

**Lesson Title:** Hooray for Arrays

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**Topic:** Arrays

**Targeted Grade Level:** 2<sup>nd</sup> Grade

**Time Needed:** 3-4 class periods, 30-45 minutes each

**Subject Integration:** Math, Art, and Technology

**Justification:** This lesson allows students to use their artistic abilities and technology to show their thinking and understanding of arrays. Students will learn what an array is, important terms and characteristics of arrays, and how you can use a repeated addition sentence to represent an array. Students will learn that repeated addition is a method of skip counting, which is a much more efficient way to count, and that it is also the basis for multiplication. Students will be creating arrays using either their best drawing skills or a digital tool.

**Standards:**

**Common Core Math Standard:**

[CCSS.MATH.CONTENT.2.OA.C.4](#)

Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

**Common Core ELA Standard:**

[CCSS.ELA-LITERACY.SL.2.1](#)

Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.

[CCSS.ELA-LITERACY.SL.2.6](#)

Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

National Core Art Standards:

- #1. Generate and conceptualize artistic ideas and work.
- #2. Organize and develop artistic ideas and work.
- #3. Refine and complete artistic work.

| Science and Engineering Practices  | Disciplinary Core Ideas  | Crosscutting Concepts:  |
|--|--|---|
| <p><b><u>Developing and Using Models</u></b><br/>Modeling in K-2 builds on prior experiences and progresses to include using and developing models (i.e., diagram, drawing, physical replica, diorama, dramatization, or storyboard) that represent concrete events or design solutions.</p> <ul style="list-style-type: none"><li>- Develop a simple model based on evidence to represent a proposed object or tool. (K-2-ETS1-2)</li></ul> | <p>ETS1.B: Developing Possible Solutions</p> <ul style="list-style-type: none"><li>- Designs can be conveyed through sketches, drawings, or physical models. These representations are useful in communicating ideas for a problem's solutions to other people. (K-2-ETS1-2)</li></ul> | <p>Structure and Function</p> <ul style="list-style-type: none"><li>- The shape and stability of structures of natural and designed objects are related to their function(s). (K-2ETS1-2)</li></ul> |

## **Measurable Student Learning Objectives:**

Students will be able to:

- Explain what arrays are using grade-level appropriate language and vocabulary
- Write or identify repeated addition sentences that match/represent arrays
- Create an array with manipulatives, drawings, or digital drawing tool
- Use repeated addition to find the total number of objects in an array
- Explain how skip-counting is connected to arrays, and why using skip-counting or repeated addition is important

**Nature of STEM:** Math is all about patterns and relationships. But it's not enough to notice these patterns and relationships. We need to be able to use what we observe and learn about the patterns and relationships we see. Arrays are the perfect example of this. We can quickly see that there are patterns in arrays, but we must go deeper than that, by exploring how we can use these patterns to find solutions to problems, both in Math class and in the real world.

**Engaging Context/Phenomena:** There's no better way to hook students into a lesson than by connecting what you want them to learn to their lives. Since arrays can be seen in so many places that students are familiar with, hopefully the material they are learning will mean more to them and stick with them better than it would if they had no personal connections to the material. Asking students to "put on their scientist coats" will hopefully make them feel like their role as a learner is important, as well.

**Data Integration:** Arrays are all around us - in nature, in the classroom, in Walmart. Using photographs of arrays that students see in their real-life is a simple way to bring data into this lesson.

**Differentiation of Instruction:** Peer helpers, small group instruction, teacher prompts and sentence starters, and giving students choices on how to show their learning will help students of all ability and confidence levels successfully learn, and later express their learning.

**Real-life Connection:** There are so many times that students will see arrays in real life, and even more times that they will have to count up the number of items in an array, even if they don't know that it is an array. For example, students who work in a grocery store or other retail stores may have to create a display or arrange items on shelves in an array, and knowing how to repeatedly add, and eventually multiply, would be tremendously faster and more appropriate than adding items one by one.

**Possible Misconceptions:** Students often confuse rows and columns, usually because of their lack of experience with them. Giving them real life examples and photographs goes a long way in helping them understand the difference.

There is also frequently a misconception that arrays can only be counted by row. While that is the most common way to add up the items in an array, it is not the only way. Arrays can be counted by columns as well. Teach by row first.

**Lesson Procedure:**

| 5E Model   | 5E Objectives   |
|--|---|
| <p><b><u>Engage</u></b></p> <p><i>Introduce the lesson with an anchoring phenomenon. Facilitate student questions, discussion, etc. as appropriate. Learn about what students already know and want to know.</i></p> | <p><b><u>Procedure:</u></b></p> <ul style="list-style-type: none"><li>• Teacher will show students photos of real-life arrays.</li><li>• Teacher will tell students to put on their invisible scientist coats, so they can observe like scientists do, and ask students to observe the photos.</li><li>• Students will complete a Notice/Wonder/Think graphic organizer, independently.<ul style="list-style-type: none"><li>○ Teacher will encourage students to use their best spelling, and remind them that this graphic organizer is simply a place for them to put down their thinking, and is not a spelling test. Any students who still need help can raise their hand for help.</li><li>○ Tech tool option: Teacher can have students use FlipGrid (Loom, Seesaw, etc.) to record themselves telling what they notice, think, and wonder, instead of filling out the graphic organizer.</li></ul></li></ul> <p><b><u>Modifications:</u></b></p> <p>Teacher will have peer helpers chosen for students who don't write or spell well, and who need the extra confidence to complete their graphic organizer.</p> <p>Students who express themselves better with words can use FlipGrid to tell what they notice, think, and wonder, so they can better explain what they observe and are curious about.</p> <p><b><u>Standards Addressed:</u></b></p> <p><a href="#"><u>CCSS.ELA-LITERACY.SL.2.6</u></a></p> <p>Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.</p> <p><b>Formative Assessment:</b> Teacher will observe students while they are looking at arrays and completing their graphic organizers. Teacher will read over student graphic organizers - or Flipgrid videos - and ask questions for clarification, when necessary.</p> |

**Resources:** , , Flipgrid formative assessment link

- Real-world array photos [Arrays Around Us Photo Cards](#)
- Notice/Think/Wonder graphic organizer [Notice, Think, Wonder Graphic Organizer](#)
- Flipgrid formative assessments
  - Sample Flipgrid - Notice, Think, Wonder <https://flipgrid.com/f5a85b43>
  - Sample Flipgrid - What do you know about arrays? <https://flipgrid.com/a22c924d>

### **Explore**

*Plan for students to engage in hands-on activities that are designed to facilitate conceptual change.*

### **Procedure:**

- Teacher will put students into partners or small groups, giving them more/new/different photos of arrays that are seen in real life.
- Students will discuss with their partner/group what they notice, think, and wonder, just like they did independently earlier. Students will add to their graphic organizers when needed.
- As students are observing and working, the teacher will begin asking students how many objects they see in each array, and to explain how they came up with that amount - to observe how students are counting (by one, or skip counting). When students count by ones, the teacher will ask if there is another way we could count the objects, more quickly, but still the right number - without telling them to skip count, or what to count by.

**Modifications:** Students will be paired/grouped strategically, to support the shy and struggling learners, specifically. Teacher will prompt students with questions, when necessary.

### **Standards Addressed:**

[CCSS.ELA-LITERACY.SL.2.1](#)

Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.

### **Formative/Summative Assessments:**

- Teacher will listen to group conversations, and observe the additions to their graphic organizers.
- Teacher will use questioning to get a better picture of student understanding, when necessary.

|   |   |
|---|---|
|   | <ul style="list-style-type: none"> <li>• Teacher may make notes about what is heard/said/written - both right and wrong, to help guide the next session's discussion/explanation.</li> </ul> <p><b><u>Resources:</u></b></p> <ul style="list-style-type: none"> <li>• Photos of real-life arrays <a href="#">Arrays Around Us Photo Cards</a></li> <li>• Students' Notice, Think, Wonder graphic organizers from session 1 <a href="#">Notice, Think, Wonder Graphic Organizer</a></li> </ul>   |
| <p><b><u>Explain</u></b></p> <p><i>Facilitate opportunities for students to explain their understanding of concepts and processes and make sense of new concepts.</i></p> | <p><b><u>Procedure:</u></b></p> <ul style="list-style-type: none"> <li>• Teacher will call all groups back together (if done on the same day as the EXPLORE phase).</li> <li>• Teacher will ask each group to explain what they discovered/observed/now know about arrays. <ul style="list-style-type: none"> <li>▪ Teacher may choose to record student responses on the white board, Smartboard, an anchor chart, or in Word of Google Docs, so it can be referred back to later and remembered.</li> </ul> </li> <li>• Teacher will share with students any information about arrays that is important, that students do not mention, or were confused about in their group conversations. <ul style="list-style-type: none"> <li>○ This will include important terms and characteristics of arrays, such as: <ul style="list-style-type: none"> <li>▪ Equal - the same</li> <li>▪ Rows - go across</li> <li>▪ Columns - go up and down</li> <li>▪ Repeated addition - adding the same number over, and over again</li> </ul> </li> <li>○ This may also include explaining why skip counting is a more efficient way to count, rather than counting by 1's, and how skip counting is the beginning and the basis of learning to do multiplication.</li> </ul> </li> <li>• Teacher may show a video about arrays, or share a story about arrays, if it helps support student learning. Here are a few to choose from: <ul style="list-style-type: none"> <li>○ Rows and Columns <a href="https://www.youtube.com/watch?v=XNZr7fnHRCs">https://www.youtube.com/watch?v=XNZr7fnHRCs</a></li> <li>○ <u>Amanda Bean's Amazing Dream</u>, Read Aloud <a href="https://www.youtube.com/watch?v=g07vteeiz_o">https://www.youtube.com/watch?v=g07vteeiz_o</a></li> <li>○ 2<sup>nd</sup> Grade Arrays and Repeated Addition <a href="https://www.youtube.com/watch?v=vO6WW1BGbLw">https://www.youtube.com/watch?v=vO6WW1BGbLw</a></li> </ul> </li> </ul> |

- Real Life Arrays by Mrs. Dubose <https://www.youtube.com/watch?v=ks-q6gKoQKs&t=18s>
- NumberRock Equal Groups and Repeated Addition (Intro. To Multiplication) <https://www.youtube.com/watch?v=gzFbUZ8VjEg>

**Modifications:**

- Teacher may prompt students who struggle with sharing their thinking with questions and sentence starters.
- Teacher may ask students who need time to think their question first, give them think time, and then come back to them after they have had time to process their question and response.

**Standards Addressed:**

[CCSS.MATH.CONTENT.2.OA.C.4](#)

Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

[CCSS.ELA-LITERACY.SL.2.1](#)

Participate in collaborative conversations with diverse partners about grade 2 topics and texts with peers and adults in small and larger groups.

[CCSS.ELA-LITERACY.SL.2.6](#)

Produce complete sentences when appropriate to task and situation in order to provide requested detail or clarification.

**Formative Assessment:**

Students will share in writing, or in a video recording (FlipGrid, Loom, Seesaw, or other) what they have learned/now know about arrays. Teacher will be listening for the key terms and characteristics of arrays, and for students to discuss the connection between arrays and skip counting.

**Resources:**

- Helpful articles for teachers about teaching arrays:
  - <https://teachingsecondgrade.com/how-to-teach-arrays/>
  - <https://missgiraffesclass.blogspot.com/2015/07/how-to-teach-arrays.html>
  - <https://theappliciousteacher.com/arrays/>

- What I've Learned About Arrays (written response): [What I Know About Arrays](#)
- Sample FlipGrid for What I've Learned About Arrays: <https://flipgrid.com/a22c924d>

**Procedure:** (This could be completed in small groups, but is designed for whole group.)

- Teacher will create arrays using math manipulatives, or draw with on paper/the whiteboard. (These could be premade.)
- Students will look at the arrays, and describe what they see. The teacher will be listening for students to use the array terms that they have been discussing, such as rows, columns, and for students to count how many "items" are in each array.
- Teacher will ask them how many items are in each array, and how they should count the items in each array.
- As students are counting, the teacher will remind them that as they grow and learn, they should be skip counting instead of always counting by ones.
- Teacher will ask students what equation they could write that would match their array, listening for students who are counting by 1's, and students who are skip counting.
- Teacher will introduce the term "repeated addition". Have students tell what they think it means, and then discuss how repeated addition is just that - a number sentence where the same number is repeated over and over. Then explain and demonstrate how each repeated addition sentence they make should always match the rows in the array. (\*Explain that you can use repeated addition with columns, but that by row is the most common way to add up an array.)
- Teacher will continue building simple arrays, and having students explain what repeated addition sentence they should write to match the arrays.
- Teacher will then have students draw or create arrays with a given characteristic, for example, "Build an array with 3 rows and 4 columns, and write repeated addition sentences that match."
- Teacher will carefully watch students, and prompt students who struggle.

**Modifications:**

- Teacher can designate peer helpers to help students who require more support.
- Teacher can build all the arrays for students who aren't yet ready to build their own, in a one-on-one or small group setting, or set up the number sentence blanks for students. (   +   +   =    )

**Elaborate**

*Provide applications of concepts and opportunities to challenge and deep ideas; build on or extend understanding and skills.*

**Standards Addressed:**

[CCSS.MATH.CONTENT.2.OA.C.4](#)

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**National Core Art Standards:**

#1. Generate and conceptualize artistic ideas and work.

#2. Organize and develop artistic ideas and work.

#3. Refine and complete artistic work.

**Formative/Summative Assessments:**

- Teacher will observe students and their conversations, and will make notes of students who need to be pulled again for extra help with these tasks.
- Teacher will question and prompt students to check for understanding.

**Resources:**

- Materials for teacher and students to draw and create arrays: whiteboard and markers, or math manipulatives (linking cubes, counting bears, counters, etc.)

**Evaluate**

*Assess students knowledge, skills and abilities.*

**Procedure:**

To evaluate students, here are two summative assessments that students can be asked to complete, depending on student needs. Teacher can use one or both of the assessments.

#1 - Arrays Assessment [Simple Arrays Assessment](#)

#2 - Teacher will present options for students to choose from, where they can use their creativity to demonstrate their understanding of arrays.

- **Option 1:** Students may create/design a full page array, using pencil, crayons, colored pencils, and markers. Students will use their personal interests to choose the "topic" of their arrays. Students will write a repeated addition sentence to match their array.

- **Option 2:** Students will design/create a digital array - using ABCYa Paint (or some other tech tool, such as Google Drawings, Seesaw, etc.). They will use their personal interests to choose the "topic" of their arrays. Students will write a repeated addition sentence to match their array.
- **Option 3:** Students can create a video of themselves explaining their understanding of arrays - what they know and have learned - using FlipGrid, Seesaw, Loom, or any other video tech tool.

**Modifications:**

- Giving students three options allows all students to show their understanding in the way that they feel most confident about.
- If there are students who struggle to make choices like these, the teacher can make the choice for them, individually or in small groups.

**Standards Addressed:**

[CCSS.MATH.CONTENT.2.OA.C.4](#)

Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

**National Core Art Standards:**

*#1. Generate and conceptualize artistic ideas and work.*

*#2. Organize and develop artistic ideas and work.*

*#3. Refine and complete artistic work.*

**K-2-ETS1-2**

Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

**Formative/Summative Assessments:**

- Arrays Assessment (linked above)
- Hand-drawn/designed arrays, using paper, pencil, crayons, markers, other drawing tools (Option 1)
- Online array creations (Option 2)
- FlipGrid/Loom/Seesaw video (Option 3)

### Resources:

- Arrays Assessment (linked above)
- Paper, pencil, crayons, markers, other drawing tools
- ABCYa Paint [https://www.abcya.com/games/abcya\\_paint](https://www.abcya.com/games/abcya_paint)
- Sample FlipGrid Assessment <https://flipgrid.com/49f3b6db>
- Rubric for Student Options [Arrays Assessment Rubric](#)

### Teacher Background:

- Arrays are items are arranged in rows and columns.
  - Rows go across. (horizontal)
  - Columns go up and down (vertical)
- Arrays can be seen all around us in real-life.
- Repeated addition is when a number is added over and over again to get a sum.
  - This is an efficient way for 2<sup>nd</sup> graders to count up objects or pictures in an array, much more so than counting them one by one.
  - It is an excellent example/model for skip counting.
  - Repeated addition is a perfect way to introduce multiplication. An array with 3 rows and 4 columns has 12 objects,  $3 \times 4 = 12$ . Multiplication is introduced in 3<sup>rd</sup> grade Common Core curriculum.
- Helpful articles for teachers when teaching arrays:
  - <https://teachingsecondgrade.com/how-to-teach-arrays/>
  - <https://missgiraffesclass.blogspot.com/2015/07/how-to-teach-arrays.html>
  - <https://theappliciousteacher.com/arrays/>