist to make sure you have included everything in your final project.

11. Once all questions have been answered, give students the remainder of class time for work time (slide thirty-three). On slide thirty-three are tips for students so they can be successful or if they do not know where to start. There is graph paper linked here: <http://bit.ly/3ZQGVTO> if students would like to draft their project with the lines. Using graph paper is optional. Students can draft their project on a blank piece of paper. The tips mentioned above are:

- Draw your lines lightly so you can erase
  - Refer to your checklist for what you are required to have
  - Anything beyond the checklist is welcome!
12. When there is five minutes left of class, transition to wrapping up the lesson (slide thirty-four).
  13. To close the lesson, have students write their name on a sheet of paper and answer the following questions:
    - Name one thing you learned about Piet Mondrian other than the fact he was an artist.
    - What is one thing you made progress on for your final project today during work time?
    - What is an example of non-representational art?
  14. The purpose of asking some of these questions is to make sure students are understanding the content being taught and as a self reflection tool to make sure students are staying on task.
  15. Share with students that tomorrow is the last day they will work on their project and that they will have the entire time to work on their projects. Answer any additional questions students might have.

#### **Day 4: Project Work Time**

**Note:** This lesson goes along with a presentation that is linked <http://bit.ly/3XVbfen> and at the beginning of the lesson. Day four starts on slide thirty-five.

1. Have students complete a warm up (slide thirty-five). Students will complete a focused cloze. See below for the completed focused cloze. The words in purple are the answers for the blanks.

Piet Mondrian was a Dutch artist who lived from 1872-1944. Mondrian is considered the founder of neoplasticism, a style of abstract art. Abstract art is art that does not show things that are real. Mondrian used the primary colors in his work. The primary colors are red, blue, and yellow. He never used a ruler to draw his lines.

2. Review the answers once all students have had time to finish the focused close. Have students turn in their warm up. Move on to review the learning targets (slide thirty-six).
3. When sharing the learning targets for today, you are sharing all the targets from the unit since today is the last day of the unit. Below are the learning targets for the unit.

We have been working on multiple goals for this unit...

- Representing fractions using fraction models like fraction circles and number

lines.

- Determining equivalent fractions.
- Locating fractions on a number line.
- Ordering and comparing fractions.
- Explaining who Piet Mondrian is and how his art uses shapes and color to create fractions.
- Creating a piece of art that is non-representational.

I will know you have learned these skills by your completion of the art project that shows your understanding of fractions and Piet Mondrian's style of non-representational art.

4. The rest of class time is for students to finish their projects (slide thirty-seven). Remind students that today is the last day for them to finish their projects in class and if they don't finish they will need to finish at home.
5. If students have finished their draft and their draft includes everything on the checklist, they can take a new sheet of paper for their final copy. The paper for the final draft can be a larger size piece of paper or the same size as the draft. It is recommended that the final copy is done on a piece of construction paper or cardstock so the paper is heavier.
6. When students are working on their final project, they can use markers, crayons or colored pencils to color. They should use a ruler and then use a black marker to make the lines bold. If students finish early, there are two worksheets attached at the end of the lesson. Both worksheets are from education.com. The first worksheet is titled "Plot Equivalent Fractions on a Number Line" and can be accessed here: <http://bit.ly/3R3jJhr> . The other worksheet is titled "Ranking Fractions: Largest to Smallest" and can be accessed here: <http://bit.ly/3H8YdmK> .
7. When there is about five minutes left of class, have students start to clean up and begin to wrap up the lesson (slide thirty-eight).
8. Have students complete an exit ticket answering the following questions on a piece of notebook paper:
  - What do fractions and art have in common?
  - Where do we see fractions outside of math class?
  - What is non-representational art?
9. Collect the exit tickets and share with students how all their work in this unit helped them meet the learning targets. They can represent fractions as models, compare and order fractions, explain who Piet Mondrian is, and they made a piece of non-representational art.



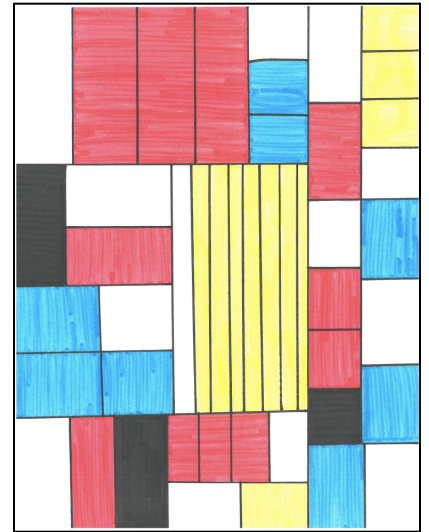
# A Part of Art: Final Project

Name: \_\_\_\_\_

Directions:

At the end of the unit, you will complete a final project showing what you learned about the artist Piet Mondrian and fractions. Throughout the unit you learned how to represent fractions using a variety of models along with comparing and ordering fractions. Using that knowledge, along with what you know about Mondrian, you will create a piece of art in the style of Mondrian's *Composition in Red, Yellow, and Blue*, 1921.

Your project can only use the colors, red, yellow, blue, white, and black. Like discussed in class, the key components of Mondrian's art must be included in your piece. Those components are listed below:



- Horizontal and vertical black lines
- Primarily red, yellow and blue in color

In addition to showing artistic understanding, you must show an understanding of fractions. Below are the items you need to include to demonstrate your understanding of fractions.

- 3 fraction bars that are split into 4 parts
- 5 fraction bars that are split into 2 parts
- 1 fraction bar that is split into 8 parts
- 2 fraction bars that are split into 3 parts.
- Any other fraction bars that fit you can include.

This project is worth 50 points and is what will be used to demonstrate your mastery of the fraction skills and art knowledge taught in the unit. There is no test or quiz for this unit.

Score: \_\_\_\_ / 50

Use the checklist to make sure you have included everything in your final project.

# A Part of Art: Final Project Checklist

As you work on your project, mark off what you have completed. You will turn this checklist in along with a draft and the final project.

## 3 fraction bars that are split into 4 equal parts:

- Fraction bar 1
- Fraction bar 2
- Fraction bar 3

## 5 fraction bars that are split into 2 equal parts:

- Fraction bar 1
- Fraction bar 2
- Fraction bar 3
- Fraction bar 4
- Fraction bar 5

## 2 fraction bars that are split into 3 equal parts:

- Fraction bar 1
- Fraction bar 2

1 fraction bar that is split into 8 equal parts

## Colors Used:

- Red
- Blue
- Yellow
- Black for lines
- White

- Horizontal lines
- Vertical lines
- Straight lines (can tell a ruler was used)

- Project looks neat
- Draft of project is turned in with final project
- Fills the paper
- Colors inside the lines
- Shows creativity
- Checklist is turned in with final project

## Rubric:

Each line is worth 2 points, for a total of 50 points.

### 3 fraction bars that are split into 4 equal parts:

- Fraction bar 1
- Fraction bar 2
- Fraction bar 3

### 5 fraction bars that are split into 2 equal parts:

- Fraction bar 1
- Fraction bar 2
- Fraction bar 3
- Fraction bar 4
- Fraction bar 5

### 2 fraction bars that are split into 3 equal parts:

- Fraction bar 1
- Fraction bar 2

1 fraction bar that is split into 8 equal parts

### Colors Used:

- Red
- Blue
- Yellow
- Black for lines
- White

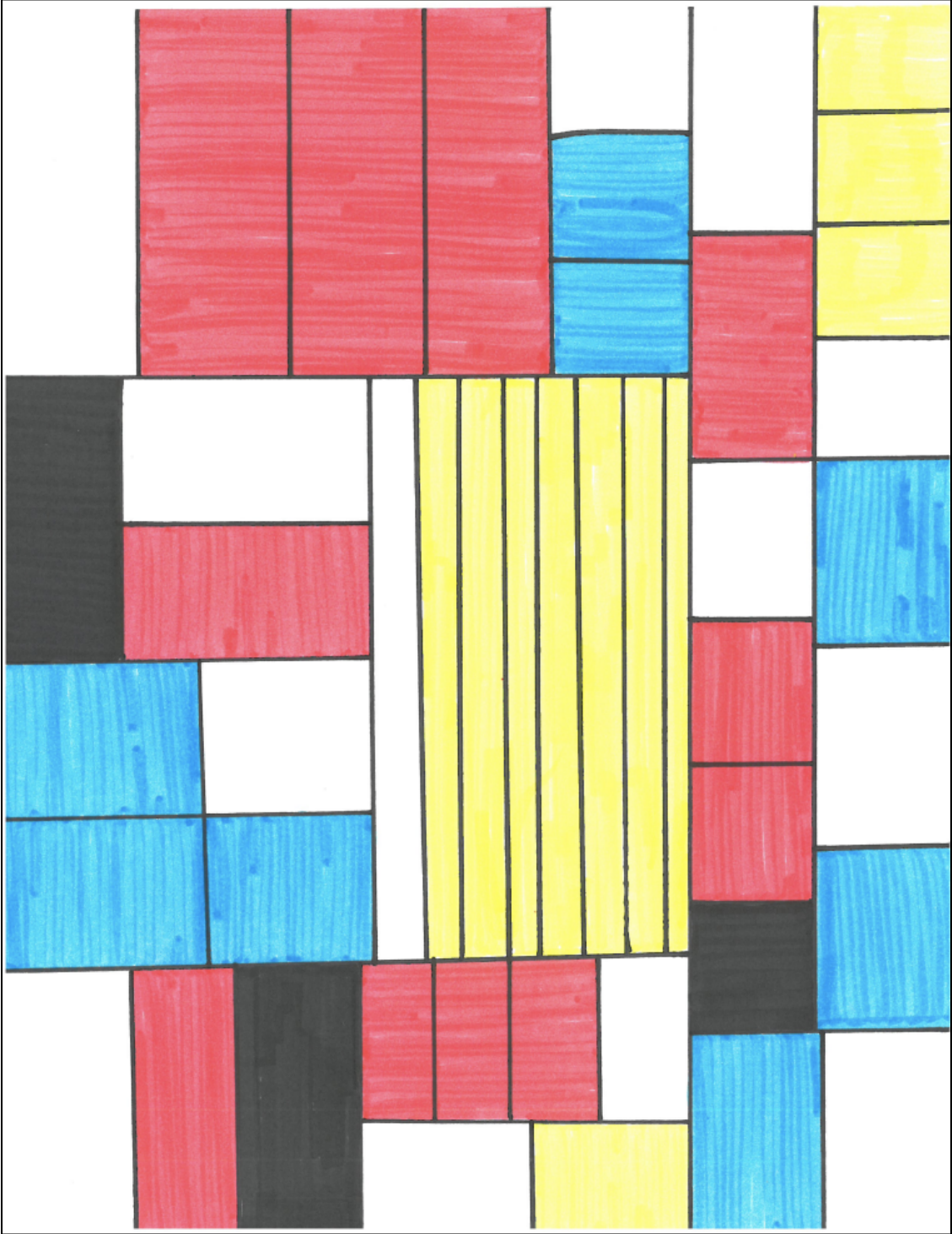
- Horizontal lines
- Vertical lines
- Straight lines (can tell a ruler was used)

- Project looks neat
- Draft of project is turned in with final project
- Fills the paper
- Colors inside the lines
- Shows creativity
- Checklist is turned in with final project

Total: \_\_\_ / 50

# Sample Project

Project created by Katherine Panning 2023



# Take Your Mark:

## 5th Grade Physics and Social Justice Mini Unit

<b>Grade:</b> 5th Grade	<b>MN State Standards</b>
<b>Subject:</b> Art, Science, Engineering, Environmental Justice, Literacy and Math: Force and Motion	<b>5P.3.2.2 1</b> Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.* (P: 6,CC: 5, CI: PS3, ETS1, ETS2) Examples of devices may include electric circuits that convert electrical energy into motion, light, or sound; and a passive solar heater that converts light into heat. Examples of constraints may include the materials, cost, or time to design the device.
<b>Time:</b> Five - One Hour Lessons	<b>5.5.2.2.1</b> Generate and document an innovative idea for art making
<b>Prior Knowledge:</b>  Students should have some familiarity with the engineering design process, but if students are not familiar, they can still be successful as the engineering design process is discussed in the unit.	<b>Learning Targets:</b>  I Can... <ul style="list-style-type: none"> <li>- Apply the ideas of mass and forces to demonstrate what would help a car travel farther.</li> <li>- Describe and demonstrate Newton’s laws of motion.</li> <li>- Design and document a balloon powered car in an engineering journal thinking like an artist and engineer.</li> <li>- Explain the choices made when building a car and how the car meets the criteria and constraints.</li> <li>- Define environmental justice and how cars are an environmental justice issue.</li> <li>- Describe the environmental impact of cars and how using different alternatives for transportation impacts the environment.</li> </ul>
<b>Vocabulary:</b>  <ul style="list-style-type: none"> <li>- Force</li> <li>- Motion</li> <li>- Engineering Design Process</li> <li>- Newton’s Laws of Motion</li> <li>- Friction</li> <li>- Environmental Justice</li> <li>- Sustainability</li> <li>- Equity</li> <li>- Justice</li> </ul>	
<b>Materials:</b>	

\*Materials are organized by part type.

**Teacher Note:** You could have students bring their own supplies to class, which supports more creativity. However, some students might not have access to supplies so you could have supplies in class for students to select from.

#### Jet

- Balloons
- Rubber bands
- Tape

#### Body (Students choose 1)

- Water bottle
- Disposable cup
- Juice box
- Or any type of body you wish to use

#### Axles (Students choose 1)

- Straws
- Barbeque skewers
- Chopsticks

#### Wheels

- Bottle caps (different sizes)
- Cardboard

#### Connector for attaching wheels to an axle (Students choose 1)

- Dry sponge
- Foam
- Play-dough
- Marshmallow

#### Other

- Worksheet (attached at the end of lesson)
- Pre/Post assessment (attached at the end of the lesson)
- Pre/Post assessment answer key (attached at the end of the lesson)
- Money
- Balloon car directions (linked in additional resources)
- Vocabulary graphic organizer (attached at the end of the lesson)
- Price Sheet (attached at the end of the lesson)
- Forces and Motion Presentation (can be accessed here: <http://bit.ly/3Hv4jzr>)
- Client letter (attached at the end of the lesson)
- Stopwatches
- Tape measure or ruler
- Student's engineering notebooks
- Post it notes
- Videos (linked where used)
- "Hot for Hybrids: Can Cool Cars Help Save the World" <http://bit.ly/3j6c9pC>
- "Dream Machines" <http://bit.ly/3j0mTpM>
- "Environmental Justice" <http://bit.ly/3YHtUKM>
- *Iqbal and His Ingenious Idea: How a Science Project Helps One Family and the Planet*

by Elizabeth Suneby

- *How to Spot an Artist: This Might Get Messy* by Danielle Krysa
- Exit ticket (can be accessed here: <http://bit.ly/3mLYs0x>)
- Checklist (attached at the end of the lesson)
- Projector

### **Assessment:**

**Pre Assessment:** Students will complete a quiz on forces, motion, and environmental justice prior to introducing any unit content. Reviewing the results will help determine what needs to be covered and what is covered briefly.

**Formative Assessment:** There will be multiple formative assessments throughout this unit. Students will be assessed through participation, discussion, and check for understanding(s).

**Summative Assessment:** Student knowledge will be assessed through a quiz and the final project where students will complete an engineering design challenge and make a balloon car.

### **Additional Resources:**

PBS Kids Design Squad 4-Wheel Balloon Car <https://to.pbs.org/3HwgGLy>

Science Learning Hub: <http://bit.ly/404Rnr6>

National Institute of Environmental Health Science: <http://bit.ly/3wvjZMQ>

Britannica Kids: Sustainability <http://bit.ly/3wuI71T>

Social Justice Books: <http://bit.ly/3XW4h97>

Climate Generation: <https://climategen.org/>

*I Like to Move It! Physical Science Book for Kids* by Professor Beaver

*Isaac Newton (Giants of Science)* by Kathleen Krull

*We Are All Great: Be Inspired to Save the World* by Valentina Giannella

## **Daily Plan**

**Day 1: Newton's Laws of Motion and Environmental Justice**

**Note:** This lesson goes along with a presentation that is linked here <http://bit.ly/3Hv4jzr> and is linked at the beginning of the lesson.

1. Introduce the unit by explaining to students that they will be completing another engineering design challenge (EDC) (students should be familiar with this, if not an EDC is a challenge that has students constructing something using engineering concepts to solve a real world problem).
2. Have students take out their engineering notebooks to take notes. This is just a notebook dedicated to all of their work for the engineering design challenges or science content if desired.
3. Pull up the presentation on the board and begin going through the slides. Presentation is linked <http://bit.ly/3Hv4jzr>.
4. Start with a warm up (slide two). On post it notes, students will answer the question “what do forces and motion have to do with cars”? Have students share their ideas out loud with the class. Now is not the time to answer questions, but tell students you are going to learn and see if they are right.
5. Have students complete a pre-assessment (slide three). This assessment is also the same as the post assessment. Remind students that this is not graded but to show what they know. It is okay if they do not know anything yet. The last question will be answered when students take the quiz at the end of the unit.
6. Once all students have finished the pre-assessment, start talking about the engineering design process (slide four). Students should already be familiar with the engineering design process, but you will ask them what the process is and then show a chart (included on the slide) that goes step by step through the process.
7. Talk about the plan for today and share the learning targets (slide five). The targets are presented in the format of - today we are working on... followed by I know you learned what I taught by... There will be questions that students should be able to answer if they have mastered the learning targets. Here are the learning targets for day one:

Today I want to teach you about:

- Newton’s laws of motion and what they look like in our everyday life.
- Environmental justice and the impact of cars on the environment.

I will know you learned what I taught by answering the following questions:

Can I...

- Describe and demonstrate Newton’s laws of motion?
- Explain what the engineering design process is?

8. After reviewing the learning targets, introduce some vocabulary for the lesson (slide six). Attached at the end of this lesson is a vocabulary graphic organizer that students could use to take notes. On the graphic organizer, students write the word, definition, and draw a picture of the term. Below are the vocabulary terms covered on this slide. Students should record the definition and example of force in their engineering notebooks.



**Note:** On the vocabulary sheet, some of the terms have been filled in. These are words that students should record in their notebooks. There are blank graphic organizers at the end that could be used to include more words. The words students should include are force, Newton's laws of motion, environmental justice, equity, and sustainability.

Motion: a change in position on an object moving from one place to another.

Force: the greater force on an object can produce a greater change in motion

Friction: the resistance that one surface or object encounters when moving over another

9. As you are introducing each of these terms, go over examples of each. On the slide are examples of each term, but to make the lesson more engaging, have a demonstration of each term for students to physically see what each term looks like.
10. Introduce Sir Isaac Newton (slide seven). Talk about when he was born and died and what he studied.
11. Watch a brief video titled "Newton's 3 Laws, With a Bicycle - Joshua Manley" which can be accessed here: [https://youtu.be/JGO\\_zDWmkvk](https://youtu.be/JGO_zDWmkvk) on Newton's laws of motion (slide eight). After watching the video, fill out the graphic organizer (slide nine). Have students record this information in their engineering notebooks. Information to include are definitions and examples. Have students help you fill out the chart using what they saw in the video.
12. Now you are going to start making connections between environmental justice and science (slide ten). Ask students to share what they think environmental justice is. Explain that justice, even though we might know what it is when we see it, it is a difficult term to try and define. Go over some different definitions of environmental justice and provide some examples.
13. Have students read the article titled "Environmental Justice" from ReadWorks that can be accessed in the materials section, or here: <http://bit.ly/3YHtUKM>.
14. As students are reading, have them annotate the reading by highlighting key details, circling unfamiliar words, and underlining sections that are surprising or shocking (slide eleven).
15. Once students finish reading, have them answer the questions associated with the reading. These questions can be accessed by going to ReadWorks' website.
16. Once students have had time to answer the questions, have them turn and talk with a partner and compare their answers. Have students share what they found shocking or surprising and if there were any unfamiliar words, see if they can work together to figure out what the word means.
17. Go over the answers to the questions as a class and answer any questions.
18. Start wrapping up the lesson by having students complete an activity called "what stuck with you" (slide twelve). On post it notes, students will write answer questions on each post it note. One post it note for one answer/question. Once they have answered these questions on the different post it notes, students will need to find the chart that has the question relating to their answer and stick their note on that chart. Each note should go on a different chart.
19. Once all notes have been stuck on the different charts. Have students walk around the room and look at what their peers wrote. Have students go back to their spots and ask them to share if they noticed any similarities on the posters.

20. Finish the lesson by sharing with students that tomorrow they will learn about the design challenge.

## **Day 2: Transportation Alternatives and Introducing the Design Challenge**

1. Start with the warm up (slide thirteen). In their engineering notebooks, students need to label the three pictures with the law of motion it is showing. After students have had time to write their answers, go over which picture is showing which law.
2. Talk about the plan for today (slide fourteen).

Today I want to teach you about:

- Alternatives to gas powered vehicles and the impact of cars on the environment.
- Our engineering design challenge.

I will know you learned what I taught by answering the following questions:

Can I...

- Describe the impacts of gas powered vehicles on the environment and list the benefits of alternative modes of transportation?
- List the criteria of the design challenge?

3. After reviewing the learning targets, introduce some vocabulary for the lesson (slide six). Attached at the end of this lesson is a vocabulary graphic organizer that students could use to take notes. On the graphic organizer, students write the word, definition, and draw a picture of the term. Below are the vocabulary terms covered on this slide. Students should record the definition and example of force in their engineering notebooks.

**Note:** On the vocabulary sheet, some of the terms have been filled in. These are words that students should record in their notebooks. There are blank graphic organizers at the end that could be used to include more words. The words students should include are force, Newton's laws of motion, environmental justice, equity, and sustainability.

Sustainability: the idea that humans must interact with the environment in ways that leaves enough resources for future generations

Social Justice: everyone having the same rights no matter how someone looks, their religion, or how they identify

Equity: custom tools that identify and address inequality

Equality: evenly distributing tools and assistance

4. As you are introducing each of these terms, go over examples of each.
5. Have students read the article titled "Hot for Hybrids: Can Cool Cars Help Save the World" from ReadWorks that can be accessed in the materials section or here: <https://bit.ly/3j6c9pC>.
6. As students are reading, have them annotate the reading by highlighting key details, circling unfamiliar words, and underlining sections that are surprising or shocking

(slide sixteen).

7. Once students finish reading, have them answer the question 1-2 associated with the reading. These questions can be accessed by going to ReadWorks' website.
8. Once students have had time to answer the questions, have them turn and talk with a partner and compare their answers. Have students share what they found shocking or surprising and if there were any unfamiliar words, see if they can work together to figure out what the word means.
9. As a whole class, read the article titled "Dream Machines" from ReadWorks that can be accessed in the materials section or here: <https://bit.ly/3j0mTpM>.
10. Have students finish answering the questions about the readings.
11. Go over the answers to the questions as a class and answer any questions.
12. Move on to the activity called "Extra! Extra!" (slide seventeen). Students are going to design an advertisement for a car company that is telling people why they should use a car that is not powered by gas. Students should include a drawing of the car, a connection to environmental justice, the name of their car and what fuels the car, the cost and any other information that would make someone want to purchase their car.
13. Students can do this activity individually, in pairs or small groups. To promote collaboration, have students work in partners to design their advertisement. These partners will be the same pairs for the design challenge.
14. Give students 20-30 minutes to complete this activity. Once students have created their ads, hang the ads up around the room.
15. Introduce the design challenge (slide eighteen). Pass out the client letter and have students read the letter in pairs. Students should list the criteria for the challenge in their engineering notebook. Students can start brainstorming designs for their cars. Once all students have had time to read the letter and list the criteria, go over the design challenge criteria as a class so everyone knows what the expectations are for the challenge.
16. Once students know the criteria, pass out price sheets and have students start deciding what materials they will use to build their cars and the cost (slide nineteen). Students should record their budget and materials needed in their engineering notebooks.
17. When there is five minutes left of the lesson, have students complete an exit ticket (slide twenty). The exit ticket can be found here: <http://bit.ly/3mLYs0x>. Students will answer the question "What did you learn about alternative modes of transportation and environmental justice during this lesson? Give an example." They will also rate their understanding on a scale of one to five.
18. Once students have finished filling out the exit ticket, collect them and then share that tomorrow you will be learning about another justice issue and making connections between what they are learning.

### **Day 3: Making Connections**

1. Start with the warm up (slide twenty-one). Students will turn and talk with a partner and talk about the progress they are making on their car. Guiding questions are listed on the slide.
2. Talk about the plan for the day (slide twenty-two).

Today I want to teach you about:

- How there are other types of social justice issues.
- Ways to improve the design of your car.

I will know you learned what I taught by answering the following questions:

Can I...

- Describe a different social justice issue and how it connects to what we are learning about environmental justice?
  - Improve the design of my car so it aligns better with the design criteria?
3. Introduce the book *Iqbal and His Ingenious Idea: How a Science Project Helps One Family and the Planet* by Elizabeth Suneby. As you are reading, have students think about the question “How does this connect to what we are learning and how does Iqbal strive for a more just and equitable world?” (slide twenty-three)
  4. Discuss the reading (slide twenty-four). Ask students how Iqbal's story relates to what they are doing for Fuel the Future. Fill out a venn diagram comparing Iqbal’s solution to a social justice issue to Fuel the Future’s solution (slide twenty-five). Students should also write the venn diagram in their engineering notebooks.
  5. Now that students have another example of a social justice issue, transition to the design challenge (slide twenty-six). Students can go shopping for their supplies based off of the list they made yesterday. Students will shop for the supplies and bring their supplies to the teacher to pay for their materials.
  6. Once students have their supplies they can begin building their first design (slide twenty-seven). When there is five minutes left of the lesson, have students complete the 3-2-1 feedback activity (slide twenty-eight).
  7. For the activity titled “3-2-1 Feedback” students will write on a sheet of paper three things they have learned, two things they found shocking or surprising, and one question they have. Students will trade their paper with someone in their group and they will research and answer their classmate’s question and bring an answer to class tomorrow.

#### **Day 4: Building and Testing Design #1**

1. Start the lesson by having students turn and talk with their group and share the question they had to answer and what they learned (slide twenty-nine). Have some students share with the class what they learned.
2. Talk about the plan for the day (slide thirty)

Today you are going to:

- Build and test design #1 of your car.
- Share with another team the artistic choices you made when designing your car.

I will know you learned what I taught by answering the following questions:

Can I...

- List the criteria for the design challenge?
  - Apply scientific and artistic principles when designing and testing my car?
3. Read the book *How to Spot an Artist: This Might Get Messy* by Danielle Krysa (slide thirty-one). As you are reading, have students think about what it means to be and think like an artist. If you do not have access to a physical copy of the book, you can access a read aloud here: [https://youtu.be/R3udo\\_BDmxc](https://youtu.be/R3udo_BDmxc).
  4. After reading, discuss the question and explain that what students are doing in the design challenge is thinking like an artist.
  5. Once students understand the connection between being an artist and the design challenge, have them gather their supplies so they can continue building their car and testing the design (slide thirty-two). Attached at the end of the lesson is a worksheet for students to complete while designing and testing their car. Make sure to have a start line so all students are starting at the same point when testing their car.
  6. When there is about five minutes left of class, have students answer the focused close in their engineering notebooks. The words in purple are the answers for the blanks.

Sir Isaac Newton was a **physicist/scientist** who studied forces and motion. The laws he created called the laws of **motion**, help us understand the way things move and respond to force. These laws relate to the design challenge because we are using **air** as the force to move our cars the farthest distance possible without needing more air. Fuel the Future wants us to design a new solution to gasoline power cars because gas powered cars are an environmental **justice** issue. Environmental justice is the right to live on a safe, healthy, and sustainable planet for **all**. We want a **clean** Earth and by designing a new car we are helping the **environment/planet** and making the world a better place to live in.

**Note:** At the end of the lesson is a checklist. This will be used for students to evaluate their work and make sure they have met the learning targets. Students will turn in the checklist with their engineering notebooks at the end of the unit to be assessed for their mastery of the learning targets.

### **Day 5: Building and Testing Design #2**

1. Warm up by having students turn and talk with their table mates and talk about their plans to finish the design challenge (slide thirty-four).
2. Talk about the plan for today (thirty-five).

Today you are going to:

- Build and test design #2 of your car.
- Graph class data to show the results of the design challenge.
- Compare and contrast your car designs using scientific and artistic thinking.

I will know you learned what I taught by answering the following questions:

Can I...

- Take class data from the design challenge and show it on a bar graph?
  - Build another car and explain the design choices I made?
  - Describe which design was “better” and why?
3. Now students can redesign and test their second car (slide thirty-six). Students need to complete all testing today since this is the last day of the design challenge.
  4. About half way through the lesson, gather students back together and compare race results (slide thirty-seven). Using the bar graph on the slides, graph the results with cost (in \$50 increments) on the y-axis and distance (in inches) on the x-axis. Students will graph this in their engineering notebooks.
  5. Talk about what you notice and what this data tells us. Ask students if there are other ways to show the data collected. If there is time, graph other data like cost and distance.
  6. Have students take the post assessment (slide thirty-eight). This is the same assessment as the pre-assessment. This time, students are answering the last question on the assessment.
  7. Once students have finished the quiz, have them reflect in their engineering notebooks answering the questions below (slide thirty-nine).
    - What are Newton’s three laws of motion?
    - How are the laws of motion related to the design challenge?
    - How did you use the engineering design process during this unit?
    - What is environmental justice?
    - How is the design challenge connected to environmental justice?
    - What does it mean to be and think like an artist?
  8. Wrap up the unit by having students go around the room and sharing one thing they learned about environmental justice and how it related to the design challenge.

## Forces and Motion Assessment

Name: \_\_\_\_\_

Date: \_\_\_\_\_

1. A force is \_\_\_\_\_.
  - a. A push
  - b. A pull
  - c. Both a and b
  - d. None of the above
2. Newton's 3rd Law of Motion states that \_\_\_\_\_.
  - a. For every action there is an equal and opposite reaction.
  - b. An object continues to be under the state of uniform motion unless an external force acts on it.
  - c. Force is a product of mass and acceleration.
  - d. None of the above.
3. A ball is laying on the floor. When will the ball move?
  - a. When a loud noise is made.
  - b. When a force acts on it.
  - c. It will never move.
  - d. When friction acts on it.
4. What type of force will slow down a moving object that slides on a surface?
  - a. Gravity
  - b. Friction
  - c. Electric force
  - d. Magnetic force
5. Define environmental justice:
  
6. What is equity?
  - a. Giving everyone the same amount of everything
  - b. Giving people custom tools so they can meet their needs
  - c. Not giving people anything
  - d. Giving one person everything and everyone else gets nothing

### ***After completing the design challenge:***

Describe the environmental justice impact of cars and how using different alternatives for transportation impacts the environment. Use details from what you have learned in the unit.

Write your answer on the back of this paper.

Forces and Motion Assessment

Name: **KEY** \_\_\_\_\_

Date: \_\_\_\_\_

1. A force is \_\_\_\_\_.
  - a. A push
  - b. A pull
  - c. Both a and b
  - d. None of the above
2. Newton's 3rd Law of Motion states that \_\_\_\_\_.
  - a. For every action there is an equal and opposite reaction.
  - b. An object continues to be under the state of uniform motion unless an external force acts on it.
  - c. Force is a product of mass and acceleration.
  - d. None of the above.
3. A ball is laying on the floor. When will the ball move?
  - a. When a loud noise is made.
  - b. When a force acts on it.
  - c. It will never move.
  - d. When friction acts on it.
4. What type of force will slow down a moving object that slides on a surface?
  - a. Gravity
  - b. Friction
  - c. Electric force
  - d. Magnetic force
5. Define environmental justice:

Answers will vary:  
Everyone having the same rights no matter how someone looks, their religion, or how much money they have with respect to the environment. The right to a safe, healthy, and sustainable planet for all.
6. What is equity?
  - a. Giving everyone the same amount of everything
  - b. Giving people custom tools so they can meet their needs
  - c. Not giving people anything
  - d. Giving one person everything and everyone else gets nothing

***After completing the design challenge:***

Describe the environmental justice impact of cars and how using different alternatives for transportation impacts the environment. Use details from what you have learned in the unit. Write your answer on the back of this paper.



Fuel the Future  
United States of America  
August 7<sup>th</sup>, 2022

Dear Student Engineers,

My name is Alma Hernandez, and I am the CEO of Fuel the Future, an automotive company researching alternative modes of transportation and their impact on the environment. My company is looking to hire you for one of our projects. Many people drive their car to work, school, and home. However cars that are fueled by traditional gasoline are harmful to the environment. Our company is looking for someone to design and build a car that is fueled by air. This car will be better for people's health and will help solve the environmental justice issue of cars and their negative impact on the environment. Below are some of the many issues that cars pose to the environment:

- Electric cars are an alternative to gasoline powered vehicles, but they are expensive and not accessible for people who live in rural areas.
- Burning gasoline and diesel creates harmful secondary gasses that contribute to air pollution.
- Gasoline is not only extremely flammable but cars emit carbon dioxide which is the most common human-made greenhouse gas.

Our company wants to help solve these problems. Our goal is to design a car made out of reusable materials that will still function as a mode of transportation but will not have harmful effects on the environment that gasoline powered vehicles do. We understand that there are other modes of transportation like public transportation, walking, biking and so many other ways to move around, but for some people those ways are not accessible to them because of where they live or time. As you develop your plan please take a few things into consideration. First this car needs to be inexpensive so everyone can afford this solution, under 1,000 dollars is preferred. The car should also be energy efficient and safe; the goal of this product is to reduce pollution emissions. The car needs to run on air, be low cost, travel at an appropriate speed; meaning a snail cannot move faster than it, and travel far distances without needing more air. When you share your final design with us, please be prepared to justify your design with evidence. We look forward to working with you.

Sincerely,

*Alma Hernandez*

Alma Hernandez  
CEO of Fuel the Future

## Take Your Mark: Checklist

### *In your engineering notebook did you include the following:*

- Notes on Newton's laws of motion
- Day two warm up
- Vocabulary covered in the lessons
- List of criteria for the design challenge
- Cost for each design of your car
- Sketch with labels for design one of your car
- Write a summary explaining the choices you made for design one
- Sketch with labels for design two of your car
- Write a summary explaining the choices you made for design two
- Focused close from day four
- Bar graph with class results
- Day five wrap up questions

### *On your worksheet did you:*

- Answer all of the question in complete sentences
- Fill in both data charts and used the correct units
- Draw a final sketch for design one of your car
- Draw a final sketch for design two of your car
- Describe what went well and didn't go well with your designs
- Describe what you would do differently next time
- Use vocabulary in your answers

### *During class discussions did you:*

- Participate in conversation with peers though sharing ideas and listening
- Make connections to environmental justice and the design challenge
- Fill in the venn diagram comparing Iqbal's story to Fuel the Future
- Trade the 3-2-1 feedback assignment with someone in your group and research their question to find an answer
- Annotate your readings using what you know about annotating
- Make a newspaper advertisement for a car that is not fueled by gasoline

## Engineering Design Challenge: Take Your Mark

Supply	Price Per Item
<b>Body:</b> Bottle	\$200
<b>Axle:</b> Straw Skewer Chopstick	\$50 \$100 \$30
<b>Wheels:</b> Small Medium Large Pre-Cut	\$23 \$30 \$40
<b>Connectors:</b> Play-Dough Ticky-Tack Sponge	\$10 \$30 \$20
<b>Jet:</b> Balloon Rubber Band Scotch Tape (per inch) DuctTape (per inch)	\$10 \$5 \$5 \$20
<b>Additional Fees:</b> Cutting Services Scissor Rental Skewer Cutter Rental	\$50 / item \$25 \$25

## Take Your Mark Worksheet

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Lesson Objective: To design a balloon powered car that meets the criteria that can travel the farthest distance in the shortest amount of time without needing to refuel.**

1. What factors influence how far objects travel?

### *Design #1:*

2. Take the sketch of the car that you designed in your engineering notebook and create a final sketch in the space below.

3. Describe what happened after building and testing your car? Record the data from your first design for question #4.

4. Fill in the chart below with the data from design one.

Design #1	Distance Traveled (inches)	How long your car traveled for (seconds)	How much did your car cost to build?	Speed Distance/time (in/sec)
Trial #1				
Trial #2				

### *Design #2:*

5. Take the sketch of the redesign of your car that you drew in your engineering notebook and draw a final sketch of the second design of your car.
  
6. Describe what happened after building and testing your car a second time? Record the data from your second design for question #7. Was this design better? Think: What would make the design “better”?
  
7. Fill in the chart below with the data from design two.

Design #2	Distance Traveled (inches)	How long your car traveled for (seconds)	How much did your car cost to build?	Speed Distance/time (in/sec)
Trial #1				
Trial #2				

***After testing both of your car designs:***

8. Reflect on your car’s performance from both designs. What was successful and what was unsuccessful?. Use data to support your answer. What would you do differently next time?
  
9. Which design worked better? Why?

## Vocabulary Graphic Organizers:

Word	Definition	Drawing
Force		

Word	Definition	Drawing
Newton's laws of motion		

Word	Definition	Drawing
Environmental justice		

Word	Definition	Drawing
Equity		

Word	Definition	Drawing
Sustainability		

Word	Definition	Drawing

# Sample Projects

Projects created by Katherine Panning 2023

