Your competence will be assessed as you complete the DMT1 performance assessment for this course of study. This course of may take up to 6 weeks to complete.

Introduction

For course mentor information, see the Math Program Course Mentoring document.

Overview
The history of mathematics is long, varied, rich, and detailed. As you engage in the course readings and interact with fellow students studying this material, be thinking about how to incorporate the information you learn into lesson plans so as to contextualize the topics you present to your own students. Think about what sorts of activities you might develop and how to engage your students with the materials in a meaningful way. By inserting some relevant mathematics history into your lesson plans, you will be able to breathe life into, lend context to, and motivate your lessons.

The performance assessment focuses on the construction of original lesson plans using appropriate research-based, age-specific pedagogies. Students will need to infuse selected mathematics history and contributions topics, which include the fields of discrete mathematics, measurement and measurement systems, number and number systems, algebra, calculus, statistics and probability, and Euclidean and non-Euclidean geometry. There is also a pre-clinical experience (PCE), which requires placement into a PCE classroom by the WGU Demonstration Teaching Department. Be sure to discuss this with your mentor if you have any questions about the PCE placement process. Completing the tasks within your term takes considerable planning, and we recommend previewing the tasks to help with your planning.

Outcomes and Evaluation
There is 1 competency covered by this course of study; it is listed in the "Competencies for Specific Teaching Practices: Mathematics History and Contributions (DMT1)" page.

Teaching Dispositions Statement
Please review the Statement of Teaching Dispositions.

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

Performance Assessment
You will complete the following performance assessment in TaskStream:

- DMT1

Previews of task instructions and evaluation rubrics for this assessment are available via the “Assessment Preparation” box in the online course of study.

Preparing for Success

The information in this section is provided to help you become ready to complete this course of

study. As you proceed, you will need to be organized in your studies in order to gain competency in the indicated areas and prepare yourself to pass the final assessments.

Your Learning Resources

Enroll in or order the learning resources for this course as early as possible so as to give them time to arrive and give you enough time to become familiar with them.

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

- Katz, V.J. (2009). *A history of mathematics, an introduction* (3rd ed.). Upper Saddle River, NJ: Pearson. ISBN: 0321387007

Note: These e-texts are available to you as part of your program tuition and fees, but you may purchase hard copies 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.

Additional Preparation

There are many different learning tools available to you within your course of study in addition to the learning resources already discussed. Take the time to familiarize yourself with them and determine how best to fit them into your learning process.

Message Boards, FAQs, Note-Taking Tool

Message boards, FAQs, and a note-taking tool are available in every course of study.

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

The WGU Central Library

The WGU Central Library is available online to WGU students 24 hours a day. The library offers access to a number of resources, including over 60,000 full-text e-books; articles from journals, magazines, and newspapers; course e-reserves; and tutorials on how to use these resources and the library. The library also includes a reference service for help with research questions or navigating the library.

For more information about using the WGU Library, view the "WGU Library: Finding Articles, Books & E-Reserves" video in the Student Resources section of The WGU Channel.

Course Mentor Assistance

Course mentors are available to help you. Their job is to aid understanding in areas where you need to improve and to guide you to learning resources. Request their help as needed when preparing for assessments.

Course mentors cannot provide reviews of entire assessments. If you fail assessment attempts, review the provided feedback first, then ask the course mentor specific questions about what you can do to meet the competency standard. Request course mentor assistance as necessary in preparing for second attempts at objective assessments or performance task revisions. Mentors cannot guarantee you pass as they do not evaluate assessments; however, they can provide the assistance and advice necessary to help you succeed.

Ancient Mathematics

Ancient mathematical discoveries are often associated with Greece, and rightly so. However, ancient Egypt and Mesopotamia also discovered important mathematical properties that have given rise to the modern concepts of mathematics.
Competencies covered by this subject
602.5.1 - Teaching Methods-Mathematics (Secondary)
The graduate provides effective, research-based mathematics instruction.

Egypt, Mesopotamia, and Greece

Ancient Egyptian and Mesopotamian mathematics focused on methods for calculating quantities and the number systems necessary to record them. Ancient Greece, however, wanted do to more than just calculate quantities--they wanted to prove those calculations to be correct.

Egypt and Mesopotamia

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 1 ("Egypt and Mesopotamia")

The Beginning of Mathematics in Greece

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 2 ("The Beginnings of Mathematics in Ancient Greece")

Euclid, Archimedes, and Apollonius

Three famous mathematicians, Euclid, Archimedes, and Apollonius, made important mathematical advancements in ancient times. Euclid formalized much of what was known about geometry and other fields of mathematics in his seminal work, Elements. Archimedes approximated pi (?), and Apollonius advanced what was known about conic sections.

Euclid

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 3 ("Euclid")

As you work through the remainder of this course of study, consider the following question:

- How did Euclid's *Elements* affect the path of mathematics history for the next several hundred years?

Archimedes and Apollonius

Read the following pages in chapter 4 ("Archimedes and Apollonius") in *A History of Mathematics, An Introduction*:

- pages 94–113 (through section 4.4)

The mathematical discoveries of Archimedes and Apollonius are tied to the physical world. How can you help your future students discover mathematical properties using the same principle?

Hellenic and Greek Mathematics

Mathematical methods lead to and are important discoveries. This section also discusses Greek mathematics at the end of its heyday, highlighting important advances in arithmetic and algebra.

Mathematical Methods in Hellenistic Times

Read the following pages in chapter 5 ("Mathematical Methods in Hellenistic Times") in *A History of Mathematics, An Introduction*:

- pages 133-140 (through section 5.1.1)
- pages 157-168

How are modern mathematical tools shaping the way mathematics is taught in schools today?

The Final Chapters of Greek Mathematics

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 6 ("The Final Chapters of Greek Mathematics")

This chapter illustrates the codependence of arithmetic and algebra. What implications does this codependence have on how arithmetic should be taught in elementary school? On algebra in the middle grades?

Medieval Mathematics

As human history approaches medieval times, more is known about non-Hellenic nations' contributions to mathematical advancements. This section will detail contributions from China, India, Islam, Europe, the Americas, Africa, and the Pacific.

Competencies covered by this subject

602.5.1 - Teaching Methods-Mathematics (Secondary)

The graduate provides effective, research-based mathematics instruction.

Ancient and Medieval China and India

Mathematics from Ancient and Medieval China and India may have made its way to Europe and affected mathematical thinking there. This section details advances from China and India in calculation methods, geometry, and algebra.

Ancient and Medieval China

Read the following pages in chapter 7 ("Ancient and Medieval China") in *A History of Mathematics, An Introduction*:

- pages 195-220

How did the Chinese government's need for mathematically competent civil servants drive mathematical discovery there?

Ancient and Medieval India

Read the following pages in chapter 8 ("Ancient and Medieval India") in *A History of Mathematics, An Introduction*:

- pages 230-244 (through section 8.4)

Why are most Indian mathematics found in works of astronomy?

Medieval Mathematics of Islam and Europe

Islam and Europe: these two rich, highly literate cultures are the birthplace of many mathematical ideas. Both the Islamic world and Medieval Europe actively curated mathematical works and encouraged discovery.

The Mathematics of Islam

Read the following pages in chapter 9 ("The Mathematics of Islam") in *A History of Mathematics, An Introduction*:

- pages 265–305 (through section 9.5)

How did religious beliefs both further, and later hinder, the work of collecting, translating, assimilating, and discovering mathematics in the Islamic world? Also, what Islamic advances in algebra are still being used today?

Mathematics in Medieval Europe

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 10 ("Mathematics in Medieval Europe")

How did religious beliefs both further and hinder the work of collecting, translating, assimilating, and discovering mathematics in the Christian world?

Mathematics Around the World

Not as much is known about mathematical knowledge outside of the cultures detailed previously, but certain mathematical principles were well known nearly everywhere. Were these principles discovered independently, or were they somehow communicated?

Mathematics Around the World

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 11 ("Mathematics Around the World")

What types of mathematical properties were well known throughout the world? What types of

discoveries were found only in the more literate civilizations? Why?

Early Modern Mathematics

The Renaissance saw an explosion of mathematical discovery. Algebra matured into something very close to what is used today. Measurement in art, navigation, map making, and astronomy drove new methodology. Probability and calculus came onto the scene.
Competencies covered by this subject
602.5.1 - Teaching Methods-Mathematics (Secondary)
The graduate provides effective, research-based mathematics instruction.

Algebra and Mathematical Methods of the Renaissance

Algebraic problem solving is pushed forward, and symbolism is formalized in this section. Also, the exploration and art explosions of the renaissance drive mathematical discovery.
Algebra in the Renaissance

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 12 ("Algebra in the Renaissance")

Why is Viète considered one of the most important algebraists in history?
Mathematical Methods in the Renaissance

Read the following chapter in *A History of Mathematics, An Introduction*:

- chapter 13 ("Mathematical Methods in the Renaissance")

How did art, navigation, and map making push mathematical discovery in the Renaissance?

Algebra, Geometry, and Probability in the Seventeenth Century

A formalization of the most likely outcomes involving chance begot the birth of probability theory. The seventeenth century was also the birthplace of analytic geometry.
Algebra, Geometry, and Probability in the Seventeenth Century

Read the following pages in chapter 14 ("Algebra, Geometry, and Probability in the Seventeenth Century") in *A History of Mathematics, An Introduction*:

- pages 467-499

The notion of a mathematical community collectively determining the value of mathematical works was born in the seventeenth century. This led to an explosion of mathematical discovery. Why would this not have been possible before the seventeenth century?

The Beginnings of Calculus

Calculus was simultaneously discovered by both Newton and Liebniz, and notation from both mathematicians survives in calculus classes today. This section details Liebnizs' approach to calculus. The interested reader should further delve into Newton's approach, as well.
Newton and Leibniz

Read the following pages in chapter 16 ("Newton and Leibniz") in *A History of Mathematics, An Introduction*:

- pages 565-573 (through section 16.2.3)

How did the notion of inverse functions give rise to Liebniz's calculus?

Modern Mathematics

Mathematics is a dynamic discipline that continues to grow in both theoretical richness and practical application.
Competencies covered by this subject
602.5.1 - Teaching Methods-Mathematics (Secondary)
The graduate provides effective, research-based mathematics instruction.

Highlights from Modern Mathematics

The following brief excerpts from the last few chapters in the text give some modern notes to the topics of Algebra, Geometry, Number Theory, and Probability and Statistics.

Algebra and Number Theory in the Eighteenth Century

Read the following pages in chapter 19 ("Algebra and Number Theory in the Eighteenth Century") in *A History of Mathematics, An Introduction*:

- pages 665-674 (through section 19.2.2)
- pages 680-682 (section 19.4)

What important algebraic discoveries were written in Euler's Introduction to Algebra?

Geometry in the Eighteenth Century

Read the following pages in chapter 20 ("Geometry in the Eighteenth Century") *A History of Mathematics, An Introduction*:

- pages 686-694 (through section 20.2)

Why is the parallel postulate so important in modern geometry?

Algebra and Number Theory in the Nineteenth Century

Read the following pages in chapter 21 ("Algebra and Number Theory in the Nineteenth Century") in *A History of Mathematics, An Introduction*:

- pages 730-733 (sections 21.3.1 and 21.3.2)

What was Peacock's great contribution to algebra?

Probability and Statistics in the Nineteenth Century

Read the following pages in chapter 23 ("Probability and Statistics in the Nineteenth Century") in *A History of Mathematics, An Introduction*:

- pages 828-830 (section 23.3)

How have statistical graphs changed since the nineteenth century? What modern statistical tools can we use to find and communicate results today?

Geometry in the Nineteenth Century

Read the following pages in chapter 24 ("Geometry in the Nineteenth Century") in *A History of Mathematics, An Introduction*:

- pages 858–862 (section 24.4)

How might air traffic controllers use modern graph theory today?

Mathematics History in Lesson Planning

Mathematics history is not studied solely for the purpose of curetting important works and ideas: it is also studied as a tool to help make instructional decisions.

Competencies covered by this subject

602.5.1 - Teaching Methods-Mathematics (Secondary)

The graduate provides effective, research-based mathematics curriculum instruction.

Incorporating History in the Mathematics Classroom

Mathematical ideas that were traditionally difficult for mathematicians in the past to accept and understand may also be ideas that individual students may struggle to learn. For example, imaginary numbers were often dismissed by mathematicians as impossible because they could not be directly connected to the physical world. An instructor may choose to teach imaginary numbers differently if the history behind the discovery of these important mathematical objects is understood. In this way, knowledge of mathematics history can directly inform instructional decisions.

Sample Lesson Ideas to Incorporate History

Read the following pages in Appendix A.2 ("Sample Lesson Ideas to Incorporate History") in *A History of Mathematics, An Introduction*:

- pages 935-939

Mathematics History Resources for Lesson Planning

Review the following website:

- Math DL: The MAA Mathematical Sciences Digital Library

The Mathematical Association of America (MAA) has a special-interest group that studies how to teach mathematics using history. This website includes examples of lesson plans using mathematics history to motivate mathematical topics. This site can give you ideas for your tasks as well as ideas for your future classroom.

Mathematics History Performance Task 1

You now have the competency necessary to complete the first DMT1 task.

Many diverse cultures have contributed to the development of discrete mathematics. The following mathematics topics arise in discrete mathematics:

- logic
- set theory
- combinatorics
- graph theory
- algorithmics

In short, discrete math is all around you every day, even though you may not be aware of it. Discrete mathematics deals with mathematical systems or structures that are fundamentally discrete. In other words, the systems and structures are not continuous but, rather, are finite in nature. The primary focus with discrete mathematics is studying those elements of mathematics that are countable.

602.5.1-07 Part 1 Performance Task

Complete the following task in TaskStream:

- DMT1: 602.5.1-07 part 1

For directions on how to receive access to performance assessments, see the "Accessing Performance Assessments" page.

Mathematics History Performance Task 2

You now have the competency necessary to complete the second DMT1 task.

There is a rich history behind many of the questions taken for granted today:

- How long is this object?
- How much does it weigh?
- How long does this process take?
- How much energy does it take to run a particular process?
- What are standards for measurement?

Measurement and measurement systems is a branch of mathematics dealing with the methods used to quantify how much of something you have. This branch of mathematics includes the development of a variety of ways to quantify length, area, volume, mass, weight, time, energy, work, torque, etc. Measurement has direct relevance in helping to answer the most fundamental of daily questions.

602.5.1-07 Part 2 Performance Task

Complete the following task in TaskStream:

- DMT1: 602.5.1-07 part 2

For directions on how to receive access to performance assessments, see the "Accessing

Performance Assessments" page.

Mathematics History Performance Task 3

You now have the competency necessary to complete the third DMT1 task. This task gives you the choice of writing a lesson plan incorporating the history of number systems, algebra, geometry, calculus, **OR** statistics and probability.

Number and Number Systems

Number and number systems is a branch of mathematics dealing with the study of how you use numbers to achieve certain goals. Reflect on the following questions:

- What is a number?
- What is a number system?
- How many number systems can you describe?
- How many relationships can you identify among various number systems?
- How is a number system constructed?

The set of real numbers is a number system composed of a collection of subsets that include the set of all natural numbers, whole numbers, integers, rational numbers, and irrational numbers. Where did irrational numbers come from? What is the relationship between the complex number system and the real number system? Were this number system structure and the existing relationships always understood? Can you identify other number systems? Is it possible to identify all possible prime numbers? These are just a few of the questions that have relevance in this branch of mathematics.

Algebra

Algebra is a branch of mathematics dealing with a variety of constructs that allow you to manipulate numbers and symbols in prescribed ways. Without such constructs, you would not have mathematics as you know it today.

Geometry

Euclidean geometry deals with a mathematical system attributed to the Greek mathematician Euclid of Alexandria. Euclid's text, Elements, is considered by many as the first systematic discussion of geometry. This system is based on a small set of axioms (postulates) used to prove a collection of propositions (theorems). The essential difference between Euclidean and non-Euclidean geometry resides in the application of Euclid's fifth postulate.

Calculus

Calculus is a branch of mathematics often used to study the change in processes or systems. This branch can be further broken down into areas dealing with differential calculus and integral calculus. Applications of calculus can be found in the fields of physics, engineering, medicine, biology, etc. Some of the following are questions that arise in this branch of mathematics:

- What is the slope of the tangent line to a given point on a curve?
- How do you mathematically define continuity at a point on a curve?
- Where did the fundamental theorem of calculus come from? Why is it important?

- How do you find the true area under a curve?
- What is the relevance of the mean value theorem for differentiation and integration in the field of mathematics?

Note: Chapter 15 ("The Beginnings of Calculus") *in A History of Mathematics, An Introduction, while not assigned reading, would provide excellent information if choosing to write a lesson plan about the history of calculus.*

Statistics and Probability
Statistics is a branch of mathematics dealing with the collection, analysis, interpretation, explanation, and presentation of data. This branch can be further broken down into areas dealing with descriptive statistics, inferential statistics, and mathematical statistics.

Probability is the branch of mathematics attempting to make predictions with regard to the chance or likelihood that a particular outcome or set of outcomes will occur or not occur. This branch can be further broken down into areas dealing with theoretical probability and experimental probability.

The questions that arise in both branches of mathematics involve a central theme. How can you use mathematics to analyze and describe a system under study with the intent of making predictions regarding future events? What is the truth as it pertains to the system you are studying?

602.5.1-07 Part 3 Performance Task

Complete the following task in TaskStream:

- DMT1: 602.5.1-07 part 3

For directions on how to receive access to performance assessments, see the "Accessing Performance Assessments" page.

Mathematics History Performance Task 4

You now have the competency necessary to complete the fourth DMT1 task.

The lesson plan you create for this task will be presented in a pre-clinical experience; therefore, it is very important that you work with the teacher(s) who will be supervising this experience during your lesson plan construction.

602.5.1-07 Part 4 Performance Task

Complete the following task in TaskStream:

- DMT1: 602.5.1-07, etc.

For directions on how to receive access to performance assessments, see the "Accessing Performance Assessments" page.

Final Steps

Congratulations on completing the activities in this course of study! This section will guide you through the assessment process.

Assessment Information

The activities in this course of study have prepared you to complete the DMT1 performance assessment. If you have not already completed the assessment, you will do so now.

Accessing Performance Assessments

You should have completed the following tasks as you worked through this course of study. If you have not completed the tasks in TaskStream, do so now.

- DMT1: 602.5.1-07 part 1
- DMT1: 602.5.1-07 part 2
- DMT1: 602.5.1-07 part 3
- DMT1: 602.5.1-07, etc.

For directions on how to receive access to performance assessments, see the "Accessing Performance Assessments" page.

Feedback

WGU values your input! If you have comments, concerns, or suggestions for improvement of this course, please submit your feedback using the following form:

- Course Feedback

ADA Requirements

Please review the University ADA Policy.