SUNY Potsdam CE/EC Lesson Plan Template

Background information	
Date and Time of Lesson November 22 9:45 2018	**Prepare chart paper with circle.Prepare a chart with the following headings diameter, circumference prediction, circumference, circumference ÷ diameter** **Collect meter sticks, string, circle items for measuring.**
Grade 5 Subject Area : Math, Measuring Circumference	
Pre-Requisite Knowledge/Skills Students are able to measure in centimeters. Students are familiar with measuring tapes, recording data, observing patterns in charts.	
Time Allotment 40 minutes	
Curriculum: Standards **Curriculum Expectation:** Measurement **Skill:** estimate, measure, and record perimeter, area, temperature change, and elapsed time, using a variety of strategies; **Skill:** determine the relationships among units and measurable attributes, including the area of a rectangle and the volume of a rectangular prism. **Expectation Area:** Specific Expectations - Attributes, Units, and Measurement Sense **Skill:** estimate and measure the perimeter and area of regular and irregular polygons, using a variety of tools (e.g., grid paper, geoboard, dynamic geometry software) and strategies.	
Learning Objectives/Targets • **Students will explore the concept of circumference using concrete materials.** • **Students will observe the relationship between the diameter of an object and the circumference**	
Instructional Strategies I will use are: • Hands on learning to explore and measure the items • Working in partners to gather data. • Student engagement questions to deepen initial thinking	
Assessments I will use are: • Observation throughout the lesson • Collection of student measurement charts.	
Lesson Procedures	
Anticipatory Set/Minds On	

The teacher will hold up a round object and ask students how they could measure the width of it. (use a ruler, the width is the middle,) Invite a student to demonstrate how to measure the width. This distance is the diameter. Then ask the students how they could measure the distance around the object? (with a ruler, use a string then hold up to a ruler). Let students know the distance around a circular object is the called the circumference. Ask students what they think the circumference of the object might be, think about the diameter when making a prediction. Invite a student to measure the circumference of the object using a string and then measuring the length with a ruler. *Record the data on the chart created prior to the lesson . Let students know that we will visit the final column later.

Today we are going to measure the diameter, predict the circumference, then measure the circumference of round objects. We are going to also explore the relationship between diameter and the circumference of an object.

Procedures

1. Prior to the lesson, the teacher will create a chart with the following headings: Object, diameter, circumference prediction, circumference, circumference ÷diameter.
2. The teacher will share another round object. Invite 2 students to measure the diameter of the object and record the information. Ask the students to look at the previous data when thinking about the prediction of the circumference. Record a student prediction. Ask 2 more students to measure and record, they will measure the circumference of the object and record the measurement.
4. Ask students to look at the numbers on the chart. Do they notice anything about the numbers in the width compared to the number in the circumference? (they are larger) Is the number 2 times, 3 times or 4 times larger?
5. Now what do you think might happen if we divide the circumference by the diameter for the objects we have measured? (they will be the same, different, larger, smaller) Record the findings in the final chart column.
5. Share with the students that they will be given a collection of items in the classroom to measure. They will measure the diameter, predict the circumference, and then measure the circumference. Once they have measured all of their items they can then work on the final column with a calculator.
6. Students will work in pairs to measure the list of items:

Water bottle, hula hoop, trash can, cup, head, stool seat, marker lid, roll of tape, frisbee, hockey puck, drum, CD, cymbal, pizza pan, round table, clock,

7. Once students have explored the items, recorded their information, and begun to complete the final column, the teacher will observe and listen to student conversations to get an idea of what students are thinking.
8. Once students have the final column complete (or at least 5 items), have them observe their final columns to see if there is anything they notice.
9. Invite students back to the carpet. Have them bring their work and sit with their partner. Using the doc cam to show the chart you started ask a few students to add a few items they measured to add to the chart. Calculate the final column if they haven't. Ask students what they notice about the number in the final column? (they are all close to 3). Ask them why they think that might be?
10. Share the video Circles: What is Pi? by Math Antics. Begin the video at 2:48 to 7:05

https://www.mathantics.com/section/lesson-video/circles-what-is-pi
11. Look at the chart again to see if our data agrees with the information in the video.

Closure/Go back to learning targets
Share with students that the circumference of a circle will always be a little more than three times the diameter, which is the value of pi. It doesn't matter how big or small the circle is the relationship will always be the same.

Universal Design for Learning (UDL)
Some will be for whole class, groups of students, individual students.

Principle #	Evidence
1.1 Offer ways of customizing the display of information	The teacher will present the items using charts, manipulatives, and through the doc cam.
2.1 Clarify the vocabulary and symbols	The teacher will provide a visual of the circle with appropriate labels (circumference, diameter) as well as review division.
3.1 Activate or supply background knowledge	The teacher will review measurement and seek prior knowledge throughout the lesson by asking students for ideas. The teacher will provide all required information prior to learning.
4.1 Vary the methods for response and navigation	Students are able to walk around the classroom to gather information from items.
5.3 Build fluencies with graduated levels of support for practice and performance	The teacher will begin with demonstrating the procedure of measuring and recording and gradually release control to students to work independently.
6.3 Facilitate managing information and resources	The teacher will provide a chart for students to record their findings.
7.1 Optimize individual choice and autonomy	The students are able to choose a partner to work with. The students are also able to choose items to measure.
8.3 Foster collaboration and community	The teacher will encourage students to work collaboratively to seek information. The teacher will use student generated data to help demonstrate the relationship between circumference and diameter.
9.1 Promote expectations and beliefs that optimize motivation	The teacher will provide encouragements and ensure students understand that they will be successful in their learning.

MISC. NOTES/To Do/Reflections after lesson

Conceptual Development

Learning to understand why we do things in math is an important step when applying knowledge students have to solve problems. When students understand why we may be doing something, the learning becomes more meaningful and students are able to think critically about the possible solutions and methods that can be used to achieve them. When we break a task down into its parts, students can begin to see where the thinking is coming from and how we have created or come to know the formula's and strategies that many adults are familiar with. In planning my lesson, I was seeking ideas as to the best way to introduce circumference to students. In this process, I learned why we use pi when finding the circumference! Maybe I learned this fact (that the circumference is 3.14 times larger than the diameter) when circumference was introduced to me, but I had clearly forgotten until looking into this fact for the lesson! As I was able to watch (in a video) as they were able to physically manipulate the diameter to lay over the circumference, it began to make sense and was a great visual to show the development of the concept of pi. The students have been observing patterns in math data for a few weeks prior to the lesson and were beginning to pick out and describe some obvious patterns as well as some more complex patterns. I asked the students to record their data along their measuring journey to see if they were able to notice a pattern in their charts. Some students were able to say that the circumference was more than 2 times larger (they had not gotten to three times larger during the exploration, but later during our discussion, a student pointed this out). By having the students collect measurements for many items, all with varying sizes they will be able to see that this rule will apply to all circles, no matter the size. Once we were able to divide the circumference by the diameter and students began to see that outcome they were very quick to share that the numbers were all pretty close to the number 3. At that point, they saw that all of the circumferences were just over three times the diameter.

We discussed that occasionally our measurements may be slightly off, which can alter the quotient when dividing and discussed going back to check their work if there is one discrepancy in a pattern that seems to be developing. I personally now understand the concept of pi, that it is more than just a number that goes on infinitely and never repeats and applies to circles, but that it has a direct relationship to the circumference and diameter of a circle. The students were able to identify this as well through their learning and our discussion.

As the students had prior knowledge of measurement, using string to measure distance, creating charts, observing patterns, and basic operational knowledge (division) they were able to carry out

this task quite easily as the skills needed to reach the understanding of the relationship between diameter and circumference were already there.

Reflective Inquiry

I believe this lesson is a great example of allowing students to feel comfortable about exploring what could be a challenging concept without making it complicated. They are able to collect their measurements and create a table (all things they have done before) and then search for patterns in their table (another task they are familiar with). By breaking down this concept into manageable parts, students are less likely to feel overwhelmed or anxious about dealing with formulas or complicated vocabulary or strategies. Students are then invited to use division to see if there is an observable relationship. For this step, I allowed students to use calculators to ensure they had accurate responses and to make certain they did not get bogged down on the calculation but could reach a solution. Students could then see that their quotients should be near 3.14. Once a pattern began to emerge they could also ask themselves (or myself) as to why one of their quotients didn't seem to follow the pattern.

The students felt comfortable to ask and were accepting of the idea that their measurements may be off and eagerly re-measured to check their work. My mentor teacher has created an amazing classroom environment where students feel empowered and encouraged to take risks with their learning. Students have created a class code of conduct that specifically applies to work in math that encourages students to join groups with an open mind, encourage others to share their thinking and to accept and acknowledge differing opinions with respect and kindness. She has also learned the art of constructive feedback that allows students to learn from their mistakes and feel valued for taking a risk in something they may not be confident in. When students feel they are part of the discussion and not just models for teaching from their mistakes, they feel more willing to share their ideas and how they solved their problems, even though they may not have the correct answer.

As students were able to track their measurements as they went and had them readily available during our class discussion they were able to reference what they found immediately following the activity. The students discussed with their partners what they saw and were comfortable sharing what they thought. They were also comfortable using new vocabulary (circumference and diameter).

Making Connections Among Different Concepts

Students are using the skills they have learned previously to master a new concept in this lesson. They have background knowledge in measuring linear objects with string and then transferring their measurements to a meter stick or ruler. Creating, recording and seeking patterns in charts and tables are also skills they have been building in their math classroom. The students are able to divide whole numbers successfully and are familiar with using calculators to find the answer of more complex division problems when the focus is more on problem-solving and less on calculating. The students were able to see that the circumference is just over three times larger than the diameter. They were also able to identify that when you divide the circumference by the diameter, you reached a number close to 3.14. One student was able to identify that "it was like the same, but backwards." By building upon skills that students already have to introduce a new idea allows students to feel confident and successful in their learning. When students have the ability to physically manipulate pieces to show their learning, students will also be able to make connections through the information found in their chart and see it visually represented as well.

Use of Technology

The students had the use of string to measure the circumference and diameter, which they were able to use against a ruler or meter stick to get a unit of measure. The students measured objects or various sizes to show that this rule can apply to small and large circles. Calculators were used in calculating the quotient of Circumference divided by diameter. We also used the projector and doc cam to show the chart we created as a class and to display student charts. A video was shared to reinforce the information at the end of the lesson to give another example of the relationship between the circumference and the diameter. It also gave some background information about pi and what it actually is and means in the mathematical world.