

George Mason University
College of Education and Human Development
Secondary Education

SEED 672.001 – Advanced Methods of Teaching Mathematics in the Secondary School
3 Credits, Spring 2022
Mondays 4:30-7:10, Synchronous Online & Concurrent on select days

Faculty

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Prerequisites/Corequisites

This course recommends EDCI 572 and EDUC 522 as prerequisites. This course recommends EDRD 619 as a corequisite.

University Catalog Course Description

Focuses on learning processes for mathematics. Introduces national and state standards regarding content and methodologies for teaching mathematics. Examines instructional methods and materials in relation to secondary mathematical content, curriculum, and assessment. School-based field experience required.

Course Overview

In Teaching Mathematics in the Secondary School course, you thought about what it means to understand mathematics, were introduced to learning theories, became familiar with standards documents, and learned about characteristics of mathematics instruction that fosters deep understanding of and proficiency in working with mathematics.

In this course, Advanced Methods of Teaching Mathematics in the Secondary School, you will learn more about four aspects of mathematics teaching: managing classroom discourse, differentiation, use of technology, equity and assessment. You will explore these aspects of mathematics teaching while keeping a focus on student thinking and learning. Regardless of whether a teacher is engaging with the class, differentiating instruction, or conducting an assessment, the teacher must focus on the development of student thinking about mathematics and a respect for student difference and diversity. You will learn how to do this in this class.

This will help you as you embark upon Internship and your first teaching position!

We will address the objectives as we progress through the course, which is organized into four sections:

I. **Managing Classroom Discourse**

In this part of the course you will critique and learn more about teacher decisions in managing whole-class mathematical discussions. You will learn more about questioning and will consider appropriate times to ask particular questions. Then, later in the course, you will have the opportunity to practice managing a conversation when you teach a full lesson to the class.

II. **Assessment**

In this final section of the course you will consider the role of assessment in a mathematics classroom and will learn more about ways that teachers might gain insight into student thinking about mathematics.

III. **Differentiation**

In this section of the course, you will become familiar with strategies for differentiating mathematics instruction. By focusing on student thinking, you will learn how to meet student needs while holding them to high standards.

IV. **The Responsibility of the Teacher in Today's Schools**

In this final section of the course you will consider the role of a mathematics teacher in today's world. You will consider your responsibility to the diverse group of students you will be teaching and to the surrounding community.

Course Delivery Method

This course will be delivered online (76% or more) using a synchronous format via 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.

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 and Blackboard, as these are the official methods of communication for this course.
- Students will need a headset microphone for use with the Blackboard Collaborate web conferencing tool.
- 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.
- The following software plug-ins for PCs and Macs, respectively, are available for free download:
 - Adobe Acrobat Reader: <https://get.adobe.com/reader/>
 - Windows Media Player:
<https://support.microsoft.com/en-us/help/14209/get-windows-media-player>
 - Apple Quick Time Player: www.apple.com/quicktime/download/

Expectations

- Course Week:
Our course week will begin on the day that our synchronous meetings take place as indicated on the Schedule of Classes.
- 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 at least 3 times per week. In addition, students must log-in for all scheduled online synchronous meetings.
- 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. Those unable to come to a Mason campus can meet with the instructor 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 insure accessibility must be registered with George Mason University Disability Services.

Learner Outcomes or Objectives

This course is designed to enable students to do the following:

1. Demonstrate an ability to critique classroom discourse and the role of the teacher in facilitating that discourse through findings from research on student learning
2. Demonstrate an ability to plan a mathematics lesson that fosters deep understanding of mathematics content for all students
3. Plan a mathematics lesson that includes elements of differentiation, assessment, and technology, is problem-based, requires students to engage in sense making, and engages students in mathematical communication while adhering to state and national standards
4. Develop assessments that give a teacher insight into student thinking about mathematics content
5. Conduct an analysis of ideas for teaching mathematics in diverse classrooms
6. 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 focusing on tasks, discourse, environment, and assessment

Professional Standards ([National Council of Teachers of Mathematics NCTM])

Upon completion of this course, students will have met the following professional standards:

NCTM Secondary Mathematics Standard 2, Mathematical Practices: Effective teachers of secondary mathematics solve problems, represent mathematical ideas, reason, prove, use mathematical models, attend to precision, identify elements of structure, generalize, engage in mathematical communication, and make connections as essential mathematical practices. They understand that these practices intersect with mathematical content and that understanding relies on

the ability to demonstrate these practices within and among mathematical domains and in their teaching.

NCTM Secondary Mathematics Standard 3, Content Pedagogy: Effective teachers of secondary mathematics apply knowledge of curriculum standards for mathematics and their relationship to student learning within and across mathematical domains. They incorporate research-based mathematical experiences and include multiple instructional strategies and mathematics-specific technological tools in their teaching to develop all students' mathematical understanding and proficiency. They provide students with opportunities to do mathematics – talking about it and connecting it to both theoretical and real-world contexts. They plan, select, implement, interpret, and use formative and summative assessments for monitoring student learning, measuring student mathematical understanding, and informing practice.

NCTM Secondary Mathematics Standard 4, Mathematical Learning Environment: Effective teachers of secondary mathematics exhibit knowledge of adolescent learning, development, and behavior. They use this knowledge to plan and create sequential learning opportunities grounded in mathematics education research where students are actively engaged in the mathematics they are learning and building from prior knowledge and skills. They demonstrate a positive disposition toward mathematical practices and learning, include culturally relevant perspectives in teaching, and demonstrate equitable and ethical treatment of and high expectations for all students. They use instructional tools such as manipulatives, digital tools, and virtual resources to enhance learning while recognizing the possible limitations of such tools.

NCTM Secondary Mathematics Standard 7, Secondary Mathematics Field Experiences and Clinical Practices: Effective teachers of secondary mathematics engage in a planned sequence of field experiences and clinical practice under the supervision of experienced and highly qualified mathematics teachers. They develop a broad experiential base of knowledge, skills, effective approaches to mathematics teaching and learning, and professional behaviors across both middle and high school settings that involve a diverse range and varied groupings of students. Candidates experience a full-time student teaching/internship in secondary mathematics directed by university or college faculty with secondary mathematics teaching experience or equivalent knowledge base.

Required Texts

Berry, R. Q., Conway, B. M., Lawler, B. R., & Staley, J. W. (2020). *High school mathematics lessons to explore, understand, and respond to social injustice*. Corwin.

You will also complete additional readings as assigned. All additional readings will be uploaded to Blackboard.

Required Software

GoReact is an online software that allows you to upload teaching footage, analyze, and engage with feedback from the instructor and other colleagues. Goreact costs \$19.99 per course or \$99 for unlimited use for five years. To sign up and receive more details visit: <https://get.goreact.com/>

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:

Course Performance Evaluation

Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard, Tk20, hard copy).

The following assignments will help you (and me) to gauge your development throughout the course:

Assessment	Percentage of Grade
In-Class Participation and Preparation	10%
Additional Weekly Assignments (e.g., tools of geometry activity, peer teaching, in-class workshops, etc.)	15%
Assessment Assignment	20%
Micro-Teaching	15%
Field Work Assignment	15%
Unit Plan Assignment & Individualized Learning Plan	25%

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 entire class will suffer. You must commit to being 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 of the date assigned.

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 often 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.

- **Assignments and/or Examinations**

Unit Plan and Individualized Lesson Plan

Throughout this 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've gained in this and the previous semester in the creation of a complete unit of study. Within this unit plan, you will be asked to design lessons that pay attention to the use of technology, the development of student understanding of mathematics content, various standards documents, assessment of student understanding, and ways to differentiate instruction for diverse groups of learners. After submission of the unit plan, you will present your plan to your peers so that the entire class can begin to create a collection of teaching ideas for various content areas within secondary mathematics. As part of the Unit Plan project, you will develop an individualized plan for a child with developmental, learning, physical, or linguistic differences within the context of the general education environment and curriculum. This will count as one of the lessons in your unit plan.

Clinical Interview

Effective teaching requires a keen awareness of how and what your students are thinking and understanding. The experience of conducting a clinical interview is intended to increase your awareness of the forms of questioning and engagement that offer insight into the thinking of your students. Conduct a clinical interview with a student, or if necessary, an adult about a carefully chosen problem or activity in mathematics.

Assessment Assignment

In this assessment, you will apply what you learned about assessment to your unit plan. Building on what you learned, you will further develop your assessment plan for the unit and, in so doing, develop two assessment instruments and corresponding grading rubrics.

Micro-Teaching Assignment

In this assignment, you will apply all that you learned about planning and orchestrating classroom discourse to the development, implementation, and reflection upon a lesson surrounding a mathematics concept covered in secondary mathematics classrooms. The implementation of a co-taught lesson will be video-recorded so as to facilitate the reflection process. This process is valuable to you as you teach and reflect on your teaching of a lesson.

Field Work Assignment

You will complete 15 hours of field work and keep a log of these hours for submission at the end of the semester. During this time, you will remain with one teacher and slowly begin to interact with students. By the end of the experience you will have taught a whole, or part of a whole, lesson. You will submit the lesson and reflect upon its effectiveness. This assignment provides you with an excellent opportunity to work with real students as you prepare to become a teacher.

- **Grading**

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

A 93-100%

A- 90-92%

B+ 88-89%

B 80-87%

C 70-79%

F Below 70%

Professional Dispositions

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

Class Schedule

Note: Faculty reserves the right to alter the schedule as necessary, with notification to students.

Weekly readings will be assigned and differentiated by student. Please see blackboard for weekly reading assignments.

Date	Topic	Activity or Assignment Due
Class 1 January 24	Staging the Big Picture: Looking Back and Looking Ahead	
Class 2 January 31	Facilitating Mathematical Discourse: Questioning Unit Planning	
Class 3 February 7	Facilitating Mathematical Discourse: Questioning	
Class 4 February 14	Assessment Introduction Formative Assessment and Discourse	
Class 5 February 21	Assessment: Formative, Summative, and Alternative	Submit Lesson Plan #1
Class 6 February 28	Assessment: Homework & Final Grades	Clinical Interview Due
Class 7 March 7	Equity Issues in Mathematics Education	Assessment Plan Due
Class 8 March 14	Mason Spring Break	
Class 9 March 21	Meeting the Needs of Diverse Learners: Complex Instruction and Groupworthiness	
Class 10 March 28	Meeting the Needs of Diverse Learners: Special Education and ELLs & Gifted	

Class 11 April 4	Asynchronous Unit Planning	
Class 12 April 11	Advanced Mathematics: Content and Considerations	
Class 13 April 18	Advanced Mathematics: Content and Considerations	Unit Plan Project Due
Class 14 April 25	Being a Member of the Mathematics Community	Field Experience Project Due
Class 15 May 2	Summing up	

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

- Students must adhere to the guidelines of the Mason Honor Code (see <https://catalog.gmu.edu/policies/honor-code-system/>).
- Students must follow the university policy for Responsible Use of Computing (see <https://universitypolicy.gmu.edu/policies/responsible-use-of-computing/>).
- 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.
- 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/>).
- Students must silence all sound emitting devices during class unless otherwise authorized by the instructor.

Campus Resources

- Support for submission of assignments to VIA should be directed to viahelp@gmu.edu or <https://cehd.gmu.edu/aero/assessments>. Questions or concerns regarding use of Blackboard should be directed to

<https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/>.

- For information on student support resources on campus, see <https://ctfe.gmu.edu/teaching/student-support-resources-on-campus>

Notice of mandatory reporting of sexual assault, interpersonal violence, and stalking:

As a faculty member, I am designated as a “Responsible Employee,” and must report all disclosures of sexual assault, interpersonal violence, and stalking to Mason’s Title IX Coordinator per University Policy 1202. If you wish to speak with someone confidentially, please contact one of Mason’s confidential resources, such as Student Support and Advocacy Center (SSAC) at 703-380-1434 or Counseling and Psychological Services (CAPS) at 703-993-2380. You may also seek assistance from Mason’s Title IX Coordinator by calling 703-993-8730, or emailing titleix@gmu.edu.

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

SAFE RETURN TO CAMPUS GUIDANCE FOR STUDENTS ENROLLED IN CEHD COURSES

Both a Safe Return to Campus and Successful Learning Opportunities Depend on YOU.

All students are required to take the Safe Return to Campus Training prior to visiting campus: it is, however, recommended for all Mason students, even those who are enrolled in fully online classes. Training is available in [Blackboard](#).

Students are required to follow the university's public health and safety precautions and procedures outlined on the university [Safe Return to Campus webpage](#).

Students are required to be Fully Vaccinated against COVID-19 by August 1, 2021 and submit documentary proof of vaccination or have an approved medical or religious exemption. Students who enroll in the University after August 1, 2021 must be Fully Vaccinated against COVID-19 as of the immunization record due date for their first semester at the University, which can be found on the Student Health Services website.

Everyone, even those who are fully vaccinated, must wear a face covering when inside university property (buildings and vehicles). If you're unvaccinated, you must wear a mask outside, as well, when at an event or if physical distancing can't be maintained. [Read the full face covering policy here](#).

All students in face-to-face and hybrid courses must also complete the Mason COVID Health Check daily, seven days a week.

- You may not come to class if you receive a Yellow, Red, or Blue email response to the Mason COVID Health Check.
- You may only come to class if you receive a Green email response to the Mason COVID Health Check.
- You must quarantine and get tested if you receive a Blue email response, because you indicated that you recently traveled outside of the United States, are not fully vaccinated, or have not completed the required 7 to 10 day quarantine period for international travel.
- If you suspect that you are sick or have been directed to self-isolate, quarantine, or get testing do not go to class.
- Faculty are allowed to ask you to show them that you have received a Green email and are thereby permitted to be in class.

Disability Services: Students unable to participate in a course in the manner presented, either due to existing disability or COVID comorbidity risk, should seek accommodations through the [Office of Disability Services](#).

Students may not, either individually or collectively, request permission to change the modality of a current course section due to COVID risks or concerns. If students are not comfortable with the modality of the course for which they are registered, they will need to register for a course offered in a different modality which better will accommodate their needs through the established drop/add process.

Campus Closure: If the campus closes or class is canceled due to weather or other concerns, students should check [Blackboard](#), Mason email, or the [Mason website](#) for updates on how to continue learning and information about any changes to events or assignments.

Participation and Make-up Work: CEHD instructors will work with students to find reasonable opportunities to make up class work or assignments missed due to documented illness. Begin by contacting your instructor for guidance. For further assistance, students may contact their program and the CEHD Office of Student and Academic Affairs (cehdsaa@gmu.edu).

Technology Requirements:

- Activities and assignments in CEHD courses regularly use the [Blackboard](#) learning system. Students are required to have regular, reliable access to a computer with an updated operating system (recommended: Windows 10 or Mac OSX 10.13 or higher) and a stable broadband Internet connection (e.g., cable modem, DSL, satellite broadband) with a consistent 1.5 Mbps [megabits per second] download speed or higher.
- Additionally, CEHD course activities and assignments may regularly use web-conferencing software (e.g., Blackboard Collaborate or Zoom). In addition to the requirements above, students are required to have a device with a functional webcam and microphone. In an emergency, students can connect through a telephone call, but video connection is the expected norm.

Course Materials and Student Privacy:

- All course materials posted to Blackboard or other course site are private; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.
- Video recordings of class meetings that include audio or visual information from other students are private and must not be shared.
- Live Video Conference Meetings (e.g. Collaborate or Zoom) that include audio or visual information from other students must be viewed privately and not shared with others in your household.
- Some/All of your CEHD synchronous class meetings may be recorded by your instructor to provide necessary information for students in this class. Recordings will be stored on Blackboard [or another secure site] and will only be accessible to students taking this course during this semester.

Testing with LockDown Browser:

CEHD courses may require the use of LockDown Browser and a webcam for online exams. The webcam can be built into your computer (internal webcam) or can be the type of webcam that plugs in with a USB cable (external webcam). [Information on installing and using LockDown Browser may be found here.](#)

You will need the following system requirements for online exams:

- Windows: 10, 8, 7
- Mac: OS X 10.10 or higher
- iOS: 10.0+ (iPad only)
- Must have a compatible LMS integration
- Web camera (internal or external) & microphone
- A reliable internet connection
- Prior to your first exam, you must install LockDown Browser following the step-by-step instructions linked above.

To ensure LockDown Browser and the webcam are set up properly, do the following:

- Start LockDown Browser, log into Blackboard and select your course.
- Locate and select the Help Center button on the LockDown Browser toolbar.
- Run the Webcam Check and, if necessary, resolve any issues or permissions your computer prompts.
- Run the System & Network Check. If a problem is indicated, see if a solution is provided in the [Knowledge Base](#). Further troubleshooting is available through the [ITS Support Center](#).
- Exit the Help Center and locate the practice quiz.
- Upon completing and submitting the practice quiz, exit LockDown Browser.

When taking an online exam that requires LockDown Browser and a webcam, remember the following guidelines:

- Ensure you're in a location where you won't be interrupted.
- Turn off all other devices (e.g. tablets, phones, second computers) and place them outside of your reach.
- Clear your desk of all external materials not permitted — books, papers, phones, other devices.
- Before starting the test, know how much time is available for it, and that you've allotted sufficient time to complete it.
- Remain at your computer for the duration of the test. Make sure that your computer is plugged into a power source, or that battery is fully-charged.
- If the computer or networking environment is different than what was used previously with the Webcam Check and System & Network Check in LockDown Browser, run the checks again prior to starting the test.

To produce a good webcam video, do the following:

- Do not wear a baseball cap or hat with a brim that obscures your face.
- Ensure your computer or tablet is on a firm surface (a desk or table). Do NOT have the computer on your lap, a bed, or any other surface where the device (or you) are likely to move.
- If using a built-in (internal) webcam, avoid tilting the screen after the webcam setup is complete.
- Take the exam in a well-lit room and avoid backlighting, such as sitting with your back to a window.
- Remember that LockDown Browser will prevent you from accessing other websites or applications; you will be unable to exit the test until all questions are completed and submitted.