

Place Value

Community Gardening and Place Value in Second Grade

Jordan Morales

Diné Institute for Navajo Nation Educators (DINÉ)

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Author Note:

Jordan Morales is a second-grade teacher at Kinsey Inquiry and Discovery School. Correspondence about this curriculum can be addressed to Jordan Morales, 1601 S. Lone Tree Rd, Flagstaff, AZ 86001. Email contact: dineteachersinstitute@nau.edu

Introduction

My name is Jordan Morales, and this is my first time participating in the Diné Institute for Navajo Nation Educators. I signed up for this institute thinking I would just leave with an interesting unit on Navajo culture but ended up learning so much more. By listening carefully to the stories that my seminar fellows shared, I learned more about what it means to them to integrate Diné culture into everyday learning, and how meaningful it can be in the students' lives. I am extremely grateful to my seminar fellows for allowing me to hear their history and family stories, and hope to have respectfully incorporated their teachings into my curriculum unit. Because I am not Diné, I tried to find a topic that I knew was culturally relevant, but where I would not be overstepping in trying to presume that I had any authority on Diné culture. In teaching this unit, my role will be as a facilitator, and to allow students to bring in their own family stories and experiences. I will simply provide that safe space to share those things, but I will not directly be teaching on Diné stories, culture, or history.

Context and Rationale

Classroom Description

The School

This curriculum unit is intended to be taught to a second-grade class at Kinsey Inquiry and Discovery School in Flagstaff, Arizona. Kinsey is a Title I Magnet school in the Flagstaff Unified School District. Because we are a magnet school, students can attend our school no matter where they live in the district. We have some families drive in from as far as Cameron, Arizona, while others simply walk to school from across the street. Our magnet is place-based, and therefore the mission is to, "Provid[e] learning experiences inspired by the environment, cultures and community of Northern Arizona," (Kinsey Inquiry and Discovery School, 2020). We achieve this through multiple community partnerships with organizations such as Willow Bend Environmental Center, Centennial Forest, Northern Arizona University, Grand Canyon Youth, and many more. These outside organizations supplement the classroom learning in a way that makes education meaningful to students as they progress through the grades at Kinsey.

At Kinsey, one hundred percent of the students at our school receive free breakfast and lunch, and we offer free after school STEM-based learning through the 21st Century Community Learning Centers Grant (also called "K21" at school). Through this grant, students can engage in programs that encourage service learning, and to extend the learning from the school day in a way that is meaningful to them. Most classes have about ten to twelve students, and teachers can work with students on topics that matter to them. For instance, the first grade K21 group was very concerned about the fires that were blazing in Australia, and they were specifically worried about the koalas living there. So, these students ran a change drive where they decorated jars for each classroom and collected loose change that people wanted to donate to aid the koalas. It was so impressive and inspiring to see these students really trying to make a difference and to help with a problem that was so far away. This is just one example of the kinds of exploratory learning that is offered in the K21 program.

In terms of demographics, around forty-nine percent of our students are Native American, twenty-five percent of students are Hispanic, twenty-one percent of students are white, and about five percent of students are Asian, Black, or two or more ethnicities. Because our school population is so diverse, we typically hold many events throughout the year where we invite families to share their cultures and traditions with the rest of the school. In May 2019, we hosted a culture night where families could bring in traditional food, presentations about their culture or family, and show off their traditional dances or songs in a talent performance. In December 2019, we had a Winter Stories night where families came in to share traditional Navajo stories that are only to be told in the winter, and it was a very special gathering. Everyone at the school was welcome to attend, and it was a wonderful way for non-Navajo students, staff, and families to learn more about Navajo culture.

My Students, and Math in Second Grade

Typically, I teach anywhere from nineteen to twenty-seven students in a school year, and I also teach a class of about ten to twelve students in our STEM-based after-school program, K21. As a grade-level team, we have determined that place value and addition and subtraction to 1000 are our most essential second-grade math skills. Most students come in to second grade with a reasonable ability to add and subtract within twenty, but there are usually about five or so students who really struggle with these introductory calculations. These struggles can stem from many different areas, not all of them directly limited to mathematics. It is my job to address these struggles so that we may progress through the main second grade math goals.

One area of struggle can stem from gaps in their place value understanding. Mathematician Roger Howe asserts that there are five stages of understanding place value, and that the first is seeing how “each base ten number is implicitly a sum,” meaning that the number 25 is made up of 20 plus 5 (Howe, 2018). Some students stumble on this first step, and do not understand the values associated with the numbers presented. Instead of recognizing that the numeral 2 in 25 represents twenty, they see it as just a two. It takes multiple representations to help students understand the full meaning of numbers. The US Math Recovery Council utilizes three aspects of number: quantitative, verbal, and symbolic (US Math Recovery Council, 2006). If a student does not have a solid grasp of all three of those aspects, they will struggle to make meaning of multi-digit numbers.

Once students understand the meaning of the place value parts of a number, they can then progress to manipulating those numbers by performing calculations. In second grade, we focus heavily on addition and subtraction strategies. Students can struggle here because we present them with a very wide variety of solving strategies, and they can become overwhelmed by these options. However, if we incorporate culturally responsive teaching methodology, students will have the option to be much more successful (Ellis, 2019). As I have learned through seminar discussions with my fellows, Navajo people culturally and historically have an innate but not explicitly stated number sense, but westernized ways of teaching typically do not support those strategies. In response to that understanding, students in my classroom will be allowed to make meaning in their own way, and if they can mathematically justify that meaning it will become part of our class bank of strategies. I really want to see what the students come up with on their own. I want to provide more space for those cultural expressions to come out!

Another cause of student struggle can be the amount of cultural relevance to the learner. This unit is being developed in response to the general lack of culturally responsive teaching in most subject areas. Although in the year 2020 most teachers recognize that their classroom library should be full of diverse stories from all cultures and walks of life, few teachers have come to reflect that same diversity in other subject areas, particularly in mathematics. We are typically convinced that “math is the subject that bridges all languages” and that we do not need to explore diversity in this subject. However, through my work in the DINÉ seminar I have discovered the great importance of culturally responsive teaching. It has been proven that when students feel their culture and their way of thinking through mathematics is valued in their classroom, they are more successful in understanding and explaining their mathematics thinking (Ellis, 2019). In the past, I have not intentionally included culture in my lessons, and I think that does a disservice to my students. While I was not intentionally excluding the students’ culture, I did not make it a priority to *include* culture in my lessons.

I usually teach addition and subtraction through different place value strategies, and I teach them as bare number tasks without any context. We spend about ten minutes a day doing word problems that provide context for the math, and the rest of the learning happens just through numbers and strategies. I do not think that this teaching method has a lasting impact, because “for too many students, mathematics learning has been limited to rote skills and procedures, so-called ‘basic skills,’” and this does not allow them to make any meaningful connections with their learning (Ellis, 2019). I want to amend this practice by trying to present learning more often in a cultural context. For example, instead of just saying, “Solve $29 + 32$,” I could instead say “I have 29 beads on my bracelet, and then my friend gives me 32 more beads. How many do I have in all?” Although presenting problems like this might take an additional thirty seconds, I think it will be helpful to students to be able to create a mental picture, and to add some real context to help them solve. I could keep that real-world application the same throughout the lesson, and just change the numbers so students are ready to solve each time. In addition, presenting problems like this allows students to provide some incredibly creative solutions to solve. In a culturally responsive classroom, all students need to feel safe to present their way of thinking, even if it’s not the most efficient or “conventional” solving strategy (Ellis, 2019). Providing a cultural context to math can inspire them to reach these alternative solutions.

Current Considerations

I want to add the context that as I write this curriculum unit, we are experiencing a world-wide pandemic. Due to that pandemic, I am teaching students in a fully online environment from my classroom. Because of that, I will not be able to teach this unit exactly as written because so many of the community building tasks would involve being in person. At this time of writing, I intend to insert notes throughout on how it might be possible to adapt part of the lesson to be better suited to online learning, but I might not do that for every activity.

Why Gardening?

It has been observed that “in New Mexico between 2004-2007, over 80% of Navajos were considered to be overweight or obese,” which is widely understood to be caused by lack of access to healthy foods, as well as the high cost of fruits and vegetables (ML Slattery, 2010). In response to this pervasive health issue, many Navajo communities have worked to create community gardens based on traditional values and knowledge (India J. Ornelas, 2017). It is

well known in the education community that when students create something on their own, they have much more engagement in that learning and in cultivating positive habits. Therefore, this curriculum unit will be centered around traditional Native American farming and gardening practices, and the math required therein. This project is exactly what students need to engage more deeply in their own health, in the garden, in their traditions, and in mathematics.

After we spend time learning about potential crops and how to grow them, students will take the information they have learned and will create a garden of their own. At Kinsey, we have a gardening space that many different classes and outside organizations have tried to work on, but none of these efforts have made a lasting and sustainable change so far. My hope is that my students will be able to provide a change for that garden. We will spend time learning about how plants thrive, and what can cause crops to fail. Then we will take that learning outside and talk about why we think the garden has not been successful in the past and how we can change that. As we work on cultivating the garden space into a feasible garden plot, we will need to perform a considerable amount of mathematics calculations. We will need to:

- measure out the garden to see how much space we can work with,
- figure out how many crops we can plant, and therefore how many seeds we will need,
- figure out how much water our garden will take each day,
- figure out how much to plant if we want to feed our entire class, and
- consider the growing times for each plant and decide when to plant so that we can accommodate for Flagstaff's short growing season.

Throughout our work we are going to be growing as a class community and creating a space that other students can enjoy in the future. For the purposes of this curriculum unit I will outline how students plan our garden, but we will continue to expand upon this learning and make it real as we move on through the school year.

To create these garden plans, students will first work independently, then as small groups, and finally as an entire class to design the ideal garden. At Kinsey, we find that beyond our Fall Festival and Culture Night, we do not always have the strongest connection between families, teachers, and classroom academics. To combat that disconnect between family engagement and learning, one study recommends including evening and weekend workshops to teach community members about different aspects of farming (India J. Ornelas, 2017). We do consider Kinsey to be a community school, and this will only help to increase our family engagement. It will also help students to continue to understand how their culture is valued in school.

In addition to making connections with our families, we will continue to engage community partners in this work. Our school frequently partners with Willow Bend Environmental Center, and they could be an instrumental community partner in helping to create our garden center. In addition, their partnership will help to increase student engagement, because the students have worked with the educators from Willow Bend for most of their time at Kinsey. It will be incredibly impactful for the students and for our families and community to be able to participate in this community garden. As one group of researchers found, "community input was essential throughout the planning and implementation of the [garden]. If effective, community gardens may be a way to increase fruit and vegetable availability and intake, and ultimately reduce risk of

obesity and diabetes” (India J. Ornelas, 2017). Although I am not sure that our small school garden will have that large of an impact in just one school year, I do believe that there is the potential for that level of success in the future.

Content Objectives

Because this project covers so many topics, there are content objectives across every subject area. Teachers utilizing this unit do not need to use all the objectives but could instead choose to focus on a select few. This is simply a list of what content objectives the unit could possibly address.

Math

The introduction to the second grade Arizona state standards for mathematics broadly encourage that,

“More learning time should be devoted to working with whole numbers and place value than any other topic.

1. Extend place value understanding of whole number relationships and place value, including grouping in hundreds, tens and ones.
2. Develop competency of strategies for addition and subtraction.
3. Develop understanding of standard units of measure,” (Arizona Department of Education, 2016).

Because of this emphasis from the state Department of Education, we focus heavily on place value and strategies for addition and subtraction. I will use the following content objectives in math. Students will use the following “I can” statements to guide their learning:

- I can use the world around me to create addition and subtraction problems.
- I can use place value strategies for addition and subtraction to solve real world problems.
- I can use knowledge of area to plot a garden.

I will put a bulk of emphasis throughout my teaching on the word problem portion of it. Typically, when students hear the phrase “word problem,” they panic and groan. This is because word problems have been set aside in their schema as something challenging and separate from just “regular math problems.” In my classroom I want to encourage students to see word problems as a part of our everyday mathematics learning process. Students need to understand that math is everywhere around them, and that they can create many problems from the world around them. The faster this is normalized in our classroom day, the more easily students will adapt to the regular process of looking at the world through a mathematical lens.

Educators in early childhood studies now understand that students begin to learn about numbers and place value by first developing a concrete understanding of numbers and number sense. Because of that understanding of how early place value ideas form and grow, students in this project will develop their number sense through work that progresses from hands on manipulative to concepts that become increasingly abstract, until they have a strong place value understanding and can utilize algorithms to solve. It is considered the best practice to associate concrete items with counting for early place value learners, because they then can build an

understanding of numbers and their meanings, instead of the steps to complete an algorithm. Because students learn in a progression that typically goes from concrete to more abstract reasoning, students will have many opportunities to utilize manipulatives in order to help them quantify different values as our project progresses. While all students may not need to utilize manipulatives throughout their project process, I will leave them available to all learners the whole time so as to encourage the use of supports when students are feeling like they cannot solve a problem without the help of the teacher.

English Language Arts

Because we will do extensive reading, storytelling, and listening to gain knowledge about traditional farming practices that might help our planting, students will have the following learning objectives:

- I can read to learn more about gardening.
- I can listen to and ask questions of those who share gardening knowledge with us.
- I can tell my own story about why gardening is important to me.

This will require background knowledge on reading comprehension skills. If students are unable to read something to learn, they will struggle to ultimately meet the first learning goal. Because of this, it might be necessary to include some reading supports in your classroom. This might include a tool to read aloud to students (such as the online library found at GetEpic.com), or some strategic partnering so students can read to each other. One thing that must be avoided is allowing students to be held back in their research by their inability to read fluently. Teachers need to provide multiple strategies in place for students to do research and gain knowledge without needing to read on their own.

Because Diné stories are traditionally shared orally, it will be important for students to cultivate skills in speaking and listening. Students should be able to listen to a story, and form relevant questions to ask of the speaker in order to learn what they need to know. Students should practice asking their peers questions before any guest speakers come to class, so that they are prepared to speak with an adult about gardening.

In keeping with the oral history tradition, I encourage students to be able to tell their own story about gardening. As this project develops, provide times for students to pause and speak with themselves and each other about what gardening means to them. You might find that as they progress, their connection to the “why” of gardening may strengthen, and that lends itself to a powerful storytelling experience.

Science

We will spend time learning about traditional farming practices, including the Three Sisters (corn, beans, and squash). This farming practice is believed to have originated with the Haudenosaunee (or the Iroquois Confederacy as they are more commonly called in the United States) (Dyjack, 2020). Long before it was proven with Western science, the Haudenosaunee knew that growing these three plants together was good for the soil, and that when eaten together they contained almost all the nutrients that people need to thrive. One author notes that “today, we sort foods into four basic groups when we talk about nutrition: the grain group...the protein

group...the milk group... and the vegetable-fruit group. ... The Three Sisters have three out of four groups covered. Together, they provide most of the nutrients the body needs” (Tesdahl, 2013). In addition to those three traditional Haudenosaunee crops, Navajo farmers cultivate other crops such as chili, tomatoes, and lavender. We will include those other crops in our garden. I plan to have students see if they can ask family to donate seeds from their own home collections, so we can authentically include their families in our project.

Social Studies

Students will use the following “I can” statements to develop their understanding of this project through a social studies lens:

- I can understand a community and its needed members
- I can participate in my class garden as a community member.

Overall, students will learn to understand their place in the garden, and find a role that leaves them feeling fulfilled and helpful to our gardening process. Students might enjoy holding the watering can, counting out seeds, or measuring out row distances. As we work through our garden, we will define and assign different roles to all students so they are all included in both the planning and the execution of the garden.

Teaching Strategies

I plan to teach this unit using a multitude of teaching strategies. The final product of this project will be accomplished as an entire class, so throughout the process we will cycle through working independently, sharing our ideas out into a small group setting, then bringing those small group ideas out for the whole class to collaborate. I do anticipate that it will be challenging to have all the students collaborate as a class many times over, so I do have a backup plan. If students are unable or not ready to work together on that scale despite my scaffolding and support, then I will have them just work in teams to plan out their portion of the garden.

Whole Group Lessons

Whole group lessons are when the entire class is together either in discussion or in delivery of instruction. When we gather in this way, all the students will have an opportunity to share their thoughts. I utilize popsicle sticks to make sure that all students have a chance to share ideas, and to ensure engagement. All the students know that they need to be prepared to talk at any time, and so they pay close attention to my comments and the ideas of their peers. In addition, I put the popsicle sticks back into whatever container they come out of so that students do not think they are finished as soon as they are done being called on the first time. Before starting to have whole group discussions, we talk about what it means to be an active listener to make sure that all students are ready to listen and respond to each other in a productive way.

Our first whole group activity will be our introduction activity. I will purchase some vegetables and have the students work together to create a dish from those ingredients. Then after we eat the dish, we will have a whole-group discussion about which vegetables they liked best and where the students think those foods might come from. To do some of this brainstorming and to make sure that every student participates in thinking about these questions, students will get a sticky

note and will have to draw their favorite vegetable and where they think it came from. We can then come back together as a class and sort their responses on a large poster, so they can see the ideas from their peers.

I will also use whole group lessons to do a class circle at the beginning and end of each lesson. Each day, I would ask an ice breaker question related to our lesson that day in both of those circles and see how students respond. I can use these responses as a formative assessment, where I can see what students understand about our project and where they may have misconceptions. Based on those responses, I will know which students I need to touch base with during the independent or group work time so that I can clear up any confusion or reinforce ideas that will help us move forward. These circles also help students to become closer to each other and to help them to build a strong community. Traditionally, gardens are a place of gathering, family, food, and health, and I want the students to be set up to fully experience that sense of community.

I will also use whole group lessons to teach any instructional content that will support students' understanding. This is where teachers can include any required content curriculum that they receive from their schools or their district. I will be utilizing Eureka math to teach the math content objectives, and those lessons take about forty-five minutes. This whole group instruction strategy will also be used to teach the science and English Language Arts content.

Students will also need to work as a class to brainstorm questions, come to conclusions about how to answer those questions, and then to reevaluate what new questions they might have. I want to have a constant cycle of questions and answers, questions and answers, to really help students think like scientists. I refer to Albert Einstein's famous quote, "the more I learn, the more I realize how much I don't know," to really help me frame that endless quest for knowledge.

Finally, I want to use the whole group environment to plant, harvest, and celebrate. On some days when there is an extra adult in the room, I might send students out to the garden in small groups with the adult. But on a normal day, we will go together into the garden a few times a week to plant and care for the plants. I do plan to have students come to the school during the summer to continue to take care of our plants if they are not able to be harvested within the school year. When our fruits come to the harvesting point during the summer, I do plan to have the students pick everything and decide what to make with it. I want to hold a big celebration for all their hard work, and that must happen in a whole group setting!

Interviews

As we delve deeper into our research and planning process, we will invite members of the community and members of the students' families to come into class and discuss how they farm or how their families have farmed in the past. Once more, I am looking to build our class culture. I find that students learn so much from their elders and from other family members in the community, and I want to encourage those families to share their knowledge with these young students. I know that there is much I do not know about gardening or traditional practices, and it will be lovely to hear directly from these experts on how to best go about creating a lasting garden.

To show how much we value these community members coming in to share their knowledge, I want the students to practice asking questions so that they are engaged during the conversations. This will really demonstrate to the visiting adults that we are not just inviting them in for show, we are really looking to see what they can share with us. I want the students to practice being inquisitive and respectful towards visitors in our classroom. Students will create a list of questions we want to ask our visitor and will practice asking each other the questions so they are comfortable asking them when our visitors arrive. Students will also take turns recording the answers of the visitors so that we can look back to those responses when we get stuck somewhere in our project.

Individual Work

Students will have some times where they will need to work independently. This will be a time after direct instruction where they are practicing seeing their own level of mastery. For example, I will give them addition and subtraction problems that relate to gardening so that they can practice their problem-solving strategies. This is truly a time for students to be able to formulate their own ideas, before we go into a larger space like small groups or whole group.

Individual work time will also include independent research. This may be time for students to read a book, watch a video, or listen to a podcast that will help them to build their body of garden research. Because the students are so young and it can be difficult to focus independently for an extended period, we will start working in just about ten minutes at a time, and then slowly build their independent time endurance. Eventually I would like for them to be able to quietly read, watch, or listen for about twenty to twenty-five minutes at a time. As they become more independent, this will allow for me to pull small groups as the rest of the class works quietly. I hope that we can build these skills quickly so that I can be efficient with the time we have, and really address all student needs in a timely manner each day.

Group Work

Students will work in groups to collaborate and combine ideas when those times come. Because they will be spending time working on their own, they will also need time to be able to put those ideas together. This team time can also come after a whole group lesson. I might present them with a work objective for that day and then give them time to collaborate so that they can complete the task I put in front of them. For example, this might be where I ask them to sketch out their garden plot. They would have already drawn it independently. They would then need to look at each other's drawings, talk productively about what they like and what they would change, and then put those ideas together in one space. While this sounds easy enough for adults, this is a strategy that takes second grade students a lot of time and patience to develop. As they practice collaborating and engaging in productive discussion, they will get more comfortable with the entire process and it will go more and more smoothly.

Classroom Activities

Throughout our project, we will have a variety of activities that will serve as milestones of our progress, as well as formative assessment tools. I will detail the activities here, and I will explain

how they can be used as assessments in the “Student Assessment Plan” section of this curriculum unit. To see the same milestones laid out in a table, see Project Timeline Organizer.

The first milestone activity I would like students to complete is their initial planning. This will happen after students first are introduced to the entire project and get an idea of what the unit is about. After our background information, I will give the students a blank grid that is about the size of our garden. Students will complete an individual picture that shows what plants they would place in that garden. In order to complete that plan, students will need to start thinking about what kinds of plants they like, how much water those plants will need, and how much space each plant might take up. Once students have figured out how much space the different kinds of plants will take, we will create a small cutout that represents that space. Then they will have glued down the plants they want within the grid. I will not expect their plans to be extremely detailed, or even “correct” in terms of how much space or water the plants will take up. I will take this as a sort of pre-assessment to see what kinds of ideas students might have about our garden.

The second milestone would be that students have chosen their plants that will go in our class garden, and will start planting them. Our class activity will be to have a big planting day where we pass out the seeds, label the plants on a popsicle stick so we know which plant is which, and then plant the seeds. If students are still learning online from home, I would add an extra activity where students work at home to find a container that they could plant their seed in. Some could make a seed starter from folded paper, some could egg cartons, or old cups, or anything they can find around the house. Either way, students will have a seed or two started, and we will continue planning the layout of our garden.

The third milestone will be that we have our plan completely finished. We will need to take the plans from the first stage, and figure out how to put them together into a single coherent plan. Depending on the cooperation abilities of the students, they might collaborate to create a whole plan for the garden. However, if cooperation is not a strong suit of this group of students, then I will assign them a portion of the garden that they will design with a small group of students instead of working together as a whole class.

Finally, in this curriculum unit students will complete final preparations to plant, and will verify that their garden plans will actually fit in the garden. They will need to check on the spacing of their plants, and make sure that they have properly planned how much and how often then will need to water their plants. We will designate the planting spaces once we have confirmed the plans, and will start to transfer the plans into the garden.

Student Assessment Plan

Students will be assessed on the completion of their milestone activities. I will first assess their garden picture and grid. I will be looking to make sure students utilized plants we have talked about, and making sure they fit their garden into the given physical parameters. I might also look to see if students included any diversity in their garden, or if they simply put the same plant throughout the entire space. Based upon their initial plans, I will find more resources to show students the importance of diversity in their gardens and the importance of proper spacing for healthy plant growth.

The second assessment will be a look at the completed second milestone STEM activity. Before students start working on creating their seed starting containers, they will get a basic rubric to help them build, and that they will be assessed on when they finish. The seed starting container will need to hold soil, it will need drainage, and it will need to last for at least a few weeks as the seeds sprout. They would receive bonus points if they were able to create a container that was biodegradable, like an egg carton or a newspaper. These containers will be assessed at the start when the seed is planted, and then reevaluated two more times to see if they hold up over the following two weeks after planting.

The third assessment will look at the class master gardening plan. The first assessment point will be based on the diversity of plants in the garden. If they only decided to plant one or two kinds of plants, they will need to understand that their crops could easily be wiped out by one environmental issue and then their gardening season is done. They will also be assessed on the location of plants in the garden so they can thrive. For instance if something grows well in shady places, did students put it in the full sun or the shade? Another example might be that if they know that two plants support each other, whether or not they remember to plant them near each other. If we were to remain in a virtual teaching environment, this would be the final assessment for the students.

The final assessment is the garden itself! As a class we will assess the success of transferring our theoretical garden plans to the real outdoor space. This assessment will be one that the students score, because truly it is the fruit of their labor. I would like to have them create their own rubric for our success. It might include whether or not we put supportive plants together like we read about in “The Three Sisters” stories, or perhaps it might look at our harvest at the end of the growing season. I want the students to determine what our success truly looks like at the end of this community project!

Alignment with Standards

Mathematics

This curriculum unit can be used to address the following objectives:

- Represent and solve problems involving addition and subtraction
- Add and subtract within 20
- Understand place value
- Use place value understanding and properties of operations to add and subtract
- Measure and estimate lengths in standard unity

We will represent and solve many addition and subtraction problems as we create our garden. Once students decide on what goes in our garden, we will need to solve many problems to repeatedly answer the question “how much?” or “how many?” in varying contexts. For example, many different plants must be planted in small groups, with so many seeds per hole. We will need to calculate how many seeds we will need, and how many bags of seeds that means we need to purchase. This will require some repeated addition, and the ability to add and subtract confidently with strong strategies. If students are still stuck on concrete methods of solving where they are literally adding up one seed at a time, they will be unable to efficiently participate

in this project. Because of that, we will lay a strong foundation of addition and subtraction strategies to ensure that we can handle the larger numbers that come with gardening. Within these calculations, we will undoubtedly add and subtract within twenty and beyond, covering the second objective repeatedly.

For students to complete these larger calculations, they will need a strong understanding of place value. The reason for this skill set has previously been explained in the Context and Rationale portion. Students will learn to understand place value through a variety of representations. They move from some concrete representations to progressively more abstract, to transition students from a shallow to deep understanding of what place value means. We usually start with a very concrete lesson in which the whole class practices bundling one thousand items into groups of ten, then bundling those ten groups together to make a hundred, and finally bundling ten of the hundred groups to make one thousand. This helps them to understand that as we go up in place value, the next largest place is ten times larger than the place before it when you move from right to left. This is something that our school's chosen curriculum spends months of the year on, because this understanding of place value to a thousand is expanded upon when they get to third grade and older.

Finally, students will need to measure and use those measurements to plan their garden. If we plan on spacing our squash 2 feet apart but do not measure properly once we are out in the garden, we will have a harder time keeping our plants healthy. Of course, the measurements do not need to be exact, but students need to generally be able to measure and utilize those measurements so that we use our gardening space efficiently.

Science

This project will address the following Arizona state standards:

- “Obtain, analyze, and communicate evidence that organisms need a source of energy, air, water, and certain temperature conditions to survive.
- Develop a model representing how life on Earth depends on energy from the Sun and energy from other organisms,” (Arizona Department of Education, 2018).

Through gardening, students will have a model to help them understand what the plants need to thrive in our garden. I hope to have some community partners come in to help teach the students about how to garden in Flagstaff, because our growing season is short, and there are many traditional ways of farming that I am not an expert on. With the garden, they will have to determine what factors will keep the plants alive, and they will learn where the energy to grow comes from.

English Language Arts

Although English Language Arts (ELA) is not the main focus of this unit, students will still be exposed to many ELA standards. Students will work through many of the Reading Informational Text standards, and they will work on the following objectives:

- “Ask and answer questions, such as who, what, when, where, why, and how, to show understanding of a text
- Identify main idea of a multi-paragraph text, including what an author wants to explain, describe, or answer
- Use various text features, such as glossaries, icons and indexes, to locate key facts and information
- Make connections between a series of historical events, scientific ideas or steps in technical procedures
- Compare and contrast important points between two texts of the same topic,” (Arizona Department of Education, 2016)

We will address these standards by reading many different informational texts to help us plan our garden. Students will read to learn more about traditional gardening practices, what plants need to survive, what they want to grow, and how we can harvest them when they are fully grown. Overall, they will read to access any content they need in order to achieve our project goals. We will also read some fictional stories to help students to develop a love of food and gardening, and those learning objectives are very similar to the ones listed above.

Social Studies

Second grade students in Arizona are generally learning about “the world around me” in Social Studies. They learn about their responsibility to others as a member of the community, and how people can work to create goods and services that they can exchange with others. We will work together to thoroughly build that understanding of community and what it means to work together towards a common goal.

Diné Education Standards

When looking at the K-3 Diné Character Building standards, we will mostly touch on concepts one, two, and four. These objectives are outlined as follows:

- “I will express critical thinking to establish relationships with the environment.
- I will practice and maintain the sacredness of self-identity.
- I will understand and appreciate all things.” (Department of Diné Education)

Through speaking together as a class and talking with outside community members who have a Diné background, students will develop a deep and personal understanding of who they are, how they fit into the world around them, and how to appreciate the connections they have with their community.

As far as the Diné Culture Standards, we will get a bit more specific in what we address. Students will “name the various plants within [their] surroundings,” as we get ready to garden, “recognize the value of water,” as we plan on how much and how often to water our garden, and students will “use [their] cultural teachings about how to take care of earth and sky,” as we listen to community and family members explain how to care for our garden and each other (Department of Diné Education).

Resources

Teacher Background Reading

Arizona Department of Education. (2016, December). *K-12 Standards Section ELA*. Retrieved from <https://cms.azed.gov/home/GetDocumentFile?id=585aa8a3aadebe12481b8435>.

This is where to find the second grade ELA standards for Arizona.

Arizona Department of Education. (2016, December). *K-12 Standards Section Mathematics*.

Retrieved from Arizona Department of Education:

<https://cms.azed.gov/home/GetDocumentFile?id=58546f14aadebe13008c1a22>. This is

where to find the second grade math state standards for Arizona.

Arizona Department of Education. (2018). *K-12 Standards Section Science*. Retrieved from

<https://cms.azed.gov/home/GetDocumentFile?id=5bd339181dcb250184c8cf0c>. This is

where to find the Arizona second grade science standards.

Department of Diné Education. (n.d.). *Pre K-3rd Dine Character Building Standards*. Retrieved from Navajo Nation Department of Diné Education:

http://www.navajonationdode.org/uploads/FileLinks/0af6457a581b4ac6a25fd65b2c014e7b/K_3DineCharacterBui.expert_8.11.12_2.pdf. This is where to find the second grade

Diné standards on character building.

Department of Diné Education. (n.d.). *Pre K-3rd Diné Culture Standards*. Retrieved from

Navajo Nation Department of Diné Education:

http://www.navajonationdode.org/uploads/FileLinks/0af6457a581b4ac6a25fd65b2c014e7b/Pre_K_3rd_Dine_Culture_Standards_4.pdf. This is where to find the second grade

standards on Diné culture.

Dyjack, D. (2020). Three Sisters. *Journal of Environmental Health*, 54. This is a brief retelling of the traditional planting method using corn, beans, and squash.

Ellis, M. (2019). Knowing and Valuing Every Learner: Culturally Responsive Mathematics Teaching. *Ready Classroom Mathematics*, 1-17. This reading provides an excellent overview of how a teacher can make their classroom culturally responsive.

Howe, R. (2018). Learning and Using our Base Ten Place Value Number System: Theoretical perspectives and twenty-first century uses. 57-68. This is an overview of how we develop place value understanding in students.

India J. Ornelas, D. D. (2017). Yéego Gardening! A Community Garden Intervention to Promote Health on the Navajo Nation. *Progress in Community Health Partnerships: Research, Education, and Action*, 417-425. This article describes how a community garden project was implemented in a school, including how it involved families and community members.

Kinsey Inquiry and Discovery School. (2020). Retrieved from <https://www.fusd1.org/Page/9879>. This is the Kinsey Elementary school homepage.

ML Slattery, e. a. (2010). Associations among body mass index, waist circumference, and health indicators in American Indian and Alaska Native Adults. *American Journal of Health Promotion*, 246-254. This article details the health challenges that Native Americans can face.

Smithsonian National Museum of the American Indian. (2009) *Haudenosaunee Guide for Educators*. Smithsonian Institution. This is an excellent teacher's guide on the Haudenosaunee cultural group.

Tesdahl, K. (2013). The Gift of the Three Sisters. *Skipping Stones*, 15-16. This is another retelling of the traditional planting strategy using corn, beans, and squash.

US Math Recovery Council. (2006). *Add+VantageMR Course One Teacher Handbook*. This is a mathematics program handbook that helps assess and teach students number sense and place value concepts.

Student Reading

Fry Bread by Kevin Noble Maillard, illustrated by Juana Martinez-Neal. A fiction story about a modern Native American family and what fry bread means to them.

The First Strawberries by Joseph Bruchac. A telling of the Cherokee legend of how strawberries came to be.

When We Are Kind / Nihá'ádaahwiinit'iigo (English and Navaho Edition) by Monique Gray Smith. A story of celebrating acts of everyday kindness and community.

Materials for Classroom Use

At the following URL, teachers can find an incredible list of stories for young readers that is told from the Native American perspective. <https://coloursofus.com/32-native-american-childrens-books/>

Colorado, U. o. (2020). Area Builder. Retrieved from PhET: <https://phet.colorado.edu/en/simulation/area-builder> . This is an online simulator that students can use to practice concepts of area and perimeter

Eureka Mathematics Second Grade Curriculum. This is the designated math curriculum that is used across Flagstaff Unified School District, and is available for free online.

US Math Recovery Council. (2006). *Add+VantageMR Course One Teacher Handbook*. This is a mathematics program handbook that helps assess and teach students number sense and place value concepts.

Project Timeline Organizer

Milestone:	initial plans drawn out	plants chosen and seeds started	plans finished	prepared to plant: ground is cleared, seeds are counted out, spaces are designated	ready to invite the public ⁱ	Garden is finished ⁱⁱ
Necessary learning	-how to use a grid -how different plants grow -how much water we need to plant each seed	-how to plant a seed -kind of soil needed -how often to water -how much sunlight	-how to weather a sprout -where in the garden things will go	how to transfer our plan to the real space	-how to harvest. -How many people our harvest will feed. -how to write an invitation.	how to choose and make a recipe for the harvest
Math problem	If it takes x amount of water for one y plant, how much water will we need for 10 y plants?	If a y plant needs to be watered every x days, how many times will we water it in 2 weeks?	How much space will it take to plant a garden?	How long will it take for the plants to grow to harvest?	If we harvest x amount of plants, how many people can we feed?	When should my class next school year start seeds?
Student check-in	Students have work individually, and then in teams to create their garden plot plan.	student seed plan	Student posters with the garden plan and harvest outcome are ready to present at garden party	We plant!	We've written an invitation to our families to come to the garden party	we celebrate our planted seeds (maybe write songs to encourage our seeds to grow)

ⁱ Will occur after the end of this curriculum unit

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