

George Mason University
College of Education and Human Development
Secondary Education Program

EDCI 372/572 001 – Teaching Mathematics in Secondary School

3 Credits, Fall 2020

Mondays, 4:30pm-7:10pm, Zoom

Faculty

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Prerequisites/Corequisites

None

University Catalog Course Description

This course emphasizes developing different styles of teaching and covers curricula, current issues, and research literature in secondary school mathematics. School-based field experience required.

Course Overview

As a future secondary mathematics teacher, you have the opportunity to shape the future. You can play an important role in the development of adolescents and have an influence on the way in which they come to understand the world in which they live. You can help students to develop strong understandings of mathematics and its uses, understandings that are foundational for work beyond high school. Further, you can shape their dispositions toward learning mathematics. You have chosen an amazing and rewarding career path!

In this course, you will come to develop knowledge, skills, and understandings that will be useful to you in your work as a secondary mathematics teacher. Though there are no “easy recipes” for helping students learn mathematics, research has identified *characteristics* of effective mathematics teaching. Throughout the semester, we will explore these characteristics and ways in which you can incorporate them into your teaching. You will learn how to be reflective about your work and that of other teachers so that you can continue to draw on and build upon the knowledge and understandings you gain in this course throughout your career as a secondary mathematics teacher who is equipped to help *all* children thrive in secondary mathematics classrooms

Course Delivery Method

This course will be delivered online using synchronous format via Zoom and Blackboard Learning Management system (LMS) housed in the MyMason portal. You will log in to the Blackboard (Bb) course site using your Mason email name (everything before @masonlive.gmu.edu) and email password. The course site will be available on Monday 8/24/20.

Under no circumstances, may candidates/students participate in online class sessions (either by phone or Internet) while operating motor vehicles. Further, as expected in a face-to-face class meeting, such online participation requires undivided attention to course content and communication.

Technical Requirements

To participate in this course, students will need to satisfy the following technical requirements:

- High-speed Internet access with standard up-to-date browsers. To get a list of Blackboard's supported browsers see:
https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#supported-browsers
- To get a list of supported operation systems on different devices see:
https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#tested-devices-and-operating-systems
- Students must maintain consistent and reliable access to their GMU email, Blackboard, and Zoom, as these are the official methods of communication for this course.
- Students may be asked to create logins and passwords on supplemental websites and/or to download trial software to their computer or tablet as part of course requirements.

Expectations

- Course Week:
Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes, Monday 8/24/20.
- Log-in Frequency:
Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials. In addition, students must log-in for all scheduled online synchronous meetings via Zoom.

Join Zoom Meeting

<https://gmu.zoom.us/j/93908219334>

Meeting ID: 939 0821 9334

- Participation:
Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.
- Technical Competence:
Students are expected to demonstrate competence in the use of all course technology. Students who are struggling with technical components of the course are expected to seek assistance from the instructor and/or College or University technical services.
- Technical Issues:
Students should anticipate some technical difficulties during the semester and should, therefore, budget their time accordingly. Late work will not be accepted based on individual technical issues.
- Workload:
Please be aware that this course is **not** self-paced. Students are expected to meet *specific deadlines* and *due dates* listed in the **Class Schedule** section of this syllabus. It is the student's responsibility to keep track of the weekly course schedule of topics, readings, activities and assignments due.
- Instructor Support:
Students may schedule a one-on-one meeting to discuss course requirements, content or other course-related issues via telephone or web conference. Students should email the instructor to schedule a one-on-one session, including their preferred meeting method and suggested dates/times.
- Netiquette:
The course environment is a collaborative space. Experience shows that even an innocent remark typed in the online environment can be misconstrued. Students must always re-read their responses carefully before posting them, so as others do not consider them as personal offenses. *Be positive in your approach with others and diplomatic in selecting your words.* Remember that you are not competing with classmates but sharing information and learning from others. All faculty are similarly expected to be respectful in all communications.
- Accommodations:
Online learners who require effective accommodations to ensure accessibility must be registered with George Mason University Disability Services.

Learner Outcomes

Success in this course is measured by the degree to which students are able to:

- Demonstrate an understanding of the ways in which secondary students develop strong, usable understandings of secondary mathematics content (NCTM SPA Standard 2; CEHD Core Value of Research-Based Practice)
- Analyze instruction and instructional materials for their potential to promote student learning of secondary mathematics content in diverse settings (NCTM SPA Indicator 3c; NCTM SPA Standards 4, 5, 6; CEHD Core Value of Research-Based Practice and Social Justice)
- Design tasks, including those that rely on technology, that foster the development of deep understanding of secondary mathematics concepts (NCTM SPA Indicators 3c, 4e, 5b; CEHD Core Values of Research-Based Practice and Innovation)
- Justify instructional decisions by reference to research findings, national standards, and learning theory (NCTM SPA Indicators 3a, 3b, 3c; NCTM SPA Standards 4, 6; CEHD

Core Values of Collaboration and Research- Based Practice)

- Demonstrate the dispositions appropriate to work as a secondary mathematics teacher (NCTM SPA Standard 6; CEHD Professional Dispositions)
- Continue to develop their own knowledge of mathematics and problem solving ability as they explore mathematics from the perspective of a teacher and student (NCTM SPA Standards 1, 2, NCTM SPA Indicators 3a, 3b; CEHD Core Value of Innovation)
- Analyze different perspectives on mathematics teaching and learning (NCTM SPA Indicator 3.6; CEHD Core Value of Research-Based Practice)
- Develop knowledge, skills, and professional behaviors across secondary settings, examine the nature of mathematics, how mathematics should be taught, and how students learn mathematics; and observe and analyze a range of approaches to mathematics teaching and learning (NCTM SPA Indicator 7c; CEHD Core Value of Research-Based Practice)

Professional Standards

This course aligns to the professional standards as outlined by the National Council for Teacher of Mathematics and Council for the Accreditation of Educator Preparation (“NCTM SPA Standards and Indicators)

Upon completion of this course, students will have met the NCTM SPA professional standards 2-7 as detailed under Course Outcomes above.

Required Texts

Cardone, T., & MToBS. (2015). *Nix the tricks: A guide to avoiding shortcuts that cut out math concept development*. Creative Commons.

**Download this resource for free at <http://nixhetricks.com/Download.html>

Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding it up: Helping children learn mathematics*. Washington, D.C.: The National Academies Press.

**Download this resource for free at http://www.nap.edu/catalog.php?record_id=9822

National Council of Teachers of Mathematics. (2014). *Principles to actions : ensuring mathematical success for all*. Reston, VA :NCTM.

***Download available here for \$4.99: [https://www.nctm.org/Store/Products/Principles-to-Actions-\(Download\)/](https://www.nctm.org/Store/Products/Principles-to-Actions-(Download)/)

National Governors Association Center for Best Practices, Council of Chief State School Officers. (2010). *Common Core State Standards Mathematics*. National Governors Association Center for Best Practices, Council of Chief State School Officers, Washington D.C.
Retrieved from: <http://www.corestandards.org/Math>

Virginia Standards of Learning and Testing, Mathematics 2016. Retrieved from:

http://www.doe.virginia.gov/testing/sol/standards_docs/mathematics/2016/index.shtml

Wieman, R., & Arbaugh, F. (2013). *Success from the start: Your first years teaching secondary mathematics*. National Council of Teachers of Mathematics.

Recommended Purchase

NCTM Student Membership (\$48/year) - A student e-membership is designed for those enrolled in an accredited college or university as a full-time student with an interest in mathematics education. Set up at half the cost of a full individual membership, this option helps provide students an entry into the membership and how NCTM can help support you through graduation, first years of teaching, and beyond. Student members also get FREE registration to [NCTM Regional Conferences and Expositions](#). Click the link for additional details:
<http://www.nctm.org/Membership/Membership-Options-for-Individuals/>

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard or Tk20). Hard copies of materials are NOT accepted.

Assignments and/or Examinations

The following assignments will help us to gauge your development throughout the course:

Assessment	Percentage of Grade:
Participation, Preparation, and Professionalism (including weekly assignments and readings)	15%
Mathematics Autobiography	10%
Discussion and Critique of Secondary math lesson plan	10%
Problem Lead**	20%
Field Work Assignments	15%
Lesson Plans and Related Assignments	30%

**Problem Leads will occur at various times in the semester

Mathematics Autobiography

John Graham's famous quote states, "We teach who we are." Contemporary research in mathematics education finds this to be especially true for secondary mathematics teachers. It is important to examine our own assumptions about teaching and learning mathematics as a result of our learning experiences. In this activity, you will spend some time reflecting on your personal experiences as a mathematics learner. You will use your responses as part of a reflection activity later in the semester.

Discussion and Critique of Secondary Math Lesson Plan

This assignment will give you a chance to apply best practices learned in our class coupled with research to a sample lesson. This will prepare you for your problem lead presentation and lesson plan assignment.

Problem Lead

This assignment will give you a chance to test your skills in leading work and discussion on a mathematics problem. Given a mathematics problem, learning goal, and conceptual explanation for the mathematics via *Nix the Tricks* and your lesson plan assignment, you will prepare a 20-minute activity, facilitate it for the class, and record the facilitation. After the activity, you will analyze your video and reflect upon the effectiveness of the approach you used to engage your peers in work with mathematical content.

Field Work Assignments

One of the most valuable pieces of pre-service teacher training is the opportunity to do field work. You will complete 15 hours of field work and keep a log of these hours for submission at the end of the semester. Throughout the semester, you will be required to complete smaller assignments during your field work. These assignments provide you with opportunities to reflect upon the practice of teaching after having watched instances of teaching in real world settings.

Lesson Plan Assignment and Presentation

Throughout the semester, you will explore many issues related to the teaching and learning of mathematics. In this culminating assignment, you will have the opportunity to use the knowledge, skills, and understandings you have gained in the creation of two consecutive lesson plans (One will be assessed to meet CEHD PBA requirements). Within these lessons, you will attend to the use of technology, the development of student understanding of mathematics content, various standards documents, and problem-based instruction. After submission of the lesson plans, you will present your ideas to your peers so that the entire class can begin to create a collection of teaching ideas for various content areas within secondary mathematics. You must meet minimum standard on this, or you will be asked to resubmit.

Other Requirements

Participation and Preparation

The participation of each class member is vitally important. If you do not come prepared to discuss the readings, to share your work on a given assignment, and to participate in the activities of the day, the quality of the class suffers. You **must** commit to coming to every class on time, being prepared for the evening's activities, and being ready to participate. You can expect that, in addition to work on the larger projects outlined below, there will be weekly readings and assignments that will fall into this category. If, however, there is an emergency and you cannot make it to class, you **must email me ahead of time** and submit all assignments electronically before the end of class.

Due Dates, Late Assignments, and Revised Assignments

Due Dates: All assignments are due by 11:59pm on the due date.

Late Assignments: If an assignment is not uploaded by 11:59pm of the date assigned, and you have not contacted me to receive an extension, then the assignment will be considered late. All late assignments will receive a *one-letter grade penalty*. If you know that you are going to have an issue with completing an assignment on time, please **notify me ahead of time** to avoid this late grade penalty.

Revised Assignments: When students earn less than 80% on an assignment, I offer them the opportunity to revise and resubmit. As long as students meet the guidelines for resubmission, students may earn up to 75% of the missed points on the assignment. Please keep in mind that it requires additional work to grade revised assignments, so they will require additional time to re-grade.

• Grading

Final course grades will be assigned based upon weighted percentages as indicated by the Course Expectations.

A	95-100%
A-	90-94%
B+	87-89%
B	83-86%
B-	80-82%

C	70-79%
F	Below 70%

Professional Dispositions

See <https://cehd.gmu.edu/students/polices-procedures/>

Core Values Commitment

The College of Education and Human Development is committed to collaboration, ethical leadership, innovation, research-based practice, and social justice. Students are expected to adhere to these principles: <http://cehd.gmu.edu/values/>.

GMU Policies and Resources for Students

Policies

- a. Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/>).
- b. Students must follow the university policy for Responsible Use of Computing (see <http://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- c. Students are responsible for the content of university communications sent to their Mason email account and are required to activate their account and check it regularly. All communication from the university, college, school, and program will be sent to students **solely** through their Mason email account.
- d. Students with disabilities who seek accommodations in a course must be registered with George Mason University Disability Services. Approved accommodations will begin at the time the written letter from Disability Services is received by the instructor (see <https://ds.gmu.edu/>).
- e. Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

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Campus Resources

- f. Support for submission of assignments to Tk20 should be directed to tk20help@gmu.edu or <https://cehd.gmu.edu/aero/tk20>. Questions or concerns regarding use of Blackboard should be directed to <http://coursessupport.gmu.edu/>.
- g. For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

For additional information on the College of Education and Human Development, please visit our website <http://cehd.gmu.edu/>.

Class Schedule

Note: Faculty reserves the right to alter the schedule as necessary, with adequate notification to students. The dates of assignments are subject to change dependent on the progress of the course. I will not move due dates for major assignments to an earlier date, only a later date if necessary. Additional smaller assignments and readings may be made each week. Additionally, at times different students will read different readings and share their understandings with the class. All readings noted with “see Bb site” will be available on Blackboard at least a week before they are to be read for class.

Date	Topic(s)	Reading(s) (due at the start of class)	Assignment Due
<p>Week 1 Mon Aug 24</p>	<ul style="list-style-type: none"> ▪ Course Introduction ▪ Learning Mathematics & Mathematical Proficiency ▪ COVID-19 & The Current State of Math Education 	<ul style="list-style-type: none"> ▪ Kilpatrick & Findell (2001) – The Strands of Mathematical Proficiency (pgs. 115 – 135) ▪ NCTM_NCSM(2020) – Moving Forward ▪ Kuhfeld & Tarasawa (2020) – The COVID-19 Slide ▪ Cardone & MTBoS (2015) – Chps. 1 & 2 	<p>Mathematics Autobiography due Fri Aug 28 by 11:59pm (upload to Bb)</p>
<p>Week 2 Mon Aug 31</p>	<ul style="list-style-type: none"> ▪ The Nature of Mathematics ▪ Mathematics Identities ▪ Teaching Towards Equity <ul style="list-style-type: none"> ○ Culturally Relevant Teaching ○ Social Justice Pedagogy ▪ The Teaching of Mathematics ▪ Selecting Rich Mathematical Tasks 	<ul style="list-style-type: none"> ▪ NCTM (2014) – Access & Equity (pgs. 59 – 64) ▪ NCTM (2014) – Implement Tasks that Promote Reasoning and Problem Solving (pgs. 17 – 24) ▪ Gutstein & Peterson (2013)- Rethinking Mathematics, Chp. 9 ▪ Cardone & MTBoS (2015) – Chp. 3 	
<p>Week 3 Mon Sept 7 (No Class: Labor Day)</p>			
<p>Week 4 Mon Sept 14</p>	<p>Planning for Instruction</p> <ul style="list-style-type: none"> ▪ Learning Progressions ▪ Curricular Standards 	<ul style="list-style-type: none"> ▪ CCSSM ▪ Virginia SOLs ▪ Coherence Map ▪ Progressions Documents ▪ Cardone & MTBoS (2015) – Chp. 4 	
<p>Week 5 Mon Sept 21</p>	<p>Planning for Instruction</p> <ul style="list-style-type: none"> ▪ Overall Goal of a Lesson ▪ Learning Objectives ▪ Curricular Standards 	<ul style="list-style-type: none"> ▪ Cardone & MTBoS (2015) – Chp. 5 ▪ NCTM (2014) – Establishing Math Goals to Focus Learning (pgs. 12 – 16) ▪ McDuffie et al (2011) 	

<p>Week 6 Mon Sept 28</p>	<p>Planning for Instruction</p> <ul style="list-style-type: none"> ▪ Lesson Plan Components ▪ Launching/Enacting Lessons 	<ul style="list-style-type: none"> ▪ Cardone & MTBoS (2015) – Chp. 6 ▪ Weiman & Arbaugh Chp. 7 – Planning the Mathematics Lesson ▪ Weiman & Arbaugh Chp. 8 – Enacting the Mathematics Lesson 	<p>**Field Experience Check-In (reminder to complete: log sheet; a minimum of 3 critical incidents reflection forms to help write your 4-5pg culminating paper)</p> <p>Class Workshop: Problem Lead</p>
<p>Week 7 Mon Oct 5</p>	<p>Planning for Instruction</p> <ul style="list-style-type: none"> ▪ Reflecting & Effectively Summarizing Lessons ▪ Role of Assessment ▪ Types of Assessment ▪ Referencing Learning Objectives & Curricular Standards 	<ul style="list-style-type: none"> ▪ NCTM (2014) – Assessment (pgs. 89 – 92) ▪ NCTM (2014) – Elicit and Use Evidence of Student Thinking (pgs. 53-57) ▪ Weiman & Arbaugh, Chp. 14 – Assessment, Feedback, and Grading 	
<p>Week 8 Mon Oct 12 (Asynchronous Class)</p>	<p>Planning for Instruction</p> <ul style="list-style-type: none"> ▪ Lesson Preparation Protocol (Preparing to Teach) 	<ul style="list-style-type: none"> ▪ Cardone & MTBoS (2015) – Chps. 7,8 	
<p>Week 9 Mon Oct 19</p>	<p>Establishing a Learning Environment Conducive to Student Engagement</p> <ul style="list-style-type: none"> ▪ Instructional Design ▪ Classroom Setup ▪ Virtual Apps 	<ul style="list-style-type: none"> ▪ Weiman & Arbaugh, Chp. 11 – Classroom Management ▪ Virtual Apps <ul style="list-style-type: none"> ○ Desmos ○ Geogebra ○ IXL ○ PlayPosit ○ KhanAcademy ○ Illustrative Math ○ EducaPlay ○ Kahoot! ○ Stats Apps ○ TI-83 Calculator 	<p>Class Workshop: Problem Lead</p>
<p>Week 10 Mon Oct 26</p>	<p>Establishing a Learning Environment Conducive to Student Engagement</p> <ul style="list-style-type: none"> ▪ Manipulatives, Differentiation 	<ul style="list-style-type: none"> ▪ Reinhart (2000) 	<p>**Field Experience Check-In (reminder to complete: log sheet; a minimum of 3 critical incidents reflection forms to help write your 4-5pg culminating paper)</p>

<p>Week 11 Mon Nov 2</p>	<p>Establishing a Learning Environment Conducive to Student Engagement</p> <ul style="list-style-type: none"> ▪ Role of Discourse ▪ Effective Questioning ▪ Cooperative Learning 	<ul style="list-style-type: none"> ▪ NCTM (2014) – Pose Purposeful Questions (pgs. 35-41) ▪ Herbel-Eisenmann & Breyfogle (2005) ▪ Smith & Stein et al (2009) 	<p>Class Workshop: Lesson Plan</p>
<p>Week 12 Mon Nov 9</p>	<p>Facilitating Productive Struggle</p>	<ul style="list-style-type: none"> ▪ NCTM (2014) – Use and Connect Mathematical Representations (pgs. 24-29) ▪ NCTM (2014) – Support Productive Struggle in Learning Mathematics (pgs. 48-53) 	<p>Discussion and Critique of Secondary Math Lesson Plan due Fri Nov 13 by 11:59pm (upload to Bb)</p>
<p>Week 13 Mon Nov 16</p>	<p>Focus on Algebra</p> <ul style="list-style-type: none"> ▪ Algebraic Ideas in the Middle Grades ▪ Algebra as Gatekeeper ▪ Big Ideas ▪ Algebraic Habits of Mind ▪ Role of Representations (Rule of 4) ▪ Functions Approach 	<ul style="list-style-type: none"> ▪ Driscoll (1999) ▪ Kinach (2014) ▪ Ponce (2007) 	<p>Field Work Assignments due Fri Nov 20 by 11:59pm (upload to Bb)</p> <p>Class Workshop: Lesson Plan</p>
<p>Week 14 Mon Nov 23</p>	<p>Problem Lead Presentations, Group A</p>	<ul style="list-style-type: none"> ▪ Weiman & Arbaugh, Chp. 10 – Establishing and Maintaining Effective Group Work 	<p>Problem Lead Presentations, Group A (turn in Reflection of Presentation by Sun Nov 29 by 11:59pm on Bb)</p>
<p>Week 15 Mon Nov 30</p>	<p>Problem Lead Presentations, Group B</p> <p>Transitioning to Methods 2</p> <ul style="list-style-type: none"> ▪ Revisiting our Mathematics Autobiographies ▪ Looking ahead to Methods 2 		<p>Problem Lead Presentations, Group B (turn in Reflection of Presentation by Sun Dec 6 by 11:59pm on Bb)</p>

Week 16 Mon Dec 7 (No Class: Complete and submit final assignments to Bb)			Lesson Plans & Related Assignments due Mon Dec 7 by 11:59pm (upload to Bb)
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