# Routines for Reasoning: Fostering Structural Thinking in All Students

EDCO Collaborative June 24-27, 2019 Worcester State University
Course # C&1971

**Course Instructor:**
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**Course Location**
EDCO Collaborative
36 Middlesex Turnpike
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**Course Dates:**
June 24
June 25
June 26
June 27

**Required Text and Readings:**

Common Core Sate Standards, Standards for Mathematical Practice

Routines for Reasoning: Fostering the Standards for Mathematical Practice in ALL Students, Kelemanik, Lucenta, & Creighton, Heinemann, 2016.

**Course Description**
Teachers will develop a deep understanding the structural thinking—one of the three math avenues of thinking championed in the Standards for Mathematical Practice (SMPs) by engaging in a two instructional routines. They will learn how the instructional routines are designed to develop this avenue of math thinking in students; and how four essential strategies are intentionally woven into the routine design to ensure that all students develop structural thinking.

**Student Learning Outcomes:**
This 24-hour course will provide teachers with the knowledge and strategies they need to ensure that their students develop the capacity to look for and make use of structure, a critical mathematical practice. Participants will leave:

- Understanding what it means for student to look for and make use of structure

- Knowing two instructional routines that are designed to foster structural thinking in all students
- Ready to launch the school year with the *Contemplate then Calculate* routine
- Ready to enact the *Connecting Representations* routine in an upcoming unit

**Required Materials:**
Participants will need access to email and access to www.fosteringmathpractices.com and a copy of *Routines for Reasoning*

**Course Policies:**
Participants must attend all hours in this 24-hour course. Assignments and reflections are due October 7, 2019. Please discuss any extenuating circumstances with the course instructor.

**Grading Policy:**
Class Discussions: 30%
Reading Reflections 20%
Video Analysis: 20%
Lesson Planning and Reflection: 30%

The grading system for graduate studies at WSU employs the letter grades A (94-100), A- (90-93), B+ (87-89), B (84-86), B-(80-83), C+(77-79), C (74-76), C-(70-73), U (below 70, unsatisfactory work, no credit awarded), W (withdrawn), and I (incomplete). Grades will be rounded up between whole numbers.

**Americans with Disabilities Act**

If you believe that you may need accommodations in this course, and if you have not already done so, please contact the Disabilities Services office at 508-929-8733 or go to the Disabilities Services office on the WSU campus in the Student Center Building, Room 206.

Also, consult Disability Services information at WSU:
http://www.worcester.edu/CampusLife/Shared%20Documents/StuServ/DisabilityServices.aspx

If you would like to discuss how your accommodations will be implemented during this course or if you would like to share information unrelated to accommodations, please make an appointment to talk with the instructor as soon as possible.

***ACADEMIC HONESTY POLICY***

Much of the work completed in this course is done outside of the class time.

Take-home assignments may be completed collaboratively, but all written reflections are to be completed independently, once the collaboration is completed. If assignments are done collaboratively, it is expected that each participant contribute significantly to the process and product.

Participants are expected to cite sources – books, papers, websites, as they indicate ideas and information that are not their own. In addition, citations should be clearly indicated within the written piece.

Consult Worcester State University's Academic Honesty Policy at: http://worcester.edu/Academics/Shared%20Documents/academicpoliciesprocedures.aspx?PageView=Shared#academ_honesty for additional details and for penalties and procedures in case of violations.

**Course Topics:**

Session One:

Overview of Three Avenues of thinking within the *Common Core Standards for Mathematical Practice*
*Purpose:* To unpack the Math Practices and learn a framework for making sense of them, with particular attention to structural thinking (MP7).

*Contemplate then Calculate* Instructional Routine
***Purpose: To learn pedagogies essential to building students' capacities to reason structurally, and articulate how the Contemplate then Calculate routine leverages those pedagogies to ensure all students develop as structural thinking.***

Session Two:

Implementing *Contemplate the Calculate* in the Classroom
***Purpose:** To learn how to plan and prepare to lead the Contemplate then Calculate routine, and develop comfort facilitating the routine*.

Building *Contemplate then Calculate* into your curriculum
***Purpose: To identify tasks, plan and prepare your first five Contemplate then Calculate enactments.***

Session Three:

*Connecting Representations* Instructional Routine
***Purpose: To learn pedagogies essential to building students' capacities to reason structurally, and articulate how the Connecting Representations routine leverages those pedagogies to ensure all students develop as structural thinking.***

Session Four:

### Implementing *Connecting Representations* in the Classroom

*Purpose: To learn how to plan and prepare to lead the Connecting Representations routine, and develop comfort facilitating the routine*.

### Building *Connecting Representations* into your curriculum

*Purpose: To identify/create five* Connecting Representations *task sets for your first math unit, plan and prepare your first five Connecting Representations enactments.*

### Goal Setting

*Purpose: To articulate a learning goal for your students, a teaching goal for yourself, and classroom culture goal for the routine--Contemplate then Calculate or Connecting Representations-- you will enact at the start of the school year.*

## Assignments

**Read:**
Routines for Reasoning book, chapters 1, 2, 4, and 7, and the *Contemplate then Calculate* overview found on www.fosteringmathpractices.com.

**Reading Reflection:**
For each instructional routine, identify at least two design features that focus student attention on structural thinking and record questions you have about the routine.

**Classroom Video Analysis:**
Watch classroom video of *Contemplate then Calculate* and *Connecting Representations* and identify evidence of students thinking structurally.

**Lesson Planning and Reflection:** Choose either *Contemplate then Calculate* or *Connecting Representations* and:

- Articulate three goals:
  - Student learning goal. What do you want students to learn as a result of engaging in the routine five times. How will you know if students achieve that goal? What evidence will you collect?
  - Teaching goal. What teaching practice do you want to work on while enacting the routine five times. How will you know if you achieve that goal? What evidence will you collect?
  - Classroom Culture goal. What aspect of classroom culture do you want to develop through engaging in the routine five times? How will you know if you achieve that goal? What evidence will you collect?
- Identify and/or create, and then sequence the first five tasks you will use with the routine.
- Plan for and enact the instructional routine five times with the same group of students. Collect lesson artifacts (e.g., including meta-reflections, pictures of chart paper, video, etc.).
- Write a 3-5 page reflection paper on your experience implementing the routine that speaks to your student learning, teaching, and classroom culture goals. Include evidence from your enactments (e.g. student meta reflections, chart paper, video, transcripts, etc.) to support your claims. Also include all five tasks you used.

- Share your learning with colleagues by posting on WWW.fosteringmathpractices. Choose one task on the website (or submit the task to be uploaded if it doe not appear on the website) and comment on your experience using the task/routine with students.