The Circle of Life

Introduction

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ED 652
Literacy in the Content Area
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“Background”

Our unit plan is designed for a 9th grade classroom located at a four year high school. The high school has about 2,000 students representing dozens of countries and ethnicities. It is located in a city with about 500,000 residents. There is a large African American population (18%), Hispanic (16%) and Asian or Pacific Islander (12%) population. It’s interesting that we note 18% as a large African American population but would not make a similar statement about a 55% white population. Its population is about 45% non-white vs. around 25% for its statewide school district. A significant proportion of the students come from economically disadvantaged families (35%), about 12% of its population is classified as English Language Learners (ELL), and another 16% are categorized as students with ‘disabilities’. All and all this makes for a very diverse population and the struggle for closing the gap is in the forefront of the minds of the education staff there.

The Department of Public Instruction (DPI) graded this school as “meets expectations” despite the fact that over 25 students were named National Merit semi-finalists, it boasts of an award winning Rocket Club, and its Science Olympiad team placed in the top 10 at the National Tournament 3 years in a row. It has many AP, Honors and TAG classes and about 80% of its seniors go on to 4 year schools. The reason for DPI grading this school as ‘meets’ rather than ‘exceeds’ expectations is the tremendous learning gap we as a nation are struggling to close which is magnified in such a culturally rich environment.
The School has a whole range of extracurricular and sports activities: Chess Club, Forensics, Foreign Language Competitions, Math Competitions, Arts, and a noted cross-country team, to name a few. If you walk into the school you are greeted by the friendly reception staff and flags from all over the world. The school takes pride in its international representation and you will probably hear several different languages as well. Building a sense of community where everyone is inspired to learn can be a challenge, so the school has multicultural retreats twice a year and programs like Avid which support varied styles of learning and needs. It has support groups and clubs for minorities, and it also has bilingual support staff to help the growing ELL population.

This school has over 150 teachers and 60 support staff which give it the tools it needs for success. There is a current focus on implementing the core standards which implies playing a little catch up, purchasing new textbooks, and placing even more emphasis on closing the achievement gap. Our classrooms are representative of the enormous diversity in this school.
Geometry Around us

- The Circle -

Grade 9 Geometry
Ms. Judy Korn
For my 9th grade geometry class I’ve chosen a week long unit on circles to introduce the concept of symmetry and design in geometry and the world around us. This is a unit I would introduce at the beginning of the year because circles are easily tied to real life through discussion of their use in architecture and art and their presence in nature. It is easy to find circular structures in Ancient Rome, in century old cathedrals and in modern day edifices. Many consider the circle in itself to be of special significance, consider the Tibetan mandala, a circular halo or a Native American sharing circle. This is an enjoyable unit because it introduces basic information on circles while relating them to art, nature and beauty.

"In the Islamic culture the circle is a unit of measure. The circle is the basis for the organization of space. It is a starting point in architecture, poetry, music and even calligraphy. From a circle it is possible to construct many regular polygons." Summarized from information found in Geometric Concepts in Islamic Art.

Several Common Core State Standards will be addressed:

• CCSS.ELA-Literacy.CCRA.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

• CCSS.ELA-Literacy.CCRA.R.10 Read and comprehend complex literary and informational texts independently and proficiently.

• CCSS.Math.Content.HSG-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★
• CCSS.Math.Content.HSG-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*

• **Essential question:** How can we find symmetry and beauty in geometric shapes around us?

**Students will be able to ...**

• “identify and describe relationships among inscribed angles, radii and chords”.

• “use geometric shapes, their measures, and their properties to describe objects”.

• create their own ‘circle design’ artwork.

**Essential Understandings:**

• *Students will understand the relationship between angles and arc measurements.*

• *Students will know the different characteristics of arcs and angles in circles and understand the different between secants, tangents and chords.*

• *Students will understand that geometry exists in nature and the in the world around them and will learn to see symmetry.*
**Assessment Evidence:**
Summative Assessment tools:
- End of the week quiz on inscribed and central angles.
- Geometric artwork.

Formative/ Performance monitoring Evidence:
- Active participation in the literacy group. (Exit tickets, group summary)
- Homework assignments.
- Class participation.

The *Literacy Activity* is made up of four internet based articles on the use of circles in art, the use of circles in architecture, their existence in nature and their meaning in different cultures. Some of the language may be difficult for the students so I am offering four choices to the students to ensure that they are interested in their theme. I also opted for internet based literature because the colorful images will enhance their understanding of the texts.
**Class duration:** 70 minute period.

**Materials and Resources:** Selection of texts for literacy group work.  
http://www.archdaily.com/240524/al-dar-headquarters-mz-architects/  
http://listverse.com/2013/04/21/10-beautiful-examples-of-symmetry-in-nature/  
http://www.inspirationforthespirit.com/inspiration/native-voices/native-american-symbolic-circles/  
http://www.mandalaproject.org/What/Main.html  
Raiders of the lost ‘Arc’ worksheets. (Frank Schaffer Publication).  
http://britton.disted.camosun.bc.ca/Islamic_Art_and_Geometric_Design.pdf  

**Vocabulary:** Symmetry, Inscribed Angle, Central Angle, Arc, Subtended Arc, Chord, Secant, Tangent.

**Objective:** To recognize symmetry and patterns in art, architecture and in nature, as well as in a circle’s angles and structure. To be able to solve problems associated with inscribed angles of circles.

As stated by Black Elk, a holy man of the Oglala Lakota Sioux: "Everything the Power of the World does is done in a circle. The sky is round, and I have heard that the Earth is round like a ball, and so are the stars. The wind in its greatest powers whirls. Birds make their nests in circles, for theirs is the same religion as ours. The sun comes forth and goes down again in a circle. The moon does the same, and both are round. Even the seasons form a great circle in their changing, and always come back again to where they were. The life of man is a circle from childhood to childhood, and so it is in everything where power moves." P. 5 (Keepers of the Animals).
Day One - Monday

Objectives:
CCSS.Math.Content.HSG-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

Lesson Plan: (Procedure)
i) Warm up and Introduction: (40 minutes)
   • Introduction - We will be exploring circles, their properties and their significance in the world around us. By the end of this class you will know how to identify symmetry and how to recognize and solve problems involving inscribed angles. We will also be choosing a group for our circle investigation activity. By the end of this week each of you will have created a unique art piece using only a ruler and a compass.
   • Relevancy Activity (Hook) - Start with 2 minute clip on circles in architecture - Aldar HQ - http://www.youtube.com/watch?v=oWrLU7q9VgI. Discuss the use of circles in design. Have they been in a circular building or seen circular structures in their homes or in nature? Do circles have a special significance for them? What is the meaning of symmetry? (This will tap into their previous knowledge and engage their attention. For this activity we will sit in a circle and everyone will be encouraged to participate! My role will be that of facilitator of the discussion at hand.)
   • Power point slide share on symmetry: http://www.slideshare.net/nwalkup/radial-symmetry.
   • Description of symmetrical art work assignment problem. We will look at a few examples of art done by other students in the
slide show and they will receive a handout on how to create circular designs. They only need to use a compass and a ruler for this activity.

Handout of art project resource page:  http://britton.disted.camosun.bc.ca/Islamic_Art_and_Geometric_Design.pdf. The handout provides step by step instructions for creating Geometric Art Patterns. Demonstration on chalk board of how to create symmetric circular designs using ruler and compass only. (The student will have turned their desks towards the front chalk board and will have their own compass and ruler out to follow along as I demonstrate a basic 7 overlapping circle design. There will be a chance to answer any questions about the assignment and I will offer to be available to help during lunch period on Wednesday and Thursday as well.

ii) Literacy Activity Introduction (10 minutes)
   • Description of the four texts available for our literacy activity. There are articles on symmetry in nature, Mandalas, Aldar HQ architecture and Native American circle use. Each one of these has new words and complex ideas but they are accompanied by pictures, and students are allowed to choose their theme. To avoid everyone joining the same group there are only 7 available copies of each theme for the 24 students in the class. So every group will have from 3 to 7 team members. I will do a “think-aloud” to relate the upcoming reading activity with geometry and to emphasize the existence of geometric designs everywhere around us.

iii) Inscribed Angle work - (20 minutes)
   • Once the teams are formed and names are written down we will introduce the concept of “inscribed angles”. This will be done
on the promethean board. I will pre teach some important vocabulary and create a poster board for important words such as inscribed angle, symmetry, radius, central angle, arc, subtended arc, tangent and secant.

• Several problems will be done on the whiteboard with active participation from the students. They will be asked to volunteer answers and come up to the board to demonstrate problem solving. We will compare and contrast central and inscribed angles and discuss how to recognize them and how to use the arc length to calculate their measure. Do they see any symmetry here?

• There will be an end of the week quiz on this material so students are encouraged to ask any questions they may have, and they will get a chance to do practice problems in their homework assignment.

Assignment:
Day Two - Wednesday

Objectives:

CCSS.ELA-Literacy.CCRA.R.4 Interpret words and phrases as they are used in a text, including determining technical, connotative, and figurative meanings, and analyze how specific word choices shape meaning or tone.

CCSS.ELA-Literacy.CCRA.R.10 Read and comprehend complex literary and informational texts independently and proficiently.

CCSS.Math.Content.HSG-MG.A.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).

Lesson Plan: (Procedure)

i) Homework Collection- (5 minutes)
   • We will review the problems on the promethean board. I will use the cold call technique to review answers to the homework.

ii) Introduction and Warm up - (5 minutes)
• Overarching Question: *How can we find symmetry and beauty in geometric shapes around us?*
• Today we will address that question in our investigation groups. We will set the stage by playing the following clip: [http://www.youtube.com/watch?v=3exyfvk7TB4](http://www.youtube.com/watch?v=3exyfvk7TB4).

iii) *Literacy group activity: (45 minutes)* Students will be reminded that they are expected to research the material at hand as if they were a scientist, architect or sociologist.

• Students will divide up into four groups based on text choice. Each student will have an ipad or similar electronic device to access their article. Each group will be given a prompter sheet with question to guide the group discussion.
• Each group will need to choose 3 relevant concepts/vocabulary which interests them. The group will be in charge of researching these three concepts through Google searches and similar methods of investigation.
• The group will choose a secretary/recorder and a chairman. The recorder will take note of discussion ideas, the three concepts and will write up the group summary at the end of the reading. The chairman will be in charge of making sure everyone's voice is heard, both during the reading activity as well as during the discussion.
• Each member of the team will have a card which he/she will use as an exit ticket. They will be asked to share what they found most interesting in their reading work.
• The groups will be given about 25 minutes to read in group and about 20 minutes to investigate their concepts/vocabulary and summarize what they learned, what they already knew and what surprised them most about their text.
Group One: Native American Medicine Wheel  
http://www.inspirationforthespirit.com/inspiration/native-voices/native-american-symbolic-circles/  
The article is fully displayed by clicking on ‘read more’ but I would like them to first focus on each excerpt included in the top half of this cover page.

Group Two: Aldar HQ  
http://www.archdaily.com/240524/al-dar-headquarters-mz-architects/

Group Three: Symmetry in Nature  
http://listverse.com/2013/04/21/10-beautiful-examples-of-symmetry-in-nature/

Group Four: Tibetan Mandalas  
http://www.mandalaproject.org/What/Main.html

I will be circulating throughout the reading activity and will ask all groups to stop reading after 20-25 minutes so there is time left to choose the 3 concepts they want to investigate and to summarize the information read. Each group will have a list of questions to guide their discussion. Each group participant should participate by answering one or more of the questions.  
*Sample questions:*

1. What did you find interesting in the article?  
2. How can you relate what you just read to geometry?  
3. Are you more interested in studying circles after reading the article?  
4. How are circles referenced and used in the article you read?  
5. Can you relate what you read to your life experiences?
(.....) or What in your own life did the article make you think of?

iii) Large Group Share - (15 minutes)
• Each group will be given a few minutes to share what they learned and summarize their article.
• I will collect each group's question sheet and each individual's exit ticket.

This literacy activity will help create inspiration and interest in the subject area. We will continue studying circles for several weeks and I feel that this activity will add richness to the unit study.

Assignment: Continue working on geometric art project.

Day Three - Friday

Objectives:
CCSS.Math.Content.HSG-C.A.2 Identify and describe relationships among inscribed angles, radii, and chords. Include the relationship between central, inscribed, and circumscribed angles; inscribed
angles on a diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.

Lesson Plan: (Procedure)

Project Presentations: (10 minutes)
• Homework will be collected and students will be asked to share their artwork with the class. It will be interesting to see who used the handouts guided instructions and who created other styles. I will post their work on the wall for the rest of the semester (unless asked to do otherwise!).

Warm-up and Vocabulary (15 minutes) -
• We will review the concept of symmetry and the class will be asked to rate on a scale of one to five their understanding of this concept after Wednesday's slide show and group investigation activities. (Students will raise their hands if they are a one, two, three....). I will also ask students if their appreciation/understanding of geometry changed after this week's activities?
• We will review the concept of inscribed and central angles, supplementary angles and secants and tangents. We will do several problems from our geometry textbook on the promethean board.

Quiz - (25 minutes)
• A short quiz will have 5 simple angle calculation problems and several questions about the literacy activity. These questions will be made to help me evaluate the success of the literacy activity and what impression it had on the students. It will not form part of the quiz grading, but it will give me valuable feedback.

Continuation of Circle unit - (20 minutes)
• Hook - Indiana Jones Boulder scene [http://www.youtube.com/watch?v=tcGS_b9nMZQ](http://www.youtube.com/watch?v=tcGS_b9nMZQ)

Partner work - (15 minutes) students will pair off to do page one of “Raiders of the Lost Arc” worksheet in pairs.

**Assignment** - Do Raiders of the Lost "Arc". The Sequel.
Raiders of the Lost "Arc": The Sequel

Find the measures of the inscribed angles and their intercepted arcs by following the directions below.

1. \( m\overarc{CD} = \) 
2. \( m\angle C = \) 
3. \( m\angle BC = \) 
4. \( m\angle DE = \) 
5. \( m\angle A = \) 
6. \( m\angle B = \) 
7. \( m\overarc{BCD} = \) 
8. \( m\angle D = \) 
9. \( m\angle CAD = \) 
10. \( m\angle BAC = \) 
11. \( m\angle AB = \) 
12. \( m\angle AD = \) 

\( m\angle BAD = 75^\circ \)
Raiders of the Lost "Arc"

Find the measures of the inscribed angles and their intercepted arcs by following the directions below.

Name the arc "cut off" by each inscribed angle.

1. ∠D
2. ∠A
3. ∠DCA
4. ∠ABD
5. ∠DCB
6. ∠ABC

Find the missing measures.

7. \( \text{m} \angle B = \)
8. \( \text{m} \widehat{AB} = \)
9. \( \text{m} \angle A = \)
10. \( \text{m} \angle BC = \)

11. \( \text{m} \widehat{BAD} = \)
12. \( \text{m} \angle BCD = \)
13. \( \text{m} \angle ADC = \)
**Student Engagement Approaches** - The use of video clips and visual imagery will help hold student attention. I also believe that working in groups can enhance learning and interest when done properly. Teens are very interested in socializing and interacting with each other which is both an asset as well as a potential problem in group activities. I will try to keep students focused both by circulating and by offering the reflection questions to each group during the literacy activity. I also think the art activity will be enjoyable as they are free to choose any design they want.

**Prior Knowledge** - As this unit would be at the beginning of the year I would only expect students to have basic knowledge of circles. In 8th grade geometry class they learn about rotations, area, perimeter and parallel lines.

**Special Concerns** - All vocabulary will be on the board throughout the week in both English and Spanish to aid my ELL students. One of my students tends to talk his way through class and a cue system helps to let him know when he can participate and when he should wait. I have tried to incorporate many opportunities for my ELL students to participate in conversational English through group activities. During most classes one of my students is seated next to a ‘helper’ student who is allowed to assist him with instructions and word problems. I also have the assistance of a Special Ed teacher who helps modify and differentiate the worksheets and readings used in the class. For the literacy activity she reduced the amount of reading for the theme he chose and exchanged some words to simplify the text for him. The ELL student also had access to a simplified version of the text she chose and was given the reading on Monday to look over.