



This course supports the assessments for Specific Teaching Practices: Mathematics Pedagogy. The course covers 1 competency and represents 1 competency unit.course

Introduction

Overview

As you work through the course of studycourse activities, be aware of potential student difficulties and your potential interaction with the math content. You should consider this course of studycourse to be a culminating experience, one that requires you to synthesize what you have learned in the other mathematics pedagogy assessments you have worked through prior to this one. Be advised that the items on this assessment were written from the Van De Walle "teaching developmentally" point of view. Because that is the case, when you are confronted with items on the exam for which you feel an argument could be made for more than one of several pedagogical approaches, be sure to respond with what Van De Walle espoused.

There are several broad areas of mathematics pedagogy that this course of studycourse covers. These include the following: appropriate technology usage; prerequisite skills; mathematical errors; attitudes and curiosity; teaching strategies; and grade-level appropriate topics.

This course of studycourse has been designed to refresh your memory of what you have already learned about these topics so you will be successful on the 16-item objective assessment that covers these areas. Before requesting this assessment, you should have already passed the other math pedagogy assessments. This assessment covers some of the key elements of successful mathematics teaching. It is also presented in a multiple-choice or multiple-selection format. As you progress through this course of studycourse, think to yourself about how you might ask multiple-choice questions about the material presented here. As a math teacher, you will create assessments of your own. Now is a great time to start practicing that skill. See if you can anticipate the sorts of questions you might be asked, and you will be that much more prepared for them when you take the exam.

Competencies

This course provides guidance to help you demonstrate the following 1 competency:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction..

Teaching Dispositions Statement

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

Course Mentor Assistance

As you prepare to successfully demonstrate competency in this subject, remember that course mentors 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 mentors are excited to hear from you and eager to work with you.



Successful students report that working with a course mentor is the key to their success. Course mentors 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 mentors act as a support system to guide you through the revision process. You should expect to work with course mentors for the duration of your coursework, so you are welcome to contact them as soon as you begin. Course mentors 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.

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.

Manually Enrolled Resources

Take a moment to enroll in the learning resources listed in this section. To enroll, navigate to the "Learning Resources" tab, click the "Sections" button, and then click the "Enroll Now" button for each resource. Once your mentor approves your enrollment in the resource, you will receive an e-mail with further access instructions. Contact your mentor if you have questions.

Note: For instructions on how to enroll in or subscribe to learning resources through the "Learning Resources" tab, please see the "[Acquiring Your Learning Resources](#)" page.

CourseCompass

Enroll in the following CourseCompass course:

- "Teaching Mathematics Grades 5-12"

The following multimedia textbooks are included and contain videos, practice problems, and quizzes:

- Posamentier, A. S., Smith, B. S., & Stepelman, J. (2010). *Teaching secondary mathematics: Techniques and enrichment units*(8th ed.). Allyn & Bacon. ISBN: 9780135000038.
- Van de Walle, J. A., Karp, K. S., & Bay-Williams, J. M. (2010). *Elementary and middle school mathematics: Teaching developmentally*(7th ed.). Allyn & Bacon. ISBN: 9780205573523.



Note: Should you desire hard copies of these e-texts, the WGU Bookstore has these books available for immediate purchase and delivery. You may shop at other online bookstores, but be sure to order early and use the correct ISBN to get the correct edition.

After enrolling in this course, you will be e-mailed access information to the Pearson CourseCompass website. You will be sent a link to the site with your username and password. When you log in to this website, you can access the "Teaching Mathematics Grades 5-12" resource, e-books, MyEducationLab practice tests, and the above e-texts.

You are strongly encouraged to review the chapters you should have read for your prior math pedagogy assessments and to reflect upon the questions found at the end of each chapter. You will also be instructed in this course to take the chapter tests found at the end of each chapter of *Elementary and Middle School Mathematics* so as to get a better feel as to the types of questions you will encounter on the objective assessment.

Note: The resources you are using to master the competencies for this assessment will also be valuable as you prepare for future assessments and as you develop lesson plans to use in your classroom in the future. Therefore, it is highly recommended that you complete each activity contained in this document.

Other Learning Resources

You will use the following learning resources for this course.

Companion Websites

Also very useful are websites that reference older versions of *Elementary and Middle School Mathematics*. If you find that you need additional practice taking multiple-choice tests, the websites listed above contain additional chapter tests. If you go to the following websites, you can "jump to" any chapter to explore a variety of additional resources and also take practice tests.

- [Elementary and Middle School Mathematics Companion Site](#)
- [Elementary and Middle School Mathematics Companion Site](#)

Mathematics and Technology

This section focuses on the appropriate use of technology in mathematics classrooms. Recall what you have already learned about graphing calculators, Microsoft Excel, Cabri, and the Geometer's Sketchpad. Also recall what you have learned about TI's calculator-based ranger and calculator-based laboratory. The use of appropriate technology in math classrooms is one of the National Council of Teachers of Mathematics' (NCTM) principles. You will now refresh your memory of how these powerful tools can be appropriately used in mathematics classrooms. You will need to know how and when to use technology in your classroom in order to be an effective math teacher.



Appropriate Technology Usage

At the end of this topic, you should be able to describe how to determine whether (and when) students should use each of the educational technologies shown below, given specific curricular examples at different grade levels 5-12:

- graphing calculator
- Calculator-Based Laboratory or Calculator-Based Ranger
- Fathom or Microsoft Excel
- Geometer's Sketchpad or Cabri geometry

This topic addresses the following competencies:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Prior Math Technology Assessment Tasks

Go back through your study notebook and the tasks you submitted for the math technology assessment. Read what you wrote about the appropriate use of these technologies in mathematics classrooms. Refer to this notebook throughout this course. Try to make connections between the math pedagogy assessments you have engaged in to date and the one for which you are currently preparing.

Educational Technologies

Review the following chapter in *Teaching Secondary Mathematics*:

- chapter 5 ("Using Technology to Enhance Mathematics Instruction")

Review the following chapter in *Elementary and Middle School Mathematics*:

- chapter 7 ("Using Technology to Teach Mathematics")

These chapters should help refresh your memory as to the current trends in teaching mathematics at the 5-12 grade levels.

Online Chapter Test and Review Questions

Take the online [chapter test](#) for chapter 7 ("Using Technology to Teach Mathematics") in *Elementary and Middle School Mathematics*.

1. Click on the "MyEducationLab Practice Tests" link found on the left-hand side of the Teaching Mathematics Grades 5-12 home page.
2. Once there, click on the "Chapter 7" link, and then click the "Chapter 7 Practice Test" link.
3. Click "Yes" when asked if you would like to take this assessment now.



4. Once you are done, be sure to submit your answers in order to receive your score. You will then be prompted to view your results. Do so by clicking the "OK" button.

Once you are done, click on the "Chapter 7 Review Questions" link. Record your answers to these prompts in your study notebook.

Prerequisite Skills

As you read the list of topics below, think back to your days as a student and try to imagine all that you should have known prior to beginning to learn a particular topic. How did you feel if you were asked to learn something new without possessing the prerequisite skills needed to learn it? At the end of these activities, you should be able to determine the prerequisite content knowledge and skills that students need to master in order to solve specific problems from each of the following branches of mathematics at different grade levels 5-12:

- Numbers and Number Systems
- Natural Numbers
- Whole Numbers
- Integers
- Rational Numbers
- Irrational Numbers
- Real Numbers
- Complex Numbers
- Algebra
- Euclidean and non-Euclidean Geometry
- Calculus
- Discrete Mathematics
- Statistics and Probability
- Measurement and Measurement System

This topic addresses the following competencies:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Teaching Math Grades 5-12 Curriculum

In the [Teaching Mathematics Grades 5-12 website](#), click on the "Teaching Math Resource" resource link on the left-hand side of the page. Once you have accessed this link, click on the "Classroom Connections" folder and then on the "Classroom Connections" link. Review all of the material that is provided in the topic of "Prerequisite Skills."

- What kinds of teacher questioning were evident?
- Why did the teacher not provide the formula to start the lesson?



- Why are writing and talking aloud with peers good ways to explore ideas?
- What are characteristics for successful problem solving?

Then focus on the "Prerequisite" links found in cases 1 through 5, which you should now review. Record your reflections in your study notebook.

Understanding Mathematics

Review the following chapter in *Elementary and Middle School Mathematics*:

- chapter 1 ("Teaching Mathematics in the Era of the NCTM Standards")
- chapter 2 ("Exploring What It Means to Know and Do Mathematics")

Record your answers to the following questions in your study notebook:

- How do you respond to a statement that a student has learned the material for a test but is not prepared for related math topics?
- What does it mean to understand mathematics?
- What was a rationale for creating the NCTM reform standards?
- What are key features for "doing" mathematics?

Once you have finished this activity, take the online practice tests for both of these chapters and do the review questions for each chapter as well. Record your answers to these prompts in your study notebook.

Review of Misconceptions That Can Lead to Errors

As you study error identification, pay particular attention to which areas of mathematics and what aspects in those mathematical topics lead students to make errors. Given a hypothetical class and selected mathematics problems, you need to be able to

- identify most common errors,
- identify probable causes,
- verify causes,
- and identify ways to correct common errors.

How would these determinations be influenced if you were dealing with grades 5-9 and, alternatively, grades 7-12?

At the end of these activities, you should be able to

- identify the most common errors made by a hypothetical class of students on a given set of mathematics problems,
- determine the probable causes of their errors,
- specify how to verify the causes, and
- describe how to correct specific errors.



Mathematical Errors, Misunderstandings, and Misconceptions

You should be able to identify errors in student responses that are likely to occur in different areas of mathematics. Mathematical misunderstandings, misconceptions, and errors occur frequently in grades 5-12. You should be able to identify misunderstandings and misconceptions that are likely to occur in different areas of mathematics. For each of the identified errors or misunderstandings, you should be able to recommend error-correcting procedures that meet the diverse needs of students between grades 5 and 12. Some of these areas include

- number and number systems,
- algebra,
- Euclidean and non-Euclidean geometry,
- calculus,
- discrete mathematics,
- statistics and probability, and
- measurement and measurement systems

Identifying student errors and anticipating misunderstandings about mathematical concepts aid instruction as well as assessment. Can you name several mathematical topics that are problematic for students? Record these in your journal. Add to this list as you complete the following activities.

This topic addresses the following competencies:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Classroom Connections

In the previous topic, you reviewed the Teaching Mathematics Grades 5-12 "Classroom Connections" module. Return to this module by accessing the [Teaching Mathematics Grades 5-12 website](#), then clicking on the "Teaching Mathematics Resource" link on the left-hand side of the page. Once you have accessed this link, click on the "Classroom Connections" link. Review all of the material provided in the topics "Student Misconceptions," "Types of Misconceptions," and "Addressing Misconceptions."

Can you identify the most common errors made by a hypothetical class of students on a given set of mathematics problems? How would you determine the probable causes of these most common errors? As you write in your journal, specify how to verify the causes of the most common errors. Also, describe how to correct those specific errors.

Case 2

At the [Teaching Mathematics Grades 5-12 website](#), click on the "Teaching Mathematics Resource" link on the left-hand side of the page. Once you have accessed this link, click on the "Case 2" link. Review all the material provided in the topic "Task: Case 2: Teaching Techniques-Case 2 Error Prediction."



Can you identify errors that are likely to occur in specific areas of mathematics? Write about this in your journal. Also reflect on how identifying these will influence your teaching.

As teachers incorporate problem solving in the classroom, errors inevitably emerge. Students working to solve problems will select methods that work and some that do not work. As a teacher, how will you recognize student errors? How can you work to help students recognize and correct these erroneous problem solutions? Record your ideas in your journal.

Encouraging Persistence and Improving Student Attitudes

If students do not persist with trying to solve a problem, they essentially quit. When that happens, learning does not occur. Obviously, as a teacher, you want to avoid such situations. What are some ways in which you can encourage students to persevere? How might students' attitudes toward and beliefs about math influence their persistence? Does mathematical curiosity play a role? How can you increase students' mathematical curiosity levels?

Attitudes and Curiosity

Upon completion of these activities, you should be able to describe a variety of techniques for motivating students to engage in mathematics, encouraging curiosity towards mathematics, and encouraging further mathematical explorations for grades 5-6, 7-9, and 9-12. Are student attitudes about mathematics linked to student success? If so, how? Can you cite research to support your claim?

This topic addresses the following competencies:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Techniques for Encouraging Curiosity Towards Mathematics for Students in Grades 5-12

In the [Teaching Mathematics Grades 5-12 website](#), click on the "Teaching Mathematics" resource link on the left-hand side of the page. Once you have accessed this link, click on the links for cases 1-4 and watch the videos for these cases.

As you watch the videos, take notes on the various strategies that encourage math curiosity.

- What are the benefits to these approaches?
- How might you implement them in a math classroom?
- What is the effect of open-ended questioning?

Notice the expressions on the student faces as they truly engage in the lesson.



Encouraging Math Curiosity

Review the following chapters in *Elementary and Middle School Mathematics*:

- chapter 3 ("Teaching Through Problem Solving")
- chapter 4 ("Planning in the Problem-Based Classroom")
- chapter 7 ("Using Technology to Teach Mathematics")
- chapter 23 ("Developing Concepts of Exponents, Integers, and Real Numbers")

Takes notes and summarize the strategies for encouraging curiosity.

- Do you feel that different strategies are necessary for the upper grade levels? Why?
- How might you incorporate riddles into a lesson?
- Should you give out an answer to a math question? If so, when?
- Are there times when you would not do so?

Record your answers to these questions in your study notebook.

Once you have finished this activity, take the online practice tests for each of these chapters and engage in the review questions for each chapter as well. Record your answers to these prompts in your study notebook.

Pedagogical Strategies In this topic, you will learn how to encourage flexibility and persistence in approaching multiple solution strategies. A good attitude about students' mathematical ability can affect their performance, and you will learn strategies to help students develop a positive attitude. These strategies cut across mathematical content and build a foundation for a student's success in your math classroom as well as in future mathematics courses. How students feel about their ability to do math often affects their performance. In this topic, you will learn strategies for helping build positive attitudes in math students. Record your answers to the following questions in your study notebook:

- How did you feel about your math ability when you were a secondary student?
- How did this affect your success in mathematics?
- How can you use this experience to help others' attitudes about mathematics?

This topic addresses the following competencies:



- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Attitudes to Improve Student Success

Review the following sections in chapters 3 and 7 in *Elementary and Middle School Mathematics*:

- "The Value of Teaching Through Problem Solving"
- "Attitudinal Goals"
- "Benefits of Calculator Use"

Once you have finished this activity, take the online practice tests for both of these chapters and do the review questions for each chapter as well. Record your answers to these prompts in your study notebook.

Teaching More Effective Lessons

Review the following chapter in *Teaching Secondary Mathematics*:

- chapter 3 ("Teaching More Effective Lessons")

Dispositions and Attitudes Video and Reflection

At the [Teaching Mathematics Grades 5-12 website](#), click on the "Teaching Mathematics" resource link on the left-hand side of the page. Once you have accessed this link, click on the link for "Dispositions and Attitudes." Review all of the material that is provided in this topic. As you watch the videos, take notes on which of the teacher's behaviors might positively impact a student's disposition or attitude towards math. Record your reflections in your study notebook.

Selecting Grade-Level Appropriate Topics

It is important for you to be able to select problems and topics that are not too easy or too difficult for your students. The topics and problems should challenge students in expanding their zone of proximal development but should not cause frustration and defeat. Part of being able to select appropriate problems is knowing what prerequisite skills are necessary prior to attempting to learn the new material.

Grade-Level Appropriate Topics

In this topic, you will review some of the NCTM standards for various grade levels in an attempt to get a better handle on what topics and approaches to teaching those topics are appropriate at various grade levels. As you engage in the materials, think about the following questions:



- What are different ways in which you might approach teaching similar topics to different grade levels?
- How might student skills, knowledge, and dispositions influence how you choose to teach a particular topic?

Record your answers to these questions in your study notebook.

This topic addresses the following competencies:

- **602.5.1 - Teaching Methods-Mathematics (Secondary)**
The graduate provides effective, research-based mathematics instruction.

Middle- and High-School Standards

The following website lists the standards for mathematics:

- [Principles, Standards, and Expectations](#)

Use the links at the bottom of the page to explore the 6-8 and 9-12 expectations in the following strands:

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability
- Problem Solving
- Reasoning and Proof
- Communication
- Connections
- Representation

Reviewing these websites may help you better understand the type of mathematical topics that are appropriate for middle school and high school math students. What strands do you see that are common to both grade bands? How might your approach differ for teaching a similar topic to different grade levels? Record your answers to these questions in your study notebook.

Geometry and Probability

You will now spend a little time focusing on teaching some particular topics so as to be able to provide students with concrete examples of the teaching developmentally approach advocated by Van De Walle. First, you will examine an approach used to teach the formula for the circumference of a circle.

This topic addresses the following competencies:



- **602.5.1 - Teaching Methods-Mathematics (Secondary)**

The graduate provides effective, research-based mathematics instruction.

Teaching Geometry

At the [Teaching Mathematics Grades 5-12 website](#), click on the "Teaching Mathematics" resource link on the left-hand side of the page. Once you access this link, click on the link for "Case 2." Review all of the material that is provided in this topic. As you watch the videos, reflect upon the following questions:

- How does the class discussion around body-part ratios engage the students' interest?
- Why did the teacher not give the circumference formula to start?
- What question did the teacher ask to elicit student predictions about the ratio between the diameter and the circumference of a circle?
- How did the teacher get the students to respond to each other's guesses?

Record your answers to these questions in your study notebook.

Teaching Circumference

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

- chapter 19 ("Developing Measurement Concepts")

The circumference of any circle is about 3.14 times as long as its diameter. Why is the exact ratio, described by the Greek letter pi, considered irrational? Why is this concept difficult for some students to grasp? Record your answers to these questions in your study notebook.

Once you have finished this activity, take the online practice tests for this chapter and do the review questions for the chapter as well. Record your answers to these prompts in your study notebook.

Teaching Probability

View "Teaching Math Resource" on the [Teaching Mathematics Grades 5-12 website](#), and review case 4. Review all of the material that is provided in this topic. Record your answers to the following questions in your study notebook:

- What is meant by a favorable outcome?
- What is a tree diagram?
- What is an area model?
- What does the shaded area represent in the area model?
- How would you use these models to calculate the probability of flipping two coins and getting heads on both tosses?
- How do these models help students to understand compound probability?
- What is the benefit of empirical data
- How do you connect the concepts of theoretical and empirical probability values?



Probability

Review the following chapter in *Elementary and Middle School Mathematics*:

- chapter 22 ("Exploring Concepts of Probability")

Suppose you are playing with a fair coin toss. Can you expect the odds of coming up heads to change if you get three heads in a row? What does this mean, that the probability can be calculated? How do you distinguish between theoretical and empirical probability? Record your answers to these questions in your study notebook.

Once you have finished this activity, take the online practice tests for this chapter and do the review questions for the chapter as well. Record your answers to these prompts in your study notebook.

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.

Accessibility Policy

Western Governors University recognizes and fulfills its obligations under the Americans with Disabilities Act of 1990 (ADA), the Rehabilitation Act of 1973 and similar state laws. Western Governors University is committed to provide reasonable accommodation(s) to qualified disabled learners in University programs and activities as is required by applicable law(s). The Office of Student Accessibility Services serves as the principal point of contact for students seeking accommodations and can be contacted at ADASupport@wgu.edu.

Course Feedback

WGU values your input! Please submit any feedback you have using the following form:

[Course Feedback](#)