



This course supports the assessment for Elementary Mathematics Methods. The course covers 9 competencies and represents 3 competency units.

Introduction

Overview

Watch the following welcome video for an introduction to this course:

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Teaching Dispositions Statement

Please review the [Statement of Teaching Dispositions](#).

Course Instructor Assistance

Book a call: mathsciencemethods.youcanbook.me

Email: mathsciencemethod@wgu.edu

Call: Extensions are listed in "Contact a Course Instructor" on the top right sidebar of this course.

Feel free to schedule time directly with a course instructor via this link:
mathsciencemethods.youcanbook.me.

As you prepare to demonstrate competency in this subject, remember that course instructors stand ready to help you reach your educational goals. As subject matter experts, mentors enjoy and take pride in helping students become reflective learners, problem solvers, and critical thinkers. Course instructors are excited to hear from you and eager to work with you.

Successful students report that working with a course instructor is the key to their success. Course instructors are able to share tips on approaches, tools, and skills that can help you apply the content you're studying. They also provide guidance in assessment preparation strategies and troubleshoot areas of deficiency. Even if things don't work out on your first try, course instructors act as a support system to guide you through the revision process. You should expect to work with course instructors for the duration of your coursework, so you are welcome to contact them as soon as you begin. Course instructors are fully committed to your success!

Preparing for Success

The information in this section is provided to detail the resources available for you to use as you complete this course.

Competencies & Objectives



This course provides guidance to help you demonstrate the following 9 competencies:

- **Competency 670.1.1: Differentiated Mathematics Instruction**

The graduate plans differentiated instruction in mathematics education to support the unique needs of diverse learners.

- Modify a mathematics lesson to meet the needs of a given student using a given instructional strategy.
- Analyze a mathematics lesson for how well it addresses the needs of all students.
- Create a mathematics lesson that is accessible to all students.
- Identify strategies for planning mathematics lessons for all learners.
- Compare common strategies for planning mathematics lessons for all learners.
- Explain what it means to teach for all students.
- Describe specific difficulties of learning for diverse groups.
- Select instructional strategies that provide equitable learning opportunities for diverse learners.
- Analyze the diverse needs of a given group of mathematics students.

- **Competency 670.1.2: Mathematical Communication**

The graduate integrates effective mathematical communication strategies into the development of mathematics education for elementary schools.

- Identify instructional strategies that can be used to facilitate effective class or small group discussions about mathematics.
- Identify instructional strategies that can be used to create a classroom environment that encourages mathematical communication.
- Facilitate the explanation of student mathematical thinking to other students and teachers.
- Select questioning techniques that elicit student mathematical thinking.
- Select instructional strategies that encourage students to clearly communicate their mathematical thinking to their peers and teachers.
- Decide which instructional strategies encourage the use of precise academic language in mathematics by students.

- **Competency 670.1.3: Mathematical Tools**

The graduate integrates tools that enhance student mathematics learning.

- Identify a variety of tools that can be used in mathematics instruction.
- Explain uses of specific tools in mathematics instruction.
- Integrate instructional tools into mathematics instruction.
- Select appropriate concrete materials for learning mathematics.
- Determine the appropriateness of a concrete or technological tool for learning a specific mathematical concept.

- **Competency 670.1.4: Assessment**

The graduate evaluates student learning to measure elementary students' mathematical achievement and to plan further instruction.

- Explain the steps to incorporate observational assessments into a lesson.
- Explain the importance of listening to evaluate a student's conceptual understanding of mathematics.
- Explain how to use a rubric to analyze student performance.



- Use a rubric to determine the level of student performance.
- Analyze the connection between assessment and instruction in a given mathematics lesson.
- Analyze the mathematical thinking of students.
- Analyze the effectiveness of a performance assessment for assessing key mathematics concepts.
- Analyze the mathematical thinking of students to determine further instruction.

- **Competency 670.1.5: Interdisciplinary Learning Experiences as Context for Math Instruction**

The graduate creates interdisciplinary learning experiences as contexts for mathematical instruction.

- Identify mathematical connections to contexts outside mathematics curriculum.
- Identify mathematical connections within mathematics curriculum.
- Explain how contextualizing mathematical instruction makes mathematics more accessible to learners.
- Select a context outside mathematics curriculum that can be used to teach a specific mathematical concept.

- **Competency 670.1.6: Instructional Strategies**

The graduate recommends various instructional strategies that encourage students' development of critical thinking, problem solving, and performance skills in mathematics.

- Identify common mathematical learning theories.
- Identify aspects of understanding mathematics.
- Identify important characteristics of the process of mathematics.
- Identify strategies of teaching for understanding in mathematics.
- Differentiate between knowing and understanding mathematics.
- Differentiate between various models that represent mathematical ideas.
- Translate given mathematical ideas between models.

- **Competency 670.1.7: Mathematical Learning Research**

The graduate applies mathematical learning research as a foundation for instruction.

- Identify students' common misconceptions and errors in algebraic thinking.
- Identify students' correct mathematical conceptions about algebra from which further mathematical learning can be built.
- Identify students' common misconceptions and errors in geometry and measurement.
- Identify students' correct mathematical conceptions about geometry and measurement from which further mathematical learning can be built.
- Identify students' common misconceptions and errors in number sense and performing operations.
- Identify students' common misconceptions and errors in probability and statistics.
- Identify students' correct mathematical conceptions about probability and statistics from which further mathematical learning can be built.

- **Competency 670.1.8: National, State, and Local Mathematics Standards**

The graduate integrates national, state, and local mathematics standards, learning outcomes, benchmarks, and objectives in the development of mathematics education for elementary students.

- Identify important standards documents for mathematics instructions.



- Select applicable standards for a given mathematics curriculum.
- Analyze a mathematics learning activity to determine its alignment with standards and best practices.
- Evaluate a mathematics learning activity for its overall quality and alignment with standards.
- **Competency 670.1.9: Mathematical Representation**

The graduate applies models and representations to support and enhance the interpretation, organization, recording, and communication of mathematics.

 - Identify the uses of representations in mathematical instruction.
 - Implement a representation to record and organize mathematical thinking.
 - Apply a representation to quantifiable phenomenon to model and communicate information about that phenomenon.
 - Select instructional strategies that encourage students to create their own representations of their mathematical thinking.

Learning Resources

The learning resources listed in this section are required to complete the activities in this course. For many resources, WGU has provided automatic access through the course. However, you may need to manually enroll in or independently acquire other resources. Read the full instructions provided to ensure that you have access to all of your resources in a timely manner.

In the following resources, you may read about No Child Left Behind (NCLB). Please be aware that as of December 2015, President Barack Obama replaced NCLB with the Every Student Succeeds Act (ESSA). This new act reauthorizes the 50-year-old Elementary and Secondary Education Act (ESEA), the nation's national education law and longstanding commitment to equal opportunity for all students. Although not required for this course, you are encouraged to familiarize yourself with the new act. For additional information, please visit the following links from the U.S. Government and the U.S. Department of Education:

- [Webinar recording](#)
- [Read the ESEA now referred to as the ESSA](#)
- [Fact sheet on ESSA](#)
- [Transition Letter](#)

Automatically Enrolled Learning Resources

You will be automatically enrolled at the activity level for the following learning resources. Simply click on the links provided in the activities to access the learning materials.

VitalSource E-Texts

The following textbook is available to you as an e-text within this course. You will be directly linked to the specific readings required within the activities that follow.

- Van de Walle, J. A.; Karp, K. S.; Bay-Williams, J. M. (2013). *Elementary and middle school mathematics: Teaching developmentally* (8th ed.) Upper Saddle River, NJ: Allyn & Bacon. Print ISBN: 0132612267



Note: This e-text is available to you as part of your program tuition and fees, but you may purchase a hard copy at your own expense through a retailer of your choice. If you choose to do so, please use the ISBN listed to ensure that you receive the correct edition.

Teachscape

Teachscape contains additional video resources and instructional materials for this course. You will find video links throughout the study plan. Please ensure that you have enabled your internet browser to allow pop-ups through Teachscape.

Other Learning Resources

You will use the following learning resources for this course.

WGU Library E-Reserves

This course utilizes resources located in the WGU Library E-Reserves, with articles available for you to download. For instructions on how to access WGU Library E-Reserves, see the "[Accessing WGU Library E-Reserves](#)" page.

The following e-reserve materials will be used in this course:

- Whitin, P., & Whitin, D. J. (2002). *Promoting communication in the mathematics classroom. Teaching children mathematics*, 9(4), 205–211.

Listed below is the e-reserves page for this course:

- [Elementary Mathematics Methods](#)

Additional Preparations

Setting Up Your Learning Journal

Throughout this course, you will be presented with questions and prompts that will help you engage deeply in the content. Please set up a journal system to record notes and reflections.

Pacing Guide

The pacing guide suggests a weekly structure to pace your completion of learning activities. It is provided as a suggestion and does not represent a mandatory schedule. Follow the pacing guide carefully to complete the course in the suggested timeframe.

Week 1

- Introduction
- National, State, and Local Mathematics Standards
- Mathematical Communication

Week 2

- Instructional Strategies



- Differentiated Mathematics Instruction

Week 3

- Assessment
- Mathematical Tools

Week 4

- Interdisciplinary Learning Experiences as Context for Math Instruction

Week 5

- Mathematical Learning Research

Week 6

- Mathematical Representation
- Project in Elementary Mathematics Methods

Note: This pacing guide does not replace the course. Please continue to refer to the course for a comprehensive list of the resources and activities.

National, State, and Local Mathematics Standards

As you have seen in other courses, many standards guide the development of lesson plans and curriculum for elementary school classrooms.

Math Standards

Before you can begin teaching mathematics, you must have a familiarity with the national (NCTM and Common Core State Standards), state, and local standards (if available) in order to develop lessons aligned to these standards.

Assess: Preassessment

Before you get very far into this course, you should take the preassessment to help you understand which topics you should focus your time and energy on. Use the coaching report from your preassessment to guide your study in this course.

Watch: Mathematics Standards: NCTM Principles & Standards

Watch: Mathematics Standards: NCTM Principles & Standards (2:26)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Teaching Mathematics in the 21st Century

As you read in chapter 1, summarize the guidance provided to teachers and K–12



leaders in *Principles and Standards for School Mathematics*.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 1–7 (the beginning of the chapter through the end of "Professional Standards for Teaching Mathematics and Mathematics Teaching Today") in [chapter 1 \("Teaching Mathematics in the 21st Century"\)](#)
- pages 491–494 of [Appendix A Standards for Mathematics Practice](#)

Explore: Implementing the Common Core State Standards

Is your state adopting the Common Core State Standards? Regardless of whether your state has already implemented these standards, Common Core is an important movement in American education that you need to be aware of.

Explore the following website to find out more about the standards themselves and whether your state is using them:

- [Common Core State Standards Initiative](#)

Mathematical Communication

As you teach math, you will incorporate instructional strategies that promote effective mathematical communication.

Promoting Discourse and Communication

In this topic, you will learn communication strategies for the classroom.

Read: Orchestrating Classroom Discourse

As you read this section of chapter 3, take notes in your learning journal about communication in the classroom. Include your thoughts about how you might best use problem solving in your mathematics lessons.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

pages 42–46 ("Orchestrating Classroom Discourse") of [chapter 3 \("Teaching Through Problem Solving"\)](#)

Also complete the "Pause and Reflect" activity on page 44 in your learning journal.

Watch: Opportunities to Explain Thinking; Making Meaning

After watching these Teachscape videos, consider how you might encourage students to share their thinking about math concepts and procedures. Reflect in your learning journal.

In "Opportunities to Explain Thinking" Lisa Bartoli explains how she provides multiple ways for



her fourth grade students to explain their thinking during mathematics lessons. She teaches lessons in which students are talking to each other, drawing pictures, and writing out explanations of how they solve problems.

In "Making Meaning" first grade teacher Lisa Diamantopoulos describes how she encourages her students to be independent learners. She uses questioning and metacognitive strategies to help students arrive at solutions to a math problem.

- [Opportunities to Explain Thinking \(4:23\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

- [Making Meaning \(5:30\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Write: Discourse

In your learning journal, complete the "Writing to Learn" activity 3 on page 58 of [chapter 3](#) ("[Teaching Through Problem Solving](#)"):

- "Describe in your own words what is meant by 'discourse.' What are some important considerations in effectively implementing classroom discourse?"

Read: Promoting Communication in the Mathematics Classroom

After reading the materials below, reflect in your learning journal about ways you can explain student mathematical thinking to other students in a way that helps them learn to recognize and correct errors in their work.

Read the WGU Library E-Reserves article "Promoting Communication in the Mathematics Classroom," which can be found at the following e-reserves page for this course:

- [Elementary Mathematics Methods](#)

Watch: Thinking Out Loud: How Did You Get Your Answer

After watching this video in Teachscape, consider how math teachers might encourage communication in the classroom. Reflect in your learning journal.

In this video, you will see students in a fourth grade classrooms in the process of solving the same division problem. The students grapple with the notion of remainders, justifying the appropriateness of their solutions and sharing strategies that explain how they attained their solution.



Thinking Out Loud: How Did You Get Your Answer (5:30)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Evaluate: Instructional Strategies

Make a list of the instructional strategies found in [chapter 6 \("Teaching Mathematics Equitably to All Children"\)](#). In your journal, record an instance when it would be appropriate to employ each of the strategies you listed.

Instructional Strategies

How can teachers best instruct students in mathematics? Many instructional strategies can be used across content areas, but in this section you will learn about those strategies that are most effective for mathematics instruction.

Teaching Mathematics for Understanding

Now that you have become familiar with what content and skills should be taught in the mathematics classroom, you will now explore what it means for students to "learn," "know," and "do" mathematics.

Watch: Teaching Mathematics for Understanding

Watch: Teaching Mathematics for Understanding (8:21)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Constructivism

Read the following sections in Elementary and Middle School Mathematics: Teaching Developmentally:

- pages 19–23 ("What Does It Mean to Learn Mathematics?") of [chapter 2 \("Exploring What it Means to Know and Do Mathematics"\)](#)

In your learning journal, summarize the constructivist learning theory and its implications for teaching mathematics.

Watch: Understanding Concepts

As you watch the following Teachscape video, consider how you might ensure that students develop a conceptual understanding of math principles prior to asking them to learn mathematical procedures and computations. Record your ideas in your journal.

Kevin Lynch discusses his approach to balancing the development of mathematical concepts and the memorization of formulas and procedures. His approach is very practical and allows enough time for all students to understand the key concepts before they are required to



memorize anything.

- [Understanding Concepts \(2:08\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Exploring What It Means to Understand Mathematics

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 19–29 ("What Does It Mean to Understand Mathematics?") of [chapter 2 \("Exploring What it Means to Know and Do Mathematics"\)](#)

Write: Knowing and Doing Mathematics

In your learning journal, complete the "Writing to Learn" activities 1 and 3 on page 30 of [chapter 2 \("Exploring What it Means to Know and Do Mathematics"\)](#):

- "How would you describe what it means to 'do mathematics'? . . ."
- "What does it mean to say that understanding exists on a continuum from relational to instrumental? Give an example of an idea, and explain how a student's understanding might fall on either end of the continuum."

Discuss: Knowing and Doing Mathematics

Complete the following in *Elementary and Middle School Mathematics: Teaching Developmentally*:

"For Discussion and Exploration" activity 1 on page 30–31 of [chapter 2 \("Exploring What it Means to Know and Do Mathematics"\)](#)

Respond: Arguments Against Constructivism

Perform the "For Discussion and Exploration" activity 2 on page 31 of [chapter 2 \("Exploring What it Means to Know and Do Mathematics"\)](#):

- "Not every educator believes in the constructivist-oriented approach to teaching mathematics. Some of their reasons include the following: There is not enough time to let kids discover everything. Basic facts and ideas are better taught through quality explanations. Students should not have to 'reinvent the wheel.' How would you respond to these arguments?"

Write your response in your learning journal.

Teaching Mathematics Through Problem Solving



Teaching students problem-solving skills is critical for success in mathematics.

This topic covers the following learning objectives:

- Recognize common mathematical learning theories.
- Recognize aspects of understanding mathematics.
- Identify important characteristics of the process of mathematics.
- Recognize strategies of teaching for understanding in mathematics.
- Differentiate between knowing and understanding mathematics.
- Differentiate between various models that represent mathematical ideas.
- Translate given mathematical ideas between models.

Watch: Teaching Mathematics Through Problem Solving

Watch: Teaching Mathematics Through Problem Solving (7:02)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Teaching Through Problem Solving, Part 1

As you read chapter 3, take note of the differences between teaching for problem solving, teaching about problem solving, and teaching through problem solving. How can you help your students achieve higher levels of mathematical understanding?

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 32–42 (the beginning of the chapter through the end of "Adapting a non-Problem-based Task") in [chapter 3 \("Teaching Through Problem Solving"\)](#)

Watch: Problem Solving Every Day

After watching this video through Teachscape, consider how you might incorporate daily problem solving into your classroom. Reflect in your learning journal.

Michael Marcus describes how he infuses problem solving into his daily curriculum by posing a warm-up problem that can be solved in multiple ways. He explains the importance of teaching problem solving, and describes how it allows him to hear how his students think so he can more readily address common mathematical misunderstandings.

- [Problem Solving Every Day](#) (5:02)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Write: Support for Students



In your learning journal, respond to the "Write to Learn" activity 5 on page 58 of [chapter 3](#) ("[Teaching Through Problem Solving](#)"):

- "Why are 'It's easy!' and 'Let me help you' not good choices for supporting students? What is a better way of supporting a student who is having difficulty solving a problem?"

Come up with at least three ideas for supportive ways to help students learn to solve problems.

Watch: Role of the Teacher

After watching the following Teachscape video, consider the role of the teacher in a problem-based math classroom. How might problem-based learning situations serve as opportunities for informal assessment of student learning? Record your thoughts in your learning journal.

Donna Morris describes the role of the teacher in a problem-based classroom. She reflects on the benefits of problem solving, the role it plays in her teaching, and how she uses it frequently as a means of informal assessment.

- [Role of the Teacher](#) (2:45)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Teaching Through Problem Solving, Part 2

The last sections of chapter 3 include ideas about writing, lesson planning, and questions teachers frequently ask. Add to the notes in your learning journal with ways you might implement problem-solving lessons in your mathematics teaching.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 46–57 ("Writing to Learn" through the end of the chapter) in [chapter 3](#) ("[Teaching Through Problem Solving](#)")

Write: Benefits of Writing

In your learning journal, respond to "Write to Learn" activity 5 on page 57 in [chapter 3](#) ("[Teaching Through Problem Solving](#)"):

- "What are some of the benefits of having students write in mathematics class? When should the writing take place? How can very young students 'write'?"

Watch: Math Journals

After watching the following Teachscape video, please consider how you might incorporate math journals into your math classroom. Consider three to four benefits of this practice and write your thoughts in your learning journal.



Linda Catanzano demonstrates how she uses math journals as a way to gauge the daily conceptual understanding of her students in mathematics. She describes the process she goes through to teach her students how to write in the journals, and also the benefits she has experienced since using them.

- [Math Journals](#) (4:21)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Drill or Practice

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

pages 71–74 ("Drill or Practice?" through "Resources for Families") of [chapter 4 \("Planning in the Problem-Based Classroom"\)](#)

After reading this section, respond to the following scenario:

- You are teaching multiplication facts to your third grade class. Although most of the students are proficient at addition, many are struggling to understand how to multiply numbers higher than 3.

Brainstorm about types of lessons you could use to help your students understand.

- Would this be an appropriate time to use drill? Why or why not?
- Besides drill, what types of practice exercises could you assign to students in class and as homework to help them learn their multiplication facts?

Differentiated Mathematics Instruction

As in all content areas, teachers of mathematics must have the ability to differentiate instruction to meet the varying needs of different students. In this section you will learn about methods for differentiating mathematics instruction in the elementary classroom.

Instructional Planning for All Students

It is important for a teacher of mathematics to create lessons that meet the needs of diverse learners. This topic will demonstrate ways in which to evaluate and create diverse lessons.

This topic covers the following learning objectives:

- Use a given instructional strategy to modify a mathematics lesson to meet the needs of a given student.
- Evaluate a mathematics lesson for how well it addresses the needs of all students.
- Create a mathematics lesson that is accessible to all students.

Watch: Engaging All Learners



Engaging All Learners (9:13)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Planning for All Learners

As you complete the reading below, record planning strategies that can be used to meet the needs of students with a range of backgrounds and academic abilities.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 64–67 ("Planning for All Learners") of [chapter 4 \("Planning in the Problem-Based Classroom"\)](#)

Evaluate: Lesson Plan

Review the lesson plan on the following pages in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 76–77 of [chapter 4 \("Planning in the Problem-Based Classroom"\)](#)

Evaluate the lesson plan for how well the modifications meet the needs of specific students. Determine what modifications have been made to the lesson plan. Write your findings in your learning journal.

Teaching for All Students

Using differentiated instruction in mathematics is a key strategy for teaching all students. This topic will describe ways in which to make this possible and what it means to teach for all students.

This topic covers the following learning objectives:

- Recognize strategies for planning mathematics lessons for all learners.
- Contrast common strategies for planning mathematics lessons for all learners.
- Explain what it means to teach for all students.
- Describe specific difficulties of learning for diverse groups.
- Select instructional strategies that provide equitable learning opportunities for diverse learners.
- Analyze the diverse needs of a given group of mathematics students.

Watch: Engaging All Learners

Engaging All Learners (9:13)

Note: To download this video, right-click the following link and choose "Save as...": [download](#)



[video](#).

Read: Teaching Mathematics Equitably to All Children, Part 1

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 94–101 (the beginning of the chapter through the end of "Additional Strategies for Supporting Students With Moderate and Severe Disabilities") in [chapter 6 \("Teaching Mathematics Equitably to All Children"\)](#)

In your learning journal, respond to the "Writing to Learn" activity 1 on page 112 of [chapter 6 \("Teaching Mathematics Equitably to All Children"\)](#):

- "How is equity in the classroom different from teaching all students equally?"

Read: Teaching Mathematics Equitably to All Children, Part 2

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 102–111 ("Students Who Are Culturally and Ethnically Diverse" through the end of the chapter) in [chapter 6 \("Teaching Mathematics Equitably to All Children"\)](#)

In your learning journal, respond to the "Writing to Learn" activities 2, 3, 4 and 6 on page 112 of [chapter 6 \("Teaching Mathematics Equitably to All Children"\)](#):

- "For children with learning disabilities and special learning needs, what are two strategies to modify instruction for each?"
- "Describe in your own words the central ideas of culturally relevant mathematics instruction."
- "What are some of the specific difficulties English language learners encounter in the mathematics class?"
- "In the context of providing for the mathematically gifted, what is meant by depth? Give an example of how you might add depth to a classroom activity."

Assessment

General educational assessment practices apply to every content area, including mathematics. Because of the focus on STEM education and progress in America, mathematics assessment is particularly important. As a teacher, you should understand how to apply meaningful, appropriate assessment in your classroom.

Mathematics Assessment

In this topic, you will discover how to use and develop multiple types of assessments, and you will practice analyzing the connection between assessment and instruction in mathematics.

This topic covers the following learning objectives:



- Explain the steps to incorporate observational assessments into a lesson.
- Explain the importance of listening to evaluate a student's conceptual understanding of mathematics.
- Explain how to use a rubric to analyze student performance.
- Use a rubric to determine the level of student performance.
- Analyze the connection between assessment and instruction in a given mathematics lesson.
- Analyze the mathematical thinking of students.
- Evaluate the effectiveness of a performance assessment for assessing key mathematics concepts.
- Evaluate the mathematical thinking of students to determine further instruction.

Watch: Assessment in Mathematics

Watch: Assessment in Mathematics (8:24)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Integrating Assessments and Performance Indicators

As you read the first part of chapter 5, make note of the different ways you can incorporate assessment into your mathematics lessons. Also look for reasons it is important to listen to students so you can understand the way they are conceptualizing mathematical problems and solutions.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 78–92 (the beginning of the chapter through the end of "Student Involvement with Rubrics") of [chapter 5 \("Building Assessment into Instruction"\)](#)

In your learning journal, complete the "Writing to Learn" activity 1–5 on page 93 of [chapter 5 \("Building Assessment into Instruction"\)](#):

- "What is the difference between formative and summative assessment? Give examples of each."
- "Describe the essential features of a rubric. Give three examples of performance indicators."
- "How can you incorporate observational assessments into your daily lessons? What is at least one method of getting observations recorded?"
- How can students with limited writing skills "write" in mathematics class?
- How do diagnostic interviews help capture student thinking?

Watch: Combination of Assessments

As you watch the following video from Teachscape, consider how you might combine multiple assessment strategies to effectively evaluate your students. Record your thoughts in your



learning journal.

Sandra LeVan combines the use of traditional and alternative forms of assessment. As she explains in this video segment, using a variety of assessments helps her form a more detailed picture of her students, which helps her better understand their academic needs.

- [Combination of Assessments \(4:05\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Writing Journals, Observations, and Diagnostics

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 85–90 ("Writing and Journals" through the end of "Diagnostic Interviews") of [chapter 5 \("Building Assessment into Instruction"\)](#)

Also answer this question in your learning journal:

- How do writing journals, observations, and diagnostics help teachers analyze students' conceptual understanding of mathematics?

Mathematical Tools

The tools you used when you studied mathematics in elementary school are probably very different from the tools available to you as a teacher for elementary mathematics.

Tools for Mathematics

There are a variety of tools that can be used to enhance mathematics instruction, both concrete and technological. This topic explores technological tools and how they can be utilized in the classroom. Concrete tools have been touched upon in previous readings; however, chapter 7 will focus on the technological tools.

This topic covers the following learning objectives:

- Recognize a variety of technological and concrete tools that can be used in mathematics instruction.
- Explain appropriate uses of specific technological and concrete tools in mathematics instruction.
- Integrate the use of appropriate technological and concrete tools in mathematics instruction.
- Select appropriate concrete materials for learning mathematics.

Determine the appropriateness of a concrete or technological tool for learning a specific mathematical concept.



Watch: Tools for Mathematics

Watch: Tools for Mathematics (6:18)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Watch: Introduction to Manipulatives

Watch: Introduction to Manipulatives (6:18)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Review: Virtual Manipulatives

Visit the following websites for ideas on how to use manipulatives in your mathematics lessons:

- [National Library of Virtual Manipulatives](#)
- [New Haven Unified School District: Virtual Math Manipulatives](#)

Read: Technological Tools

Before you begin reading chapter 7, list in your learning journal different types of mathematics learning activities or tasks that might be facilitated by the use of tools. As you read, identify tools that could be used for each of these activities and tasks.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 114–122 (the beginning of the chapter through the end of "Tools for Developing Algebraic Thinking") of [chapter 7 \("Using Technological Tools to Teach Mathematics"\)](#)

Write: Technological Tools

In your learning journal, complete the "Writing to Learn" activity 1 on page 127 of [chapter 7 \("Using Technological Tools to Teach Mathematics"\)](#):

- "Explain at least three ways that technological tools have affected the mathematics curriculum and how it is taught. Give examples to support your explanation."

Watch: Excel Basics

Watch: Excel Basics (6:24)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Tool Use and Online Resources



Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 122–124 ("Instructional Applications" through the end of the chapter) of [chapter 7](#) ("[Using Technological Tools to Teach Mathematics](#)")

In your learning journal, respond to the "Write to Learn" activities 4 and 5 on page 127 of [chapter 7](#) ("[Using Technological Tools to Teach Mathematics](#)"):

- "What are some criteria that seem most important to you when selecting digital content?"
- "What kind of information can you expect to find on the Internet that would be useful in teaching mathematics? How can you evaluate the quality of that information?"

Interdisciplinary Learning Experiences as Context for Math Instruction

Teachers have many opportunities to relate mathematics learning to other content areas, such as science, art, and music. As teachers help students make connections between math and other subjects, they can also show students that many aspects of understanding they develop in studying mathematics can be applied in real-world situations.

Mathematical Connections

While mathematics in itself is an important content area, it is equally important for mathematics skills to be connected not only to other mathematical topics, but also to other content areas. While investigating this topic, these connections will be addressed.

This topic addresses the following learning objectives:

- Recognize mathematical connections to context outside mathematics curriculum.
- Recognize mathematical connections within mathematics curriculum.
- Explain how contextualizing mathematical instruction makes mathematics more accessible to learners.
- Select a context outside mathematics curriculum that can be used to teach a specific mathematical concept.

Watch: Mathematical Connections: Integrating Subjects

Making Connections: Integrating Subjects (7:14)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Teaching Addition and Subtraction

Prepare for your readings in this section by brainstorming ways you could incorporate mathematics learning into other content areas or vice versa. Add to your notes as you read.



Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 151–168 ("Teaching Addition and Subtraction" through the end of the chapter) of [chapter 9 \("Developing Meanings for the Operations"\)](#)

Also complete the following activity in your learning journal:

"Pause and Reflect" activity on page 160 of [chapter 9 \("Developing Meanings for the Operations"\)](#)

Read: Developing Strategies for Fraction Computation

Add to your notes from reading chapter 9 as you read parts of chapter 16.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 316, 319, 326–331 ("Understanding Fraction Operations," "Addition and Subtraction," and "Multiplication" through "Addressing Misconceptions") of [chapter 16 \("Developing Strategies for Fraction Computation"\)](#)

Watch: Supporting the Operations

As you watch this Teachscape video, take note of how the teacher helped students make connections within the mathematics curriculum. Which math topics did she incorporate? Take note of the strategies she employed in your learning journal.

Margarita Florez teaches a data analysis lesson that focuses on the operations of addition and subtraction. She uses the data analysis lesson as a way to support and integrate other mathematics concepts that her students need to practice.

- [Supporting the Operations \(3:16\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Math Connections

Read the following article located on the Math Goodies website:

- ["Math Connections"](#)

When teaching mathematics, it is important to help students make connections within the math curriculum in addition to making connections to other subjects. How might you accomplish this goal? In your journal, record several strategies for making math connections.

Mathematical Learning Research



As you begin teaching students different concepts in mathematics, you should understand the research findings related to mathematical learning. How do young students develop number sense? What can teachers do to address students' misconceptions about measurement and algebraic reasoning? In this section, you will learn about these and other topics related to student learning.

Should you need to review your math content for elementary and middle grades, you may use the "Content Check" videos in the Mathematical Learning Research Section of this [Final Review Study Guide](#).

Please note: This study guide addresses only a portion of the material and is designed as a supplementary resource to help you practice basic concepts. This study guide does not replace the Course of Study or the pre-assessment.

Number Sense and Performing Operations

This topic addresses the research regarding number sense and operations, as well as students' thinking about this area of mathematics instruction.

This topic covers the following learning objective:

- Recognize students' misconceptions and errors in number sense and performing operations.

Watch: Number Sense and Performing Operations

Watch: Number Sense and Operations (8:10)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Developing Early Number Concepts and Number Sense

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 128–136 (beginning of the chapter through the end of "Early Number Sense") in [chapter 8 \("Developing Early Number Concepts and Number Sense"\)](#)

Also complete the following activity in your learning journal:

- "Pause and Reflect" activity on page 136 of [chapter 8 \("Developing Early Number Concepts and Number Sense"\)](#)

Watch: Student Work Analysis - Number Sense Part 1

Watch: Student Work Analysis - Number Sense Part 1 (8:41)



Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Explore: Mathematical Correspondence

Respond in your learning journal to the "For Discussion and Exploration" activity 2 on page 147 of [chapter 8 \("Developing Early Number Concepts and Number Sense"\)](#):

- "You've noticed that a student you are working with is counting objects with an accurate sequence of numbers words, but is not attaching one number to each object. Therefore, the student's final count is inconsistent and inaccurate. What would you plan to help this student develop a better grasp of one-to-one correspondence?"

Watch: Student Work Analysis - Number Sense

Student Work Analysis: Number Sense (9:45)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Developing Meanings for the Operations

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 148–151 (beginning of the chapter through the end of "Computational and Semantic Forms of Equations") in [chapter 9 \("Developing Meanings for the Operations"\)](#)

You should also skim and review the rest of chapter 9, which you should have read in a previous topic in this course.

Watch: Multiplication and Division

This Teachscape video demonstrates a teacher helping students build their conceptual understanding of multiplication and division. How does she do it? Why is it important for students to develop a conceptual understanding of the operations prior to learning a procedure or memorizing their facts?

Amy Bright asks her students the essential question; "How are multiplication and division related?" The students in Amy's class engage in a variety of activities to help develop a conceptual understanding of the two operations. Only after experiences such as these can the students begin to make the connections between multiplication and division.

- [Multiplication and Division](#) (3:42)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Explore: Rules of Arithmetic



Respond in your learning journal to the "For Discussion and Exploration" activity 1 on page 169 of [chapter 9 \("Developing Meanings for the Operations"\)](#):

- "The National Mathematics Advisory Panel (2008) deemed number properties as a critical foundation for school mathematics. What is the importance of students learning the underlying principles of the fundamental properties of the operations (commutative, associative, distributive, etc.)? How does the knowledge of these 'rules of arithmetic' prepare students for making generalizations and thereby develop their ability to reason algebraically?"

Read: Representations

As you read the first part of chapter 11, pay close attention to activities 11.1–11.6. How could these activities and others like them help you identify students' misconceptions in mathematical thinking? How could they help you recognize correct mathematical conceptions?

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 192–200 (beginning of the chapter through the end of "Equivalent Representations") in [chapter 11 \("Developing Whole-Numbers Place-Value Concepts"\)](#)

Read: Real-World Applications

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 200–211 ("Oral and Written Names for Numbers" through the end of "Connections to Real-World Ideas") in [chapter 11 \("Developing Whole-Numbers Place-Value Concepts"\)](#)

After you have read this section of the chapter, spend a few minutes brainstorming the types of real-world applications that you could use in mathematics lessons to help students see the relevance of learning mathematics. What real-world ideas do you think students in your future classroom will connect with most? Consider the ages, social situations, and cultural influences that might affect your students' interests and motivations.

Write: Place-Value and Computation

In your learning journal, complete the "Writing to Learn" activity 6 on page 215 of [chapter 11 \("Developing Whole-Numbers Place-Value Concepts"\)](#):

- "How can place-value concepts and computation skills be developed at the same time? Describe two activities that can be used to address these dual agendas."

Algebraic Thinking

This topic will address the research regarding algebraic thinking as well as students' correct conceptions and possible misconceptions.



This topic addresses the following learning objectives:

- Recognize students' common misconceptions and errors in algebraic thinking.
- Recognize students' correct mathematical conceptions about algebra from which further mathematical learning can be built.

Watch: Common Math Misconceptions

Watch: Common Math Misconceptions (6:50)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Meaning of the Equals Sign

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 258–264 (beginning of the chapter through the end of "Conceptualizing the Equals Sign as Balance") in [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#)

In your learning journal, respond to the "Writing to Learn" activity 2 on page 288 of [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#):

- "What misconceptions or limited conceptions do students have regarding the equal sign? What causes these misconceptions, and how can instruction clear these up?"

Watch: Understanding Equality

As you watch this Teachscape video, consider how traditional math curriculum can inadvertently cause students to develop misconceptions about the equal sign. How can those misconceptions be corrected?

Dr. Maria Blanton explains how traditional mathematics curriculum can inadvertently develop a misunderstanding of the equal sign in students. She discusses ways teachers can remediate this misunderstanding.

- [Understanding Equality \(2:50\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Variables

Read the following sections in *Elementary and Middle School Mathematics: Teaching*



Developmentally:

- pages 265–269 ("True/False and Open Sentences" through the end of "Variables Used as Quantities That Vary") in [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#)

In your learning journal, respond to the "Writing to Learn" activity 3 on page 289 of [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#):

- "What misconceptions or limited conceptions do students have regarding variables? What causes these misconceptions, and how can instruction clear these up?"

Watch: Variables

As you watch the following video from Teachscape, consider how a conceptual understanding of variables can be developed in elementary grades. Record your thoughts in your journal.

Michael Marcus describes how he moves his students from the simple math they learned in fifth grade to the more difficult mathematics expected of them in middle school. He conducts a lesson on variables and explains how working with variables is a natural extension of working with whole numbers in the operations.

- [Variables \(4:35\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Watch: Student Work Analysis: Algebraic Thinking

Student Work Analysis: Algebraic Thinking (3:42)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Algebraic Thinking

Before you finish reading chapter 14, take a few minutes to write in your learning journal what you have learned about how learners think about algebraic concepts at the elementary level.

- What did you know about it before you started studying in this course?
- What have you learned that is surprising?

Add to your notes as you finish reading the chapter.

Read the following sections in *Elementary and Middle School Mathematics: Teaching*



Developmentally:

- pages 270–287 ("Making Structure in the Number System Explicit" through the end of the chapter) in [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#)

Discuss: Algebraic Thinking

Perform the following activity in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- "For Discussion and Exploration" activity 2 on page 289 of [chapter 14 \("Algebraic Thinking: Generalizations, Patterns, and Functions"\)](#)

Then post your thoughts about the task in your learning community. Read some of your peers' responses and respond to discussion threads that you find interesting.

Watch: Functional Thinking

What are the three levels of functional thinking? What steps can elementary teachers take to ensure that students develop the conceptual base to understand more complex math concepts and procedures in later grades?

Dr. Maria Blanton describes what it means to think functionally and the three levels of this type of thinking: recursive patterning, co-variation, and understanding correspondence relationships.

- [Functional Thinking \(3:06\)](#)

Geometry and Measurement

This topic continues the journey through the content areas within mathematics. Research and common conceptions and misconceptions will be addressed through the study of this topic.

This topic covers the following learning objectives:

- Recognize students' common misconceptions and errors in geometry and measurement.
- Recognize students' correct mathematical conceptions about geometry and measurement from which further mathematical learning can be built.

Watch: Geometry and Measurement

Watch: Geometry and Measurement (7:02)



Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Developing Measurement Concepts

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 375–381 (beginning of the chapter through the end of "Measurement Estimation Activities") in [chapter 19 \("Developing Measurement Concepts"\)](#)

Write: Measurement

In your learning journal, respond to the "Writing to Learn" activity 1 on page 401 of [chapter 19 \("Developing Measurement Concepts"\)](#):

- "Explain what it means to measure something. Does your explanation work equally well for length, area, weight, volume, and time?"

Would your explanation change if you were teaching different grade levels or explaining the concept to parents or administrators instead of students?

Outline: Activities

Go through all of [chapter 19 \("Developing Measurement Concepts"\)](#), and outline at least one activity for each of the following measurement topics:

- area
- volume and capacity
- weight and mass
- angles
- time
- money

In your outline, list the grade level(s) that would benefit from each activity, accommodations you might make to use the activity for diverse and exceptional learners, and thought processes (correct or incorrect) that could be revealed by using the activity.

Read: Developing Measurement Concepts.

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 381–399 ("Length" through the end of the chapter) in [chapter 19 \("Developing Measurement Concepts"\)](#)

Watch: Area Formulas

As you watch the following Teachscape video, consider how student thinking about area was developed prior to discussing a formula. Record your thoughts in your journal.



Kevin Lynch conducts a lesson on finding the area of triangles. He begins by tapping into the prior knowledge of his students and allows them to explore ways to apply this knowledge to deriving a new formula for finding the area of triangles.

- [Area Formulas \(4:47\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: van Hiele Levels of Geometric Thought

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 402–407 (beginning of the chapter through the end of "Implications for Instruction") in [chapter 20 \("Geometric Thinking and Geometric Concepts"\)](#)

In your learning journal, respond to the "Writing to Learn" activity 1 on page 433 of [chapter 20 \("Geometric Thinking and Geometric Concepts"\)](#):

- "Describe in your own words the first three van Hiele levels of geometric thought (levels 0, 1, and 2), including the object of thought and the product of thought. How would activities aimed at levels 0, 1, and 2 differ?"

Read: Shapes

Read the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 408–431 ("Learning about Shapes and Properties" through the end of "The Platonic Solids") in [chapter 20 \("Geometric Thinking and Geometric Concepts"\)](#)

In your learning journal, respond to the "Writing to Learn" activity 2 on page 432 of [chapter 20 \("Geometric Thinking and Geometric Concepts"\)](#):

- "Briefly describe the nature of the content in each of the four geometric strands discussed in this chapter: Shapes and Properties, Location, Transformations, and Visualization."

Discuss: Teaching Techniques

Read the following activity in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- "Writing to Learn" activity 1 on page 432 of [chapter 20 \("Geometric Thinking and Geometric Concepts"\)](#)

Then post your thoughts about the task in your learning community. Read some of your peers'



responses and respond to discussion threads that you find interesting.

Besides the questions listed in the textbook, what other things do you think teachers need to consider when teaching techniques like this to their students?

Watch: Student Work Analysis - Geometry and Measurement

Student Work Analysis: Geometry and Measurement (12:57)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Probability and Statistics

The Journey through the Mathematical Content areas continues with the study of probability and statistics.

This topic covers the following learning objectives:

- Recognize students' common misconceptions and errors in probability and statistics.
- Recognize students' correct mathematical conceptions about probability and statistics from which further mathematical learning can be built.
- Explain students' mathematical thinking about probability and statistics based on student work.

Watch: Exploring Probability

Watch: Exploring Probability (9:56)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Developing Concepts of Data Analysis

As you read chapter 21, look for examples of student work and explanations of students' mathematical thinking. In your learning journal, record your ideas for how you can accurately evaluate your students' thinking and help them overcome misconceptions they might have about probability and statistics at specific grade levels.

Read the following chapter in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- [chapter 21 \("Developing Concepts of Data Analysis"\)](#)



Watch: Data Analysis and Probability Overview

As you watch this Teachscape video, consider why it is important for K–12 students to learn to collect, record, and analyze data. Record your reasons in your learning journal.

- [Data Analysis and Probability Overview \(4:04\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Plan: Instruction

Perform the "For Discussion and Exploration" activity 2 on page 453 of [chapter 21 \("Developing Concepts of Data Analysis"\)](#):

- "The process of doing statistics must be clear to students, even when they are working on a piece (e.g., circle graphs) within the process. Pick a grade, and consider possibilities for authentic and engaging (and researchable) questions. Then discuss how you would plan instruction in order to include the four-step process and engage students in statistical thinking."

Watch: Student Work Analysis - Probability and Statistics

Student Work Analysis: Probability and Statistics (8:39)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Read: Exploring Concepts of Probability

As you read chapter 22, add to the notes you took while reading chapter 21. Look for more examples of student work and explanations of students' mathematical thinking.

Read the following chapter in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- [chapter 22 \("Exploring Concepts of Probability"\)](#)

Write: Concepts of Probability

In your learning journal, respond to "Writing to Learn" activities 2 and 6 on page 470 of [chapter 22 \("Exploring Concepts of Probability"\)](#):

- "Activities 22.3 and 22.5 ('1-2-3 How Likely?' and 'Race to the Top') are each designed to help students see that some outcomes are more likely than others. What is the difference between these two activities? Why might this difference be useful in helping



students gain insights about how likely an event is?"

- "What are some misconceptions and challenges students have with learning probability?"

Watch: Bag of Tiles: A Lesson to Demonstrate Probability

As you watch this Teachscape video, consider how students apply the concepts of random sampling, collecting data, representing data and interpreting data. Record the applications you observe in your learning journal.

The students in Rhonda Singleton's class are conducting a probability experiment using bags of colored tiles. They apply the concepts of random sampling, collecting data, representing data, and interpreting data. The students struggle with understanding why their classmates came up with different results.

- [Bag of Tiles: A Lesson to Demonstrate Probability \(1:51\)](#)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Mathematical Representation

Mathematical representations are a key concept in mathematical learning and understanding. They are not a teaching strategy, but they are an innate characteristic of mathematical thinking. Each person has mathematical representations. Some representations are common to many people, but others are unique to individuals.

Mathematical Representation

Mathematical concepts can be represented in multiple ways. During the exploration of this topic, you will learn about ways to help students to discover and use these representations.

This topic covers the following learning objectives:

- Identify the uses of representations in mathematical instruction.
- Use a representation to record organize mathematical thinking.
- Apply a representation to quantifiable phenomenon to model and communicate information about that phenomenon.
- Select instructional strategies that encourage students to create their own representations of their mathematical thinking.

Watch: Mathematical Representations

Watch: Mathematical Representations (9:07)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Review: Sections on Mathematical Representation



You should have already read chapters 2 and 21 in earlier topics, but now you will review sections of these chapters for information about mathematical representation. As you read, take notes on uses of representation in mathematical instruction, concepts behind representations, and ways in which representations can help you as a teacher to understand students' mathematical thinking.

Review the following sections in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- pages 24–26 ("What Does it Mean to Understand Mathematics" through the end of "Technology-Based Tools") in [chapter 2 \("Exploring What It Means to Know and Do Mathematics"\)](#)
- pages 434–448 ("Data Analysis: Graphical Representations") in [chapter 21 \("Developing Concepts of Data Analysis"\)](#)

Reflect: Representations

In your learning journal, complete the following activity in *Elementary and Middle School Mathematics: Teaching Developmentally*:

- "Pause and Reflect" activity on page 441 of [chapter 21 \("Developing Concepts of Data Analysis"\)](#)

What types of instructional strategies could you use in this situation to encourage students to create their own representations of their mathematical thinking?

Watch: Mathematical Representation

As you watch this Teachscape video, consider how helping students develop multiple representations gives insight into equivalent problems. Record your ideas in your journal.

Dr. Richard Schaar explains how mathematicians use different representations to solve problems and gain insight into equivalent problems.

- [Mathematical Representation](#) (4:50)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Project in Elementary Mathematics Methods

All the work you previously completed in preparation for the Elementary Mathematics Methods objective assessment is relevant for completing the performance assessment for this course.

Lesson Planning Resources

Use the following resources to guide you in preparation for your performance assessment.



A Guide to the WGU Lesson Plan Template

[WGU Lesson Plan Template](#) You can access examples of completed lesson plans here:

- [Lesson Plan Sample 1- Direct Instruction Style](#)
- [Lesson Plan Sample 2 - Modified for Inquiry Style](#)

If you have questions about any of the sections included on the WGU Lesson Plan Template, review the following recordings or e-mail the course instructor for your current course of study.

Overview:

- [Lesson Planning Guidelines](#) (8:26)

General Information:

- [Lesson Title & Subject](#) (1:38)
- [Topic or Unit of Study](#) (1:38)
- [Grade/Level](#) (1:38)
- [Instructional Setting](#) (1:38)

Standards and Objectives:

- [Curriculum Standard](#) (3:36)
- [Lesson Objective](#) (4:07)

Materials and Resources:

- [Instructional Materials](#)
- [Resources](#)

Instructional Plan:

- [Prerequisite Skills](#)
- [Presentation of New Information and/or Modeling](#) (3:16)
- [Guided Practice](#) (1:16)
- [Independent Practice](#) (1:23)
- [Culminating or Closing Procedure/Activity/Event](#) (1:47)
- [Instructional Strategy \(or Strategies\)](#) (1:46)
- [Differentiated Instruction Accommodations](#) (2:56)
- [Use of Technology](#)
- [Student Assessment/Rubrics](#) (3:07)

Virtual Manipulatives:

Visit the following websites for ideas on how to use virtual manipulatives in your mathematics



lessons:

- [National Library of Virtual Manipulatives](#)
- [Virtual Math Manipulatives](#)

Complete: Elementary Mathematics Methods Performance Assessment

Complete the following performance assessment in Taskstream:

- Elementary Mathematics Methods: DUP Task 1

Watch: Elementary Math: Lesson Plans with Manipulatives (14:00)

Note: To download this video, right-click the following link and choose "Save as...": [download video](#).

Final Steps

Congratulations on completing the activities in this course! This course has prepared you to complete the assessments associated with this course. If you have not already been directed to complete the assessments, schedule and complete your assessments now.