



This course supports the assessment for Mathematics History and Technology. The course covers 7 competencies.

Introduction

Overview

Mathematics History and Technology introduces a variety of technological tools for doing mathematics, and you will develop a broad understanding of the historical development of mathematics. You will come to understand that mathematics is a very human subject that comes from the macro-level sweep of cultural and societal change, as well as the micro-level actions of individuals with personal, professional, and philosophical motivations. Most importantly, you will learn to evaluate and apply technological tools and historical information to create an enriching student-centered mathematical learning environment. There are no prerequisites for this course.

Getting Started

Welcome to Mathematics History and Technology! To learn this content, follow the course of study. You will generally begin by reading from one or both of the electronic textbooks provided to you by WGU:

- *Elementary and middle school mathematics: Teaching developmentally, 8th Edition*, by Van de Walle, Karp, & Bay-Williams
- *A history of mathematics: An introduction, 3^d Edition*, by Katz

Usually, you'll pursue some additional knowledge by exploring a carefully selected Website or video. You'll also be asked to reflect on what you've learned by engaging in textbook exercises or other questions.

You'll demonstrate your competency by completing four performance tasks. These will have you compare different technologies for solving the same kinds of mathematics problems, create a historical timeline of the development of mathematics, and write both technology-enhanced and history-enriched lesson plans.

Teaching Dispositions Statement

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

Mathematics History and Technology

Competencies

This course provides guidance to help you demonstrate the following 7 competencies:

- **Competency 661.1.1: Historical Developments**
The graduate analyzes major historical developments and cultural contributions in number systems, algebra, geometry, calculus, discrete mathematics, statistics and



probability, and measurement.

- **Competency 661.1.2: Development of Methods in Mathematics**
The graduate analyzes the historical development of methods in mathematics.
- **Competency 661.1.3: Humanistic, Social, and Political Influences**
The graduate analyzes the humanistic, social, and political influences on mathematical discoveries and the applications and effect of those discoveries.
- **Competency 661.1.4: Evaluation of Technological Tools**
The graduate evaluates technological tools for appropriate use in a variety of situations.
- **Competency 661.1.5: Using Technology for Problem Solving**
The graduate utilizes appropriate industry-standard technological tools to solve problems.
- **Competency 661.1.6: Planning Activities Using Technology**
The graduate integrates student-centered technology to build understanding of mathematical concepts and promote creativity in the planning of learning activities.
- **Competency 661.1.7: Mathematics History and Student Learning**
The graduate integrates mathematics history into the planning of learning activities to improve student learning.

Seek Help When You Need It

Your Course Instructor is an important resource for you to take advantage of as you progress through your study. Your Course Instructor will be able to help guide your learning, answer questions, and provide valuable information. Be sure to consult your Course Instructor frequently.

Pacing Guide

The suggested schedule for completing the course:

- Week 1: Begin Preparation and Technology Tools
- Week 2: Finish Preparation and Technology Tools; Task 1
- Week 3: Technology-enhanced Lesson Planning; Task 2
- Week 4: Begin History of Math
- Week 5: Finish History of Math; Task 3
- Week 6: History-enhanced Lesson Planning; Task 4

Supplemental Activities

There might be times when you feel like you need more information or practice than what has been provided in the course. In addition to consulting with your Course Instructor when you need help, you can access optional and supplemental activities by using the word "supplemental" in the Course Search box. These activities can be enriching, but they are not essential for becoming competent.

Preparation and Technology Tools

If you do not already have a calculator for your WGU exams, refer to the [WGU Calculator](#)



[Recommendations for Secondary Math and Science Programs](#) document for calculator suggestions and get a calculator. In addition, download one or both of the following dynamic geometry software packages: [Geometer's Sketchpad](#) and/or [Geogebra](#). If you are unfamiliar with any of these tools, WGU students have open access to the complete [Lynda.com library of training videos](#).

NOTE: Your *Elementary and Middle School Mathematics: Teaching Developmentally* textbook references MyEducationLab. However, this resource is not provided to you because it is not needed to gain the competency to complete the assessment in this course.

You may read about No Child Left Behind (NCLB) in some of the resources included in this course. 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. Department of Education:

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

If you do not already have a calculator for your WGU exams, refer to the WGU Calculator Recommendations for Secondary Math and Science Programs document for calculator suggestions and get a calculator. In addition, download one or both of the following dynamic geometry software packages: Geometer's Sketchpad and/or Geogebra. If you are unfamiliar with any of these tools, WGU students have open access to the complete Lynda.com library of training videos.

1. Download the Geometer Sketchpad 5.02 software by clicking on the appropriate link below for the operating system of your computer.
 1. WINDOWS: <http://gsp5.s3.amazonaws.com/InstallSketchpad.zip>
 2. MAC: <http://gsp5.s3.amazonaws.com/GSP5.dmg>
2. If prompted to Save or Run the file, choose the Save option and then click on the InstallSketchpad.exe file from the Downloads folder.
3. When you are prompted to register Sketchpad, use the License Name and Authorization Code provided below in your License Details. Use all characters and spaces as shown. We recommend that you copy and paste the License Name and Authorization Code to ensure that you register Sketchpad correctly. **IMPORTANT NOTE: This license is only good for ONE (1) download/activation. Do NOT install the software on more than one computer or you may be charged for the additional download.**
 1. License Name (CASE SENSITIVE): WESTERN GOVERNORS UNIVERSITY
 2. Authorization Code: D4PRY5-XYBU45-69MKC9-M114RT

Using Technological Tools, Week 1



Read [chapter 7 in *Elementary and Middle School Mathematics: Teaching Developmentally* \(pp. 113–127\)](#). Focus on the following:

- Technology Tools: Examine Table 7.1 on page 114 and do [Writing to Learn #1 on page 127](#).
- Graphing Calculators: Do some Web exploration to learn a bit about graphing calculators (TI84, TINspire, etc.). Do [Writing to Learn #2 and #3 on page 127](#).
- Computer Algebra Systems: Use internet sources to learn about computer algebra systems (TI94, [WolframAlpha](#) etc.). Read about the experiences of a half-dozen professors using [Computer Algebra in Education](#).
- Showing Mathematics with Technology: Use internet sources and [lynda.com](#) to learn about Presentation software and Equation Editors (PowerPoint and Microsoft Word Equation Editor, for example).

More Technological Tools, Week 2

- Dynamic Geometry: With a special focus on pages 424 to 428, skim through [chapter 20 of *Elementary and Middle School Mathematics: Teaching Developmentally*](#). Use internet sources to learn about dynamic geometry software ([Geometer's Sketchpad](#), [Geogebra](#) etc.). Do [Writing to Learn #4 on page 433](#).
- Statistical Analysis: Skim through [chapter 21 in *Elementary and Middle School Mathematics: Teaching Developmentally*](#). Use internet sources to learn about data collection and analysis tools (CBL, CBR, StatCrunch etc.)
- Computers, Programming, and Apps: Watch and reflect on the video [Teaching Kids Real Math with Computers](#). Examine [21 Common-Core Aligned Math Apps for High School Students](#) from edshelf. Do [Writing to Learn #4 and #5 on page 127](#).

Task 1, Week 2

Complete and submit Task 1. It is about applying different technologies for solving the same kinds of mathematics problem and comparing technologies. If you do not pass, meet with your Course Instructor.

View details about the task on the assessment tab.

Technology-enhanced Lesson Planning

Using technology changes the ways you can have students interact with and learn mathematics. Math is a subject that has changed radically in the past generation; think of all the advancements that affect the subject: graphing calculators, spreadsheets, dynamic geometry software, data-collection instruments, computer algebra systems, social networking, and serious gaming. You must be able to use technology creatively for teaching and learning mathematics in a modern way.

Historical and Futuristic Perspectives on Technology, Week 3

- Read the following article: [Pencilchat: The Ultimate Technology Metaphor](#).
- Read two excerpts from Chapter 25 of *A History of Mathematics*: [pages 907–915](#) to learn about early computers in education; [and pages 922–924](#) to read about the proof of the four-color theorem. Do you believe that a proof using computers is rigorous?



- Read and reflect on the following story: [One Possible Future for Technological Mathematics Education](#).
- Do [Writing to Learn #6 on page 127](#).

Task 2, Week 3

Complete and submit Task 2. It is about creating a detailed lesson plan that deeply incorporates using technology. If you do not pass, meet with your Course Instructor.

View details about the task on the assessment tab.

History of Mathematics

Sometimes knowing how a mathematical concept was developed can be useful in teaching students that topic; at other times, knowing the historical applications or the story of the mathematician and the culture that first used a particular method can provide motivation for the students to work harder to learn a topic. Historical discussion can also help show your students how mathematics is a "human" subject—approachable and personal, not scary and inhumane, as some students feel it is.

Highlights of Ancient and Medieval Mathematics, Week 4

The readings and exercises below have you explore mathematics spanning thousands of years. The main point is not for you to learn or re-learn the mathematics, but instead how mathematics is a very human subject that comes from the macro-level sweep of cultural and societal change, as well as the micro-level actions of individuals with personal, professional, and philosophical motivations. In *A History of Mathematics*, restrict your work to the following essentials:

- Read [xi-xvi \(Preface\)](#)
- Read [chapter 1, pages 1–2, 19–21, and section 1.3 \(Conclusion\)](#).
- Complete [exercises 42 and 43 on page 30](#).
- Read [chapter 1, pages 2–10](#).
- Read [chapter 2, pp. 32–47](#).
- Address [exercises 5, 6, 7, 17, 18, 19, 20 on pages 47–48](#).
- Read [chapter 3, pages 50–60](#).
- Read [chapter 5, pages 133–144, 145, 156, 157–168](#).
- Complete [exercises 37 and 38 on page 169](#).
- Read [chapter 6, pages 172–190](#).
- Complete [exercises 7 and 27 on pages 191–192](#).
- Read [chapter 7, pages 195–226](#).
- Complete [exercises 27–31 on page 228](#).
- Read [chapter 8, pages 230–260](#).
- Complete [exercise 35 on page 263](#).
- Read [chapter 9, pages 265–277, 296–318](#).
- Complete [exercises 41–43 on page 321](#).
- Read [chapter 10, pages 324–359](#).
- Complete [exercises 41–47 on page 361](#).
- Read [chapter 11, pages 364–369](#).



- Skim [chapter 11, pages 370–379](#).

Selections from Early Modern Mathematics, Week 5

In this phase of mathematical history, it has developed to a high level of difficulty. For these readings, it is even less important to follow the actual mathematics, but even more important to understand it as a human and cultural creation.

- Read [chapter 12, pages 383–385, 389–390, 394, 396, 399–404, 407–409, 414–417](#).
- Complete [exercises 45, 47, 49 on page 420](#).
- Read [chapter 13, pages 423–462](#).
- Read [chapter 14, pages 473–495](#).
- Read the [biographies on pages 474, 478, and 491](#).
- Read [chapter 14, pages 497–499](#).

Biographies and Achievements in Modern Mathematics, Week 5

In the last three centuries, the mathematics being developed has largely been at the level of college study and beyond, so for these readings, you may focus nearly exclusively on the people involved and their personal, professional, and philosophical motivations.

- Read page 594 (Biography in 17.1, Euler of the constant "e") of [chapter 17 \("Analysis in the Eighteenth Century"\)](#)
- Read page 605 (Biography in 17.2, Clairaut for pedagogy and geometry) of [chapter 17 \("Analysis in the Eighteenth Century"\)](#)
- Read pages 656–661 (sections 18.3.2 and 18.3.3) of [chapter 18 \("Probability and Statistics in the Eighteenth Century"\)](#)
- Read pages 680–682 (section 19.4, including the biography of Banneker, an African-American mathematician) of [chapter 19 \("Algebra and Number Theory in the Eighteenth Century"\)](#)
- Read pages 686–695 and 702–705 (introduction and sections 20.1, 20.2, and 20.5) of [chapter 20 \("Geometry in the Eighteenth Century"\)](#)
- Read pages 715 and 727 (Biographies of Germain and Galois) of [chapter 21 \("Algebra and Number Theory in the Nineteenth Century"\)](#)
- Read pages 731 and 734 (sidebar 21.1 about Cambridge Mathematics and sidebar 21.2 about the tripos) of [chapter 21 \("Algebra and Number Theory in the Nineteenth Century"\)](#)
- Read page 768, 770, and 783 (sidebars 22.1, 22.2, and 22.3 which show the historical development of some central calculus definitions) of [chapter 22 \("Analysis in the Nineteenth Century"\)](#)
- Read page 787 (Biography of Kovalevskaya) of [chapter 22 \("Analysis in the Nineteenth Century"\)](#)
- Read pages 824–830 (sections 23.2 and 23.3) of [chapter 23 \("Probability and Statistics in the Nineteenth Century"\)](#)
- Read pages 841–845 and 867–870 (sections 24.2.2 and 24.6) of [chapter 24 \("Geometry in the Nineteenth Century"\)](#)
- Read pages 877, 898, and 899 (sidebar 25.1 about Hilbert, Biography of Noether, and sidebar 25.2 about women in mathematics) of [chapter 25 \("Aspects of the Twentieth Century"\)](#)



[Century and Beyond"\)](#)

- Read [pp. 946–947.](#)
- Read [Appendix A–3 Time Line.](#)

Task 3, Week 5

Complete and submit Task 3. It is a creation of a historical timeline of the development of mathematics, with an analysis of one specific topic. If you do not pass, meet with your Course Instructor.

View details about the task on the assessment tab.

History-enhanced Lesson Planning

You will learn about the importance that contributions from diverse cultures have had on modern mathematics and be able to effectively integrate this knowledge into mathematics lesson plans for your own students.

Historical Lessons for the Math Classroom, Week 6

- Study the following examples: [Completing the Square.](#) [Famous Mathematicians.](#)
- Read [Sample Lesson Ideas to Incorporate History in Appendix A.2 of A History of Mathematics.](#)
- If you need more ideas, search the internet to find Mathematics Lesson Plans that include a historical emphasis.

Task 4, Week 6

Complete and submit Task 4. It is about creating a detailed lesson plan that deeply incorporates the history of the material being covered. If you do not pass, meet with your Course Instructor.

View details about the task on the assessment tab.