CI 403 M&M2 Peer Teaching Lesson Planning Template Fall 2012 Names: Lauren Nowak and Jennifer Dao

Directions: This template is to be filled out by your group in a joint effort and submitted on Moodle prior to teaching your lesson.

SECTION ONE: Today's Lesson in the Big Picture	Exploring the Platonic Solids
Lesson Topic	What are Platonic solids, and why are there only 5 of them?
What Common Core Math Standards are Addressed in this Lesson?	**Visualize relationships between two-dimensional and three-dimensional objects** • CCSS.Math.Content.HSG-GMD.B.4 Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. • 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).★
Which of the Eight Common Core Standards for Mathematical Practice are best Promoted in your Lesson? Why?	. **CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.** • **Students will make conjectures when constructing the regular polyhedra. Moreover, they will share and justify their ideas to others about the constraints.** **CCSS.Math.Practice.MP7 Look for and make use of structure.** • **Students will apply their prior knowledge of regular polygons to construct regular polyhedra otherwise known as the Platonic Solids.** **CCSS.Math.Practice.MP8 Look for and express regularity in repeated reasoning.** • **Students will identify patterns when exploring how to use regular polygons in creating one vertex of a polyhedron.**

SECTION TWO: An Overall Look at Today's Lesson	

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What prior knowledge are you assuming your students have that is key for this lesson?	Students need to know the definition & properties of a regular polygon, that a circle sums to 360 degrees, and how to determine the interior angles for a regular polygon.
What would be an example of a problem, question, or exercise that you could give to your students to see if they are mathematically ready for today's content?	Provide students several problems on finding interior angles of regular polygons with n-sides, i.e What is the interior angle of a regular polygon with 3 Sides, 4 Sides, 5 sides,... 20 sides?
What are your specific lesson objectives? (What should students be able to do by the end of the lesson. These should be specific and assessable. Think "Bloom's" Verbs.)	Students should be able to describe how to create a vertex for a regular polyhedron. Students should be able to construct the vertices for each of the 5 Platonic solids. Students should be able to name and describe each of the 5 Platonic solids. Students should be able to explain why they cannot construct more than 5 regular polyhedra.

SECTION THREE: Teaching Today's Lesson	
State, as you are going to say it to your students at the beginning of class, what is the subject of today's lesson (e.g., "Today we are going to study…." "today's lesson will answer the question …" ; Note that this must only be an introductory statement not an explanation but must be meaningful to them.)	"Yesterday we explored regular polygons and generalized the formula how to find the interior angles of a polygon of n-sides. We have some warm-up problems for review, so please take 1-2 minutes completing them on your own then we will gather as a class...." "Today we will explore how to construct 3-D solids using regular polygons. We know that a square is a 2-D shape and is a regular polygon. What 3-D shape can we make using only squares? Can we make a different 3-D shape, why or why not?"

In what ways will you assess if your lesson objectives from Section Two have been met in your lesson? (Be Specific)	- Students will work in groups to physically construct vertices for regular polyhedra using paper and tape - Students will verbally describe, both to their group mates and to the rest of the class, what polyhedron they created and why they cannot construct any more Platonic solids - Students will record their procedure, reasoning, and explanations on their worksheets.

SECTION FOUR : Differentiating Today's Lesson	
What accommodations will be needed for your ELL students? Comment on any specific strategies you will use to help these students understand the content.	- Platonic solid models will be color-coded to aid in discussing the different shapes
Are there any considerations for meeting the needs of students of various academic abilities? If yes, explain.	- The lesson is created so groups can work at their own pace, and construct as many vertices as they are able to. - Also, we plan to group the student so that the Gifted Student will be in the same group as the struggling student. Also the unmotivated and reluctant student will be assigned an active role in participation in the exploration portion of finding vertices.
Share your additional thoughts on how you will support all students to best learn the material in this lesson.	Gifted Student: Extension for groups that finished quickly. Let students know that we applied a strict rule of using the same regular polygon to create the Platonic Solids. Ask them what if they applied a different rule using a variety of regular polygons, i.e equilateral triangle and squares? Can they make other 3D solids (Exploration of Archimedean solids)? And then have the students explore with the paper and actually confirm their solid on the applet. Reluctant Student: Give them an active role of taping and constructing. Praise and ask the student to share his or her ideas because they are valuable. Unmotivated: Tie lesson to their personal interests, or giving them an active role of taping and construction. Struggling: Group accountability will help students stay on task. One person doing taping. Students who are not on task, can give praise to other groups have made a lot of progress

Lesson Plan		**I. Warm-up: angles of regular polyhedra; circle sums to 360 degrees(?)**	

Outline Use this chart to outline the sequence of activities for today's lesson (add as many rows as needed). Include a detailed description of each lesson segment. Include at least four specific questions you would like to use during the lesson that help students develop a more thorough understanding of the content. **Highlight the four questions that you think will most benefit your lesson in red**		**5 minute warm-up: review general formula to find interior angle of a regular polygon; prior knowledge discussion 180(n-2) from connecting diagonals on one angle to other angles to make triangles.** ○ **Four specific questions:** **1. What are examples of a regular polygon?** **2. What do all regular polygons have in common?** **3. What as an example of a shape that is not a regular polygon? (irregular polygon)?** **4. From yesterday's class, who can recall how to find the interior angles of a regular polygon?** **II. Description/discussion of how to create regular polyhedra (square → cubes; how many faces at a vertex?)** **III. Group work: groups create vertices using only triangles, only squares, only pentagons. Try to create using hexagons, run into a problem** **Once students explore and find a vertex, confirm with them by showing an actual model of the solid with that vertex to the group.** ○ **Specific questions:** **1. We know that a square is a 2-D shape and is a regular polygon. What 3-D solid can we make using only squares?** **2. What is the vertex of a cube? How many squares make up one vertex?--We call each square the face of the cube.** **3. Based on our working definition of a regular polygon, what is a regular polyhedron?** **4. Using the paper and tape as tools, how many triangles do we need to make one vertex?** **5. What are you noticing when you add more triangles to make a vertex?** **6. Can we make a different solid using only squares besides a cube? Why or why not?**	

		IV. Class discussion: What happened when we tried making shapes using only the hexagons? (discussion of angle measurements, getting faces to meet - conclude that we can't make any more of these solids) ○ **Specific Questions:** **1. Did anyone try a making a vertex with hexagons? What happened?** **2. What was largest number of triangles you can have to make a vertex** **3. What happens when you try exceeding the largest number of triangles you can have?** **4. What was the largest number of squares you can have to make a vertex?..pentagons? hexagons?** **V. Closure** **From discussion, the class will discover that in order to make a vertex, some of angles of the shape must be less than 360 degrees. If it is greater than 360 then there will be an overlap.** **VI. Extension?** **(Additional discussion: What if we use different shapes at each corner? What kinds of solids can we construct? → archimedian solids)** **OR** **(Having groups fill out a table of the properties of each shape, to prepare them for Euler's formula lesson the next day?)** **OR** **(creating their own solids from nets)**	

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#	Lesson Segment Title	**Description of Lesson Segment.** What are the students doing? What are the teachers doing? What specific math exampesl are being used? What key questions would you like to ask to develop and assess student understanding? Key Transitions? Directions? Considerations?	Time Estimate (min)
1	Warm Up: Angles of Regular polygon review	Review general formula to find interior angle of a regular polygon; prior knowledge discussion 180(n-2) from connecting diagonals on one angle to other angles to make triangles. Four specific questions: 1. What are examples of a regular polygon? 2. What do all regular polygons have in common? 3. What as an example of a shape that is not a regular polygon? (irregular polygon)? 4. From yesterday's class, who can recall how to find the interior angles of a regular polygon?	2-3 minutes
2	Group Work	Transition from 2-D to 3-D; polygon to polyhedron. ○ 1. We know that a square is a 2-D shape and is a regular polygon. What 3-D solid can we make using only squares? Write class definition of polygon, polyhedron, vertex, face on board; circle characteristics ○ 2. What do you notice about a these two 3-D solids, what do they have in common? ○ 3. Who can find a vertex is on this shape? And edge? A face? Assign students into groups (4 groups of 3 or 3 groups of 4?); Give students specific roles- worksheet recorder, paper/tape experimenter, task checker; all students must share ideas and test each other's ideas Provide each group ___ Triangles, _____ Squares, ___ Pentagons, _____ Hexagons Explain to students their task is to create a vertex for a 3-D solid and find as many different ones as they can and fill it in the table from the worksheet provided ○ 4. Using the paper and tape as tools, how many triangles do we need to make one vertex? ○ 5. What are you noticing when you add more triangles to make a vertex? ○ 6. Can we make a different solid using only squares besides a cube? Why or why not?	5-7 minutes

3	Class discussion for clarification	Some students may put more than 5 triangles and try to make a vertex and might get stuck. ○ 1. Ask these students, what do they notice when they add more than 5 triangles? Can they still make a vertex? Why or why not? They should recognize that the triangles overlap so based on definition of a polyhedron and vertex, it would not work because of the overlap. Have 1 group share their ideas if they are making progress but do not give too much away; for instance one group have noticed that something happens when you try adding more than 5 triangles to make a vertex. ○ 2. What was largest number of triangles you can have to make a vertex If students are working fast and are ahead, ask them: ○ 3. Did anyone try a making a vertex with only hexagons? What happened?	2-3 minutes
4	Continue Goup work	As students make vertices using the shapes, show them the actual regular polygon they have made by creating one of the vertices, i.e you made a tetrahedron with 3 triangles of the vertex, you made a cube using 3 squares as the vertex...	5-7 minutes
5	Class discussion	Discussion of angle measurements, getting faces to meet 1. What happens when you try exceeding the largest number of triangles you can have? 2. What was the largest number of squares you can have to make a vertex?.pentagons? hexagons? 3. How many total 3-D solids have each group found? 4. Can we have more 3-D solids using the regular polyhedron rule of each face being the same shape?	10 minutes

6	Closure	Conclude that we can't make any more of these solids. From discussion, the class will discover that in order to make a vertex, some of angles of the shape must be less than 360 degrees. If it is greater than 360 then there will be an overlap. So we only have 5 regular polyhedra	1-2 minutes
7	Extension	**(Additional discussion: What if we use different shapes at each corner? What kinds of solids can we construct? → archimedian solids)** **OR** **(Having groups fill out a table of the properties of each shape, to prepare them for Euler's formula lesson the next day?)** **OR** **(creating their own solids from nets)**	If time permits

**** Be sure to upload this template AND all supporting handouts/worksheets/etc on our Moodle Site****