This course supports the assessments for EFA4. The course covers 3 competencies and represents 3 competency units.

Introduction

Overview
Throughout this course, you will strengthen your understanding in key math and science competencies. Those competencies emphasize an approach that represents the kind of balanced instruction that is so necessary in schools today—that of both content and computation, or process and product. You have already gained a good foundation of basic math and science concepts, and in this course, you will apply your existing knowledge to best teaching practices.

Watch the following introduction video for this course:

Outcomes and Evaluation

There are 3 competencies covered by this course of study; they are listed in the "Specific Teaching Practices: Math and Science (EFA5)" page.

You will complete the following assessments as you work through the course study.

Pre-Assessment

You will complete the following pre-assessment:

- PAP4

Objective Assessment

You will complete the following objective assessment:

- ELC4/5

For specific information about this assessment, click the link under the "Assessment Type" column of your Degree Plan.

Performance Assessment

You will complete the following performance assessment in Taskstream:

- EFA5
Previews of task instructions and rubrics for this assessment are available in via the "Assessment Preparation" box in the online course of study.

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

**Course Instructor Assistance**
As you prepare to successfully 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 help you prepare for another attempt. You should expect to work with course instructors for the duration of your coursework, and you are encouraged 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.

**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.

**Automatically Enrolled 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 textbooks are available to you as e-texts within this course. You will be directly linked to the specific readings required within the activities that follow.


*Note: These e-texts are available to you as part of your program tuition and fees, but you may purchase a hard copy at your own expense through VitalSource or a retailer of your choice.*
you choose to do so, please use the ISBN listed to ensure that you receive the correct edition. The following sites provide instruction on how to create a VitalSource account, use features such as downloading your e-texts for offline use, and purchase a print-on-demand option, if available.

- VitalSource Navigational Video
- Print-On-Demand Option

**Pearson MyLabSchool**

You will access video modules and/or simulations from this resource embedded at the activity level within this course of study.

**Enroll in Learning Resources**

You will need to enroll in or subscribe to additional learning resources as a part of this course of study.

You may already have enrolled in these resources for other courses. Please check the "Learning Resources" tab and verify that you have access to the following learning resources. If you do not currently have access, please enroll or renew your enrollment at this time.

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.

**Math: Teaching for Understanding**

Acquire the following resources:

- *Math: Teaching for Understanding* DVDs

**Other Learning Resources**

**Lesson Planning Best Practices**

For this course of study, you will submit lesson plans to Taskstream. The Lesson Planning Best Practices resource is available to assist you in the developing this important skill.

Please use this resource for this course of study and throughout the remainder of the program.

**Additional Preparation**

There are many different learning tools available to you within your course of study in addition to the learning resources discussed above. Some or all of them may be very useful to you as your progress through this course of study. Take the time to familiarize yourself with them and determine how best to fit them into your learning process.

The following activities and information will help you as you work through this course of study.
Message Boards, Learning Community, Study Notes, and FAQs

Message boards, learning community, study notes, and FAQs are available in every course of study.

Use the "Additional Learning Tools" document to review these tools.

Specific Teaching Practices: Elementary Education Learning community.

Plan on being an active participant in the learning community. Check out the numerous discussion board threads, announcements, and weekly chats and teleconferences. You can access the Specific Teaching Practices: Elementary Education Learning community as well as other communities you are enrolled in by logging in to your MyWGU Student Portal.

Basic Processes for Math

This section focuses on an introduction to math problem solving, counting, and place value. Elementary teachers need to understand the processes of doing math. To solve problems, teachers and students alike need to understand counting and have a basic number sense.

Problem Solving, Counting, and Place Value

You will begin your exploration of elementary math teaching methods by understanding problem solving. You will consider problem solving strategies as well as the prerequisite math and thinking skills children need before they can solve different types of mathematical problems.

This topic addresses the following competency:

- Competency 602.4.15: Teaching Methods-Mathematics
  The graduate provides effective, research-based mathematics curriculum instruction.

Problem Solving

Read the following chapter in the Helping Children Learn Mathematics text:

- chapter 6 ("Helping Children with Problem Solving")

As you read this chapter, pay special attention to the different kinds of problem solving techniques. Think of situations where you could use each of the techniques to solve perplexing mathematical problems and the skills children need in order to use the given problem solving strategies.

Access the "Problem Solving Bookmark."

In a journal or notebook, develop a list of prerequisite skills students need to have in order to be
successful in solving problems.

**Counting Skills**

Read the following chapter in the *Helping Children Learn Mathematics* text:

- **chapter 7** ("Counting and Number Sense in Early Childhood and Primary Grades")

As you read the chapter, take notes (in a journal or notebook) to identify ways in which you can engage children in counting. Consider principles and strategies for counting.

**Place Value**

Read the following chapter in the *Helping Children Learn Mathematics* text:

- **chapter 8** ("Extending Number Sense: Place Value")

As you read, think about how you will teach students the concept of place value.

Specifically, explain to a friend or WGU peer how you would teach students to read and write multi-digit numbers that contain various place values such as ones, tens, hundreds, thousands, tenths, hundredths, thousandths, etc.

**Complete: 602.4.15-04, 38, 39 and 602.4.15-37 Performance Tasks**

Complete the following tasks in Taskstream:

- EFA4 ETP: Math & Science: 602.4.15-04, 38, 39
- EFA4 ETP: Math & Science: 602.4.15-37

For details about this performance assessment, see the "Assessment" tab in this course.

**Problem Solving With Related Concepts**

This section focuses on problem solving involving fractions, decimals, computation, reasoning, and other calculations.

Fractions and decimals, as related concepts, provide opportunities to think about how information is represented, related, and reasoned.

**Problem Solving, Fractions, and Decimals**

As an elementary teacher, you should help students detect and understand the relationships that exist between related mathematical concepts.

This topic addresses the following competency:

- Competency 602.4.15: Teaching Methods-Mathematics
  The graduate provides effective, research-based mathematics curriculum instruction.

**Fractions, Part 1**
Read the following chapter in the *Helping Children Learn Mathematics* text:

- **chapter 12 (“Fractions and Decimals: Meanings and Operations”)**

**Fractions, Part 2**

View the following video:

[https://lrps.wgu.edu/provision/34375689](https://lrps.wgu.edu/provision/34375689)

This video is meant to help you gain a richer understanding of how best to teach equivalent fractions using manipulatives. Consider how you would teach your own students to learn more about number operations by introducing the concept of equivalent fractions.

In your study notebook, attempt to respond to the four follow-up questions after the video clip to test your understanding of this important math concept.

**Decimals**

Review the following chapter in the *Helping Children Learn Mathematics* text:

- **chapter 12 (“Fractions and Decimals: Meanings and Operations”)**

Once you have finished your review, examine a fourth- and a sixth-grade math textbook, and reflect on the following questions:

- What are some examples of times when rounding and truncating are appropriate?
- Can you list at least two different ways in which you might teach decimals to a third grader? What about a fifth grader?
- How might what you have learned previously about problem solving fit into the context of decimals?

**Complete: 602.4.15-11 and 602.4.15-31 Performance Task**

Complete the following tasks in Taskstream:

- EFA4 ETP: Math & Science: 602.4.15-11
- EFA4 ETP: Math & Science: 602.4.15-31

For details about this performance assessment, see the "Assessment" tab in this course.

**Operations: Facts and Meanings**

This section will help you to more clearly understand pedagogical principles pertaining to order of operations, error correction, and multiplication.

**Order of Operations and Multiplication**

Throughout this section you should consider the following guiding questions: What does *order*
of operations mean? How does the order of operations influence accuracy? What kind of errors do students make when completing problems that depend on operations?

This topic addresses the following competency:

- Competency 602.4.15: Teaching Methods-Mathematics
  The graduate provides effective, research-based mathematics curriculum instruction.

**Order of Operations**

Read the following chapters in the *Helping Children Learn Mathematics* text:

- chapter 9 ("Operations: Meanings and Basic Facts")
- chapter 11 ("Standard and Alternative Computational Algorithms")

In a journal or notebook, write a division word problem that would correspond to 24 ÷ 6. As you write out the steps to solving this problem, be sure to outline the steps in the proper order.

As an added challenge, develop a set of four math problems that would help elementary students work through the four basic math operations.

**Elementary Math Properties**

Review your *Helping Children Learn Mathematics* textbook for the commutative, associative, and distributive properties.

Then access and read the following web page:

- "Basic Number Properties: Associative, Commutative, and Distributive".

*Note: This web page, coupled with the text readings, should prepare you for the creation of the graphic organizer below.*

Create a graphic organizer that will help you to understand and remember associative, commutative, and distributive properties. Consider the following questions:

- How might you teach these properties to a fourth or fifth grade student?
- What examples might you use?
- How might you help the student to understand the differences between these properties?

**Error Correction and Multiplication**

Review the following chapters in the *Helping Children Learn Mathematics* text:

- chapter 4 ("Assessment: Enhanced Learning and Teaching")
- chapter 9 ("Operations: Meanings and Basic Facts")
- chapter 10 ("Computation Methods: Calculators, Mental Computation, and Estimation")
- chapter 11 ("Standard and Alternative Computational Algorithms")
As you read, develop in a journal or notebook a matrix of misconceptions that elementary students might develop. For example, what misconception might a student have who solves an equation incorrectly (e.g., $5 \times -7 = 35$)?

After reviewing chapter 11 in the Helping Children Learn Mathematics text, complete the following exercises in your study notebook:

- Write five things you have learned about teaching multiplication.
- Try to work with at least one elementary-aged family member or friend; give a multiplication word problem involving two-digit numbers.
- Evaluate how the problem is solved and conduct an analysis for apparent misconceptions.

**Complete: 602.4.15-20 Performance Task**

Complete the following task in Taskstream:

- EFA4 ETP: Math & Science: 602.4.15-20

For details about this performance assessment, see the "Assessment" tab in this course.

**Errors: What Are They, and How Are They Detected?**

It is the responsibility of teachers to help students improve their math skills. You must be very alert to the kinds of errors students are making because their errors may be indicative of misconceptions about important math concepts.

**Error Detection and Analysis**

One of the most important skills you need to possess as a math teacher is error identification and correction. It means that you can think like the child—that you understand math well enough to anticipate the kinds of misconceptions children will have and the kinds of errors they might make, and that you can develop instructional strategies to minimize and correct those errors.

This topic addresses the following competency:

- Competency 602.4.16: Teaching Methods-Mathematics Misconceptions
  The graduate identifies and analyzes student responses to mathematical problems to detect misunderstandings and misconceptions.

**Analyzing Student Errors**

Review the following chapters in your *Helping Children Learn Mathematics* text:

- chapter 3 ("Planning for and Teaching Diverse Learners")
- chapter 9 ("Operations: Meanings and Basic Facts")
- chapter 11 ("Standard and Alternative Computational Algorithms")
- chapter 12 ("Fractions and Decimals: Concepts and Operations")
- chapter 14 ("Algebraic Thinking")
- chapter 15 ("Geometry")
In a journal or notebook, complete the following exercises:

- Make a list of the kinds of common errors for different types of mathematical computations.
- Think of an example of a mistake students might make in math due to a misunderstanding or misconception.
- Jot down why the misconception occurs and how you would help students correct this misconception.

**Complete: 602.4.16-05 Performance Task**

Complete the following task in Taskstream:

- EFA4 ETP: Math & Science: 602.4.16-05

For details about this performance assessment, see the "Assessment" tab in this course.

**Elementary Science Instruction**

The world of elementary science is an exciting one that holds great value for children. Through science, children learn attitudes that are important for understanding life and the world. They learn essential life skills and build curiosity about the environment.

**Teaching Strategies, Curriculum, and Safety Issues**

There are numerous effective inquiry-based, problem-solving, and experiential learning strategies that teachers can structure to promote scientific thinking.

Science instruction and curriculum pose great learning potential but also carry some risks because children are exposed to materials and equipment that, if not handled properly, can cause injury. Teachers need to understand safety procedures and follow them when providing instruction.

This topic addresses the following competency:

- Competency 602.4.17: Teaching Methods-Science (Elementary)
  The graduate provides safe, effective, research-based science instruction.

**Science Teaching Techniques**

Read the following chapters in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- chapter 1 ("An Invitation to Teaching Science")
- chapter 3 ("The Teacher as Mediator and Facilitator of Student Learning")
- chapter 2 ("Locating Your Scientific Self")
- chapter 5 ("Making Connections: Scientific Exploration in the Students' Own Environment")

Consider the following questions:
What might your science classroom look like if you followed the concept learning model, the discovery model, the social constructivist model, or the experimental model? What might be characteristics they all have in common? How might they be different? Which model seems to best fit your own teaching style?

**Science Teaching Techniques: Curriculum**

Read the following in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- chapter 12 ("Science Content and Curriculum: The Big Ideas and Your Scientific Self")

Reflect on the following questions:

- If you could design your own elementary science curriculum for a grade of your choice, what topics would you include?
- What kind of learning experiences would you weave in?
- How would your science curriculum be integrated with other subject areas?

**Science Safety**

Read the following chapter in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- chapter 13 ("What’s the Big Idea? Matching Assessment to Instruction")
- chapter 14 ("Pulling It All Together: Reflection and Self-Assessment")

Access and read the following documents:

- "Safety in the Elementary (K-6) Science Classroom"

As you read these documents, think about the kinds of safety hazards that exist in an elementary science classroom.

Then, in a journal or notebook, develop a list of ten important safety tips for your own science classroom.

**Legal Issues**

Access and review the following:

- "Legal Aspects of Laboratory Safety".

As a teacher, you have an obligation to prevent children from being injured in the classroom. Consider the kinds of ramifications that may result by not planning ahead to prevent injuries from occurring.
Science as "Science"

The activities associated with this section will introduce you to data collection, error analysis, and the integration of science, which are three of the most important elements of effective science instruction.

**Data Collection, Error Analysis, and Integration of Science**

Problem finding and problem solving are integral in the field of science. Critical thinkers make decisions based on information they collect, analyze, and use. They know how to integrate decision making in a variety of contexts.

This topic addresses the following competency:

- Competency 602.4.17: Teaching Methods-Science (Elementary)
  - The graduate provides safe, effective, research-based science instruction.

**Thinking Like a Scientist**

Read or review the following chapters in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- **chapter 5** ("Making Connections: Scientific Explorations in the Students' Own Environment")
- **chapter 6** ("Matter Matters: Getting Messy with Ordinary Objects")
- **chapter 7** ("Sustained Inquiry: Explorations of Living Things")
- **chapter 8** ("Spiraling Curriculum: Explorations of Density")
- **chapter 9** ("Virtual and Concrete Models: Explorations in the Solar System")

Consider the following question:

- Why is science instruction an important part of the curriculum, despite the increasing emphasis on reading and math instruction as per the No Child Left Behind mandate?

Then, consider the following scenario:

- A child observes that the outside of a cold soda bottle is moist and concludes that the bottle is leaking through the glass. What can you as a teacher do to correct this scientific misconception?

**Data Collection**

Review the following chapter in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- **chapter 4** ("Science as a Process: Using the Skills of Scientific Study")

Create a brochure (on a computer or by hand) that you might distribute to peers who are also seeking their elementary certification; do so to test your understanding of data collection. In the
brochure, answer the following questions:

- What is data collection, and how can it be taught in an elementary classroom?
- How can oral questioning techniques be used effectively when talking about science concepts?
- What is constructivist inquiry, and what theorist is most closely associated with this theory?

**Integrating Science With Other Subjects**

Read the following chapter in the *Science Stories: Science Methods for Elementary and Middle School Teachers* text:

- chapter 11 ("Planning for Science: Lesson Plans and Instructional Strategies")

In a journal or notebook, develop a concept map to show how you might integrate science into other subject areas such as language arts, math, or social studies.

Use the following list of integration examples to stimulate your thinking:

- Identify a science learning objective that depends on mathematical understanding. What prerequisite math skills would be necessary in order for students to successfully accomplish the science lesson? Create a table or chart that visually aligns the science objective with the necessary math skills.
- Use a science activity to develop oral language skills.
- Use a science activity to develop writing skills.
- Outline a lesson that integrates science and social studies.
- Outline a lesson that integrates science and art or music.
- Write a jingle (song) about the human skeleton or the water cycle.

**Complete: 602.4.17-02 Performance Task**

Complete the following task in Taskstream:

- EFA4 ETP: Math & Science: 602.4.17-02

For details about this performance assessment, see the "Assessment" tab in this course.

**Understanding and Misunderstanding Science**

This section will focus on the naïve conceptions students have related to science that are based on their everyday experiences and their stages of cognitive development. Science teachers need to know about the kind of misconceptions children may hold and design learning activities that help students overcome their false beliefs.

**Science Misconceptions and Corrections**

You will learn about misconceptions and how to confront them.
This topic addresses the following competency:

- Competency 602.4.17: Teaching Methods-Science (Elementary)
  The graduate provides safe, effective, research-based science instruction.

Science Misconceptions

Explore the following website to learn about common misconceptions in science:

- [Common Science Misconceptions](#)

As you read, think about specific misconceptions elementary students may have about science; in your study notebook, consider the impact of life experiences or language barriers that may contribute to mistaken beliefs.

- What can you as a teacher do to help correct or prevent scientific misconceptions?
- What instructional techniques can you use to promote greater understanding?

**Complete: 602.4.17-10 Performance Task**

Complete the following task in Taskstream:

- EFA4 ETP: Math & Science: 602.4.17-10

For details about this performance assessment, see the "Assessment" tab in this course.

**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.