Common Core in the Classroom: Math Standards F-TF.2, MP.3 & 8

Graphing Trigonometric Functions

Common Core in the Classroom Series

The *Common Core in the Classroom* series was created to provide educators with actual classroom examples of Common Core practice. Each video features a classroom lesson aligned with one or more Common Core learning targets. In addition to real-life examples of teacher and student engagement, these classroom segments are enriched by excerpts from teacher interviews and reflections.

This guidebook includes the classroom lesson plan provided by the teacher featured in the video and a viewer response form, which helps viewers reflect on the lesson and consider what they might apply to their own practice.

About this Segment

Ms. Michele Loden, a math teacher at Collierville High School in Shelby County, Tennessee, engages her 12th grade students in graphing the trigonometric functions for sine and cosine and identifying patterns in those functions, using a unit circle and a table of values. Ms. Loden employs group work strategies to assist her students in formulating ideas, drawing conclusions, and discussing findings with others in the class.

Guidebook Contents

Suggested PD Activities

Opening Activity: Before viewing the video segment, discuss the following prompt with the whole learning group.

What practices and strategies help ensure that group activities yield genuine collaboration among students?

Discussion: After watching the video, use the following prompt to facilitate discussion.

(Additional discussion questions can be found online with the resources for this video.)

If you were the instructional coach observing this classroom, what 2-3 strengths in Ms. Loden's lesson could you help her identify? What evidence of critical thinking and problem solving did her students demonstrate? What constructive feedback could you give her?

Reflection/Journal Writing: After the discussion, ask participants to record new learning and ideas in their journals. The following questions can be used to encourage reflection.

(Reflection questions can also be found online with the resources for this video.)

1. How can you apply the effective practices in this lesson to your own teaching?
2. What real-world problems could you present to your students that involve graphing trigonometric functions?
3. How could Ms. Loden assess her students' growth toward mastery of the math concept taught?

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Graphing Trigonometric Functions

Teacher Lesson Plan

Teacher: Ms. Michele Loden	**Grade Level:** 12
Lesson Date: October 17, 2012	**Content Area:** Math
School Name: Collierville High School	**Location:** Shelby County, Tennessee

Summary/ Overview	Students graph *y = sin x*, *y = cos x* by transferring the unit circle into a table. Students use the table to plot points on the coordinate plane. Students analyze the graphs and discover how patterns on the unit circle translate into the graph of a trigonometric function. Students discover patterns of the graphs that allow them to predict the graphs of multiple periods of functions.
Skill-Based Objectives & Deliverables	Understand the patterns created by the graphs of *y = sin x*, *y = cos x*. Graph *y = sin x*, *y = cos x* given the unit circle. Model periodic behavior.
Standard(s) Addressed	• **F-TF.2** Explain how the unit circle in the coordinate plane enables the extensions of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle. • **MP.3** Construct viable arguments and critique the reasoning of others. • **MP.8** Look for and express regularity in repeated reasoning.
Materials & Resources	Unit circle, graph paper, pencils, graphing calculator, interactive white board.
Plans for Scaffolding the Learning	Students will be heterogeneously grouped based on proficiency and student personality. The teacher will monitor all groups, assisting each group as necessary.
Plan for Extending the Learning	Groups who have successfully graphed functions from the counterclockwise direction will then predict graph behavior in the clockwise direction on the unit circle. Students who complete these predictions will also analyze how multiplying an angle function by a coefficient changes its graphic representation.
Procedures	1. In predetermined groups, students represent the unit circle in table format. 2. Using the table, students sketch a graph of sine, cosine, and tangent. 3. Students will compare patterns of the graphs to patterns on the unit circle. 4. Students will share their findings with the class. 5. Students will use their patterns to graph multiple positive and negative periods. 6. Students will discuss real-life applications of the sine and cosine waves as they consider phenomena that are periodic in nature.
Formative Evaluation & Assessment	Check for understanding and monitor progress during group work.

Adaptations to this plan made during the teaching of the lesson are described at the end of the next page.

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To learn more about this video and the Common Core in the classroom, please visit:

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Midvale, UT 84047

801-566-6500 | 800-572-1153
Fax: 888-566-6888

www.schoolimprovement.com

Resources from School Improvement Network:

"Peer Review in Algebra II." PD 360. School Improvement Network. http://www.pd360.com/index.cfm?ContentId=4849

Other resources available on this topic:

"Graph of the sine function" video segment. https://www.khanacademy.org/math/trigonometry/trig_graphs_tutorial/v/graph-of-the-sine-function

"Graphing Trig Functions" practice worksheet. http://kutasoftware.com/FreeWorksheets/Alg2Worksheets/Graphing%20Trig%20Functions.pdf

Common Core State Standards Initiative. National Governors Association & the Council of Chief State School Officers. Web. 25 July 2012. http:www.corestandards.org

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Lesson Adaptations

- Ms. Loden did not address the graph of cosine in this lesson because she took additional time to ensure all students understood the material. She arranged to teach this concept in a follow-up lesson.
- Due to time constraints, class discussion on real-life instances of these functions was also postponed.

Grateful appreciation to

Shelby County Schools
Collierville High School
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for sharing their experiences and expertise.