George Mason University
College of Education and Human Development
Secondary Education Program (SEED)

EDCI 472.001 and 672.001– Advanced Methods of

Teaching Mathematics in the Secondary School

3 Credits, Fall 2019
Tuesdays 4:30-7:10 pm, Thompson Hall 1010 – Fairfax Campus

Faculty

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Students do not just need mathematics; mathematics needs different people's participation.

(Gutierrez, 2007)

Prerequisites/Corequisites
EDCI 472 recommends EDCI 372 and EDUC 422.
EDCI 672 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 using a lecture format.

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

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

Access to the following materials is required:

National Council of Teachers of Matheamtics. (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)/

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.

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: http://www.nctm.org/Membership/Membership-Options-for-Individuals/

COURSE ASSIGNMENTS AND EXPECTATIONS

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 • Includes Clinical Interview with student	25%

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).

Participation and Preparation
The participation of each class member is vitally important. If you do not come prepared to discuss the readings, to share you work on a given assignment, and to participate in the activities of the day the entire class will suffer. You **must** commit to be 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.

Assignment Descriptions

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 en

Clinical Interview (Part of Unit Plan – 672 students ONLY)
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. vironment and curriculum. This will count as one of the lessons in your unit plan.

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 it 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/polices-procedures/

Class Schedule

Note: This schedule serves as a roadmap for the course. Faculty reserves the right to alter the schedule as necessary, with notification to students. No assignment will ever be moved up in the calendar, but assignments may need to be pushed back based on the pacing of the course.

Date	Topic	Text	Activity or Assignment Due
Week 1 August 27th	Staging the Big Picture: Looking Back and Looking Ahead	Principles to Actions (PtA) pp. 59-68 Weiman & Arbaugh Ch 9	
Week 2 September 3	Facilitating Mathematical Discourse: Questioning Unit Planning	Wiggins & McTighe (2011) - see Bb	Bring a lesson plan from Methods 1 to re-work for an in-class activity
Week 3 September 10	Facilitating Mathematical Discourse: Argumentation and Proof	Students will be assigned one of the following: NCTM (2012) - Proof OR Knudsen et al. (2018), selected excerpts	Selection of Unit Plan Topic and partners
Week 4 September 17	Facilitating Mathematical Discourse Content Focus: Geometry	NCTM (2012) – Developing Essential Understandings in Geometry Chapter 1 **Chapter sections will be assigned**	Submit Backwards Design table for Unit
Week 5 September 24	Meeting the Needs of Diverse Learners: Complex Instruction Content Focus: Geometry	Horn (2012) – Strength in Numbers (selected excerpts)	Submit Part 1 of Unit Plan Project (top-level outline, concept map, etc.) In class: Tools of Geometry Presentations
Week 6 October 1	Meeting the Needs of Diverse Learners: Special Education and	All: NCTM (2011) – Special Ed and Mathematics – Ch.	In class: Tools of Geometry Presentations

	Gifted Learners	1 All Means All Selected readings on Bb	
Week 7 **October 8**	Meeting the Needs of Diverse Learners: Special Education and ELLs Content Focus: Advanced Mathematics	Selected readings on Bb	Submit initial unit lesson
Week 8 **October 15**	**FALL Break** **Class will NOT meet.**		**Clinical Interview Due**
Week 9 **October 22** **Asynchronous ONLINE Class**	Meeting the Needs of Diverse Learners: ELLs Content Focus: Advanced Mathematics	Selected readings on Bb	**Microteaching**
Week 10 **October 29**	Intro to Assessment	PtA – pp. 89-98 Wieman & Arbaugh – pp. 169-182	**Microteaching**
Week 11 **November 5**	Assessment: Formative, Summative, and Alternative Content Focus: Advanced Mathematics	Keely & Tobey – selected excerpts Brahier (2001/2014)	Submit Individual Lesson Plan **Microteaching**
Week 12 **November 12**	Assessment: Formative, Summative, and Alternative	Wieman & Arbaugh 193-195	**Microteaching**
Week 13 **November 19**	Assessment: Homework & Final Grades		
Week 14 **November 26**	Assessment Standardized Assessment		**Unit Plan Project Due**
Week 15 **December 3**	Being a Member of the Mathematics Community	PtA pp. 99-108 Wieman & Arbaugh pp. 187-192	
December 13	**Assessment Project Due**		

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 http://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 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/.

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

- The Writing Center provides a variety of resources and services (e.g., tutoring, workshops, writing guides, handbooks) intended to support students as they work to construct and share knowledge through writing (see http://writingcenter.gmu.edu/).

- The Counseling and Psychological Services (CAPS) staff consists of professional counseling and clinical psychologists, social workers, and counselors who offer a wide range of services (e.g., individual and group counseling, workshops and outreach

programs) to enhance students' personal experience and academic performance (see http://caps.gmu.edu/).

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

Assignment Description

UNIT PLAN ASSIGNMENT

Due _____

Throughout the semester, we have been discussing (1) what it means to understand mathematics, (2) various learning theories and their implications for the teaching and learning of mathematics, (3) NCTM's vision for school mathematics teaching and learning, (4) the role of state and local standards documents in the design of instruction, (5) characteristics of instruction that promote the development of strong understandings of mathematics, and (6) organization and planning of units and lessons. You have had opportunities to observe teaching, to lead the class in problem solving through a mini-teach assignment, and to analyze various aspects of mathematics instruction. Shortly, we will be discussing ways to assess student understanding of mathematics and you will be interviewing a student to have practice in doing so. In this culminating, unit plan project you will have the opportunity to apply all that you have learned (and will learn) to the design of an entire unit of study for secondary students – students you will someday teach!

Assignment Description

You will develop a unit plan for a significant topic in a standard 6-12 mathematics curriculum. A unit, as defined by Brahier (2009) is "a carefully planned set of learning experiences that are designed to address one or several goals and objectives over time" (p. 136). These goals should be organized around a unifying topic in mathematics.

First, you need to identify a unit. You should pick a topic that is broad enough (and significant enough) to cover 2-4 weeks of instruction (or 15-20 hours). "Solving algebraic equations" is far too broad; "constructing circles with a compass" is far too narrow. The choice of your unit should be consistent with the NCTM and Virginia State Standards. For ideas on choosing a unit, you should consult the standards documents and potentially browse through some of the mathematics textbooks in the Johnson Center library.

Once you have identified a unit, you will develop a unit plan that includes the following components:

1. A top-level outline of the unit
2. A calendar outlining the topics for each day of the unit
3. Lesson plans for **1 week (including the first lesson)** of instruction within the unit. Undergraduate students will only submit 4 lesson plans.
4. An assessment plan
5. A unit narrative

The following provides a detailed outline of each of the five components of this assignment.

1. Concept Map and top-level outline – Assessed independently from final scoring rubric

You will submit an outline of your unit. This outline should include:

a. a title (identifying its subject matter or mathematical focus),

b. a description of the students for whom the unit is intended (grade, course, prior knowledge needed, etc.),
c. a statement of the unit's goal(s),
d. a statement (paragraph) of the rationale for the unit describing why it is important (supported by sources), and
e. a list of the objectives relevant to the unit. This should be a comprehensive list for the unit, and *not limited to the objectives of the 2 weeks of lessons you are planning*. The list should indicate how these objectives align to the NCTM and VA SOL standards
f. a concept map highlighting the major concepts covered in the unit and how they relate

2. Calendar describing the unit – Assessed independently from final scoring rubric

You will submit a calendar to describe the unit. This calendar should illustrate the progression of the topics and the connections between days of instruction. In so doing, it should outline the topics for each day of instruction within the unit.

3. One week of the unit (including the first lesson) planned in detail – Assessed using Unit Plan rubric comprised of NCTM Secondary Math Standards

You will submit one weeks' worth of detailed lesson plans. Lesson plans should be submitted according to the format discussed in class. They should be interactive and should encourage inquiry. You are responsible for describing the actions of the teacher, the progression of the mathematical activity and the possible responses and questions from the students in the description of the instruction.

It is important that you submit the *first lesson* of your unit. In particular, the first lesson should provide a suitable introduction and motivation for the entire unit. Additionally, all the lessons should be clearly and meaningfully related to one another.

4. Unit narrative – Assessed using Unit Plan rubric comprised of NCTM Secondary Math Standards

The final component of your unit plan is a narrative describing the following:

a. Your goals for mathematics teaching and learning and their representation in the unit plan. For instance, if hands-on learning using real-world problem solving is important to you, how have you implemented it in the unit plan?
b. How the teaching strategies you have implemented allow for the diverse learning styles and abilities of your students.
c. How the unit is mathematically and pedagogically cohesive. Explain how the instructional strategies and mathematical content fits together.

<u>What I'll be looking for:</u>

The following identifies the criteria used to judge the quality of your unit assignment:

a. A choice of a meaningful unit topic, according to NCTM and Virginia standards.
b. A *comprehensive* outline of the unit. That is, your objectives should be consistent with your stated goal, and they should span enough of a range to include significant and meaningful coverage of the relevant mathematical ideas. The objectives should highlight the variety of types of knowledge appropriate to the unit's subject matter.

c. Lesson plans that are professional, detailed, and consistent with the standards set by NCTM and the State of Virginia. A variety of instructional strategies should be included, with strategies (i.e., direct instruction, individual work, group work, whole-class discussions, etc.) appropriately matched to the lesson objectives they are intended to support. Lessons should be appropriately sequenced.
d. Assessments that are appropriate measures of the types of knowledge they are intended to measure (as determined by the lesson's objectives).
e. Creativity. Your book, our readings, and our classroom discussions and activities have focused on the need for classroom lessons that support students' direct engagement, communication, and meaningful thinking. Your unit and lesson plans should demonstrate your efforts to think beyond strictly traditional lessons.

Grading Rubric

The following rubrics are used to assess the final lesson plan submission and accompanying narrative (Parts 3 and 4). The grading rubric for this assignment is in your syllabus and posted on Blackboard. The rubric is an integration of the InTASC *General Evaluation Rubric*, which is used by George Mason University for all secondary unit plans, regardless of content area. and the NCTM Secondary Mathematics rubric and is used only for secondary mathematics students. Please become familiar with the rubric prior to working on the unit plan.

EDCI 472/672
Unit Plan Project Rubric: InTASC

Criteria	Does Not Meet Standard 1	Approaches Standard 2	Meets Standard 3	Exceeds Standard 4
Section 1 Description of Individual Student				
The candidate regularly assesses individual and group performance in order to design and modify instruction to meet learners' needs in each area of development (cognitive, linguistic, social, emotional, and physical) and scaffolds the next level of development. ***InTASC 1(a)***	The candidate does not provide a description or the description of student **does not** include assessment data **related to cognitive, linguistic, social, emotional, and/or physical** developmental skill levels and abilities, interests, **or** educational progress.	The candidate provides description of student that includes appropriate assessment data related to **some but not all** of the following: cognitive, linguistic, social, emotional, and/or physical developmental skill levels and abilities, interests, **or** educational progress.	The candidate provides description of student that includes appropriate assessment data on **all** of the following: cognitive, linguistic, social, emotional, and/or physical developmental skill levels and abilities, interests, and educational progress. The candidate describes impact of student characteristics on learning.	The candidate provides description of student that includes both appropriate and multiple forms of assessment data on **all** of the following: cognitive, linguistic, social, emotional, and/or physical developmental skill levels and abilities, interests, and educational learning need. The candidate describes **and** provides examples of impact of student characteristics on learning.
Statement of Educational Need				
The candidate effectively uses multiple and appropriate types of assessment data to identify each student's learning needs and to develop	The candidate **does not** address student educational needs or **inappropriately uses** assessment data to create a statement of	The candidate uses assessment data to create a statement of educational need that is **marginally** aligned with assessment	The candidate uses assessment data to create an **appropriate** statement of educational need that is **aligned** with assessment results.	The candidate **effectively** uses assessment data from **multiple sources** to create a **thorough and appropriate** statement of educational need

differentiated learning experiences. ***InTASC 6(g)***	educational need.	results.		that is **aligned** with assessment results.
Section 2 **Identification of Learning Objectives**				
The candidate individually and collaboratively selects and creates learning experiences that are appropriate for curriculum goals and content standards, and are relevant to learners. ***InTASC 7(a)***	The candidate identifies learning objectives that are **either** (a) **incomplete** because related outcomes are not identified **or** (b) the objectives are **not directly related** to student educational need.	The candidate identifies learning objectives **without relevance** to student educational need.	The candidate identifies learning objectives with related outcomes that are **relevant** to individual student needs. .	The candidate identifies **distinct** learning objectives with related outcomes that are **relevant** to individual student needs.
Identification of Rationale for Learning Objectives				
The candidate plans for instruction based on formative and summative assessment data, prior learner knowledge, and learner interest. ***InTASC 7(d)***	The candidate **does not provide** rationales which are aligned to the specific learning objectives and/or the relationship of the learning objectives to student educational needs is **missing or unclear.**	The rationales provided **are not** be aligned to the specific learning objective and the relationship of the learning objectives to student educational needs is **unclear**.	The rationales provided **are aligned** with the learning objective and the relationship of learning objectives to student educational needs is **clearly** identified.	The rationales provided **are aligned** with the learning objective and the relationship of the learning objectives to student educational needs is **clearly and effectively** identified.
Section 3 **Description of Instructional Strategies**				
The candidate plans how to achieve each student's learning goals, choosing appropriate	The candidate **does not** identify instructional strategies or identifies instructional	The candidate identifies instructional strategies that are **marginally** related to the learning	The candidate identifies **evidence-based** instructional strategies that are aligned to the	The candidate identifies **evidence-based** instructional strategies that are aligned to

strategies and accommodations, resources, and materials to differentiate instruction for individuals and groups of learners. ***InTASC 7(b)***	strategies that are **not related** to the learning objectives **or** student learning needs.	objectives **or** student learning needs.	learning objectives and student learning needs.	**specific** learning objectives and student learning needs. The candidate provides **specific sources of** evidence for the instructional strategy.
Rationale for Instructional Strategies				
The candidate understands that each learner's cognitive, linguistic, social, emotional, and physical development influences learning and knows how to make instructional decisions that build on learners' strengths and needs. ***InTASC 1(e)***	The candidate **does not provide** rationales which are aligned to the specific instructional strategies **and/or** the relationship of instructional strategies to the learning objectives and student educational needs is **missing or unclear**.	The rationales provided **do not** aligned to the specific instructional strategies and, the relationship of the instructional strategies to the learning objectives that meet student educational needs is **unclear**.	The rationales provided **are aligned** with instructional strategies and, the relationship of the instructional strategies to the learning objectives that meet student educational needs is **clearly** identified.	The rationales provided **are aligned** with the strategies and, the relationship of the instructional strategies to **specific** learning objectives that meet student educational needs is **clearly and effectively** identified.
Section 4 **Description of Instructional Adaptation**				
The candidate accesses resources, supports, and specialized assistance and services to meet particular learning differences or needs. ***InTASC 2(f)***	The candidate **does not identify** either adaptations or accommodations to support student achievement of learning objectives.	The candidate identifies **either** adaptations or accommodations that **minimally support** student achievement of learning objectives.	The candidate identifies and describes appropriate adaptations or accommodations that **clearly support** student achievement of learning objectives.	The candidate identifies and thoroughly describes appropriate adaptations or accommodations that **clearly support** student achievement of learning objectives.
Rationale for Instructional Adaptation				
The candidate	The candidate	The rationales	The rationales	The rationales

knows a range of evidence-based instructional strategies, resources, and technological tools and how to use them effectively to plan instruction that meets diverse learning needs. ***InTASC 7(k)***	**does not provide** rationales that are aligned to the adaptations and accommodations **and/or** the relationship of the adaptations and accommodations to student educational needs is **missing or unclear**.	**marginally provides** evidence to support the adaptations and accommodations and the relationship of the adaptations and accommodations to student educational needs is **unclear**.	provide **adequate** evidence to support the adaptations and accommodations and the relationship of the adaptations and accommodations to student educational needs is **clearly identified.**	provide **evidence-based support** for the specific adaptations and accommodations and the relationship of the adaptations and accommodations to student educational needs is **clearly and thoroughly** identified.
Section 5 Assessment and Documentation of Student Progress				
The candidate designs assessments that match learning objectives with assessment methods and minimizes sources of bias that can distort assessment results. ***InTASC 6(b)***	The candidate **does not** describe an assessment plan that that evaluates all student learning objectives **or** describes a plan that **does not** directly measure all of the student learning objectives (e.g., is **not observable, measurable**).	The candidate describes an assessment plan that evaluates all student learning objectives but **does not** include documentation of **both** formative and summative measures that **does not** address possible assessment bias.	The candidate describes an assessment plan that evaluates all student learning objectives **and includes both** formative and summative assessments that minimize sources of bias. The candidate describes the assessment results that would prompt modification of instructional plans **and** those specific modifications.	The candidate describes an assessment plan that evaluates **all** student learning objectives, **includes** formative and summative assessments that minimize sources of bias and includes **multiple** data sources for each objective. The candidate describes **multiple** assessment results that would prompt modification of instructional plans **and** those specific modifications.

. **EDCI 472/672 Unit Plan Project Rubric**

NCTM Secondary Mathematics Rubric

***NCTM* Standard 2: Mathematical Practices** Candidates 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. *Plans include opportunities for students to engage in the following:*				
NCTM CAEP Sub-Element Alignment	**Does Not Meet Expectations (1)**	**Approaches Expectations (2)**	**Meets Expectations (3)**	**Exceeds Expectations (4)**
2a.1	Lessons provide no evidence of use of problem solving to develop conceptual understanding.	Lessons include limited or unclear uses of problem solving to develop conceptual understanding	Lessons include activities that use problem solving to develop conceptual understanding.	Lessons include activities that provide students with opportunities to use problem solving and to develop conceptual understanding.
2a.2	Lessons do not show evidence of connections to the field of mathematics or real-world contexts	Lessons do not engage students in problem solving activities or the activities only connect to the field of mathematics	Lessons engage students in problem solving activities within the field of mathematics. The candidate makes connections in real-world contexts.	Lessons engage students in problem solving activities within the field of mathematics and to connections in real-world contexts.
2a.3	Lessons offer few opportunities for students to adapt and present a	Lessons offer opportunities for students to solve problems and to	Lessons create opportunities for students to adapt and present a	Lessons consistently create opportunities for students to adapt and

	variety of problem solving strategies and to make sense of problems and persevere in solving them.	make sense of them and persevere in solving them. Opportunities to present a variety of problem are lacking.	variety of problem solving strategies and often lead to students making sense of problems and persevere in solving them.	present a variety of problem solving strategies and to make sense of problems and persevere in solving them.
2a.4	Lessons do not include opportunities for students to formulate and test conjectures in order to frame generalizations.	Lessons include experiences that allow for student discovery but lack the proper foundation for students to frame generalizations.	Lessons include an opportunity for students to formulate and test conjectures in order to frame generalizations.	Lessons include several mathematical activities and investigations that allow for students to formulate and test conjectures in order to frame generalizations
2b.1	Lessons are not designed to allow students opportunities to reason abstractly and quantitatively with attention to precision.	Lessons are designed to allow students opportunities to reason abstractly and quantitatively with attention to precision, yet inappropriate strategies or flawed arguments are within the materials.	Lessons support opportunities to communicate mathematical reasoning with clarity, precision, and logical order.	Lessons support opportunities to reason abstractly, reflectively, and quantitatively with attention to units, constructing viable arguments and proofs.

2b.2	Lessons have no evidence of students having opportunity to understand the mathematical reasoning and strategies of others.	Lessons have evidence of attempts for students having opportunities to reason mathematically or understand the strategies of others. Candidate inconsistently interprets the reasoning of his/her student in the analysis or draws limited conclusions.	Lessons have evidence of consistent opportunities for students to reason mathematically and understand the strategies of others. Candidates can meaningfully interpret the reasoning of his/her students.	Lessons have evidence of consistent opportunities for students to reason mathematically and understand the strategies of others. Candidates can meaningfully interpret the reasoning of his/her students.
2b.3	Lessons do not include opportunities for students to represent or model generalizations using mathematical reasoning.	Lessons include very few opportunities for students to represent or model generalizations using mathematical reasoning.	Lessons include opportunities for students to represent and model generalizations using mathematical reasoning.	Lessons are designed around opportunities for students to represent and model generalizations and to recognize patterns of mathematical reasoning.
2b.4	Lessons only allow student to communicate mathematical ideas using a single representation (e.g., only symbolic representation).	Lessons allow for communication using more than one representation, but no connections are made between/among the representations.	Lessons mostly require student communication and connections across a variety of representations.	Lessons consistently require student communication and connections across a variety of representations.

2b.5	Lessons do not provide opportunities for students to use appropriate vocabulary and symbols to communicate mathematical ideas to other.	Lessons provide very few opportunities for students to use appropriate vocabulary and symbols, OR vocabulary is only used in a definitional way so students do not use it to communicate mathematical ideas.	Lessons mostly require students to use appropriate vocabulary and symbols to communicate mathematical ideas to others.	Lessons consistently require students to use appropriate vocabulary and symbols to communicate mathematical ideas to others.
2c.1	Lessons are not designed to recognize mathematical models derived from real-world contexts.	Lessons incorporate real-world contexts, but do not require students to formulate and represent them.	Lessons provide opportunities for students to formulate and represent mathematical models derived from real-world contexts.	Lessons provide opportunities for students to formulate and represent mathematical models derived from real-world contexts and to build mathematical understanding from the models.
2c.2	Lessons are not designed to recognize mathematical models derived from real-world contexts.	Lessons incorporate real-world contexts, but do not require students to analyze and interpret them.	Lessons provide opportunities for students to analyze and interpret mathematical models derived from real-world contexts.	Lessons provide opportunities for students to analyze and interpret mathematical models derived from real-world contexts and to build mathematical understanding from the models.

2d	Lessons do not create opportunities for students to organize thinking and use precise mathematical language.	Lessons minimally allow for students to organize thinking. Students rarely use the language of mathematics to precisely communicate to multiple audiences.	Lessons allow for students to organize thinking and use the language of mathematics to precisely communicate ideas.	Lessons allow for students to organize thinking and use the language of mathematics to precisely communicate ideas to multiple audiences.
2e.1	Lessons do not demonstrate the interconnectedness of mathematical ideas and how they build on each other.	Lessons minimally allow students to demonstrate the interconnectedness of mathematical ideas and do not allow student to show how they build on each other.	Lessons allow students to demonstrate the interconnectedness of mathematical ideas and often allow students to show how they build on each other.	Lessons consistently allow students to demonstrate the interconnectedness of mathematical ideas how they build on each other.
2e.2	Lessons do not allow student to apply mathematical connections among mathematical ideas and across various content areas and real-world contexts	Lessons allow student to apply mathematical connections among mathematical ideas but not across various content areas and real-world contexts	Lessons often allow student to apply mathematical connections among mathematical ideas and across various content areas and real-world contexts.	Lessons consistently allow student to apply mathematical connections among mathematical ideas and across various content areas and real-world contexts.

2f	Lessons do not model how the development of mathematical understanding within and among mathematical domains intersects with the mathematics practices of problem solving, reasoning communicating, connecting, and representing.	Lessons model how the development of mathematical understanding within and among mathematical domains intersects with *some* the mathematics practices of problem solving, reasoning communicating, connecting, and representing.	Lessons model how the development of mathematical understanding within and among mathematical domains intersects with all the mathematics practices of problem solving, reasoning communicating, connecting, and representing.	Lessons model and allow student to model how the development of mathematical understanding within and among mathematical domains intersects with some the mathematics practices of problem solving, reasoning communicating, connecting, and representing.
			Mean Score for Standard 2	
***NCTM* Standard 3: Content Pedagogy** Candidates 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 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. *Lessons include the following:*				
3a.	Candidate's goals of instruction are unclear and/or inappropriate.	Candidate identifies the goals of instruction, but do not align them to appropriate curriculum standards.	Candidate's Lessons are appropriate and align with the curricular standards.	Candidate clearly identifies the goals of the instruction and how they align with the appropriate curriculum standards. The candidate identifies

				learning outcomes based on the standards.
3b	Candidate does consider research in planning for rich mathematical learning experiences in their narrative or lesson plans.	Candidate cites research in planning for rich mathematical learning experiences in narrative, but it is not evident in the lessons.	Candidate cites and considers research in planning for rich mathematical learning experiences as evidenced in their narrative and lessons.	Candidate cites, analyzes, and considers research in planning for rich mathematical learning experiences as evidenced in their narrative and lessons.
3c.1	Lessons do not incorporate differentiated learning strategies to support diverse populations	Lessons include only one differentiation strategy across all the lessons in the unit to support diverse populations.	Lessons include more than one differentiated instructional strategy that support diverse populations.	Lessons include a variety of differentiated instructional strategies that support diverse populations.
3c.2	Lessons do not incorporate mathematics-specific technology.	Lessons inappropriately incorporate mathematics-specific technology OR technology use fails to build conceptual understanding and procedural fluency.	Lessons include appropriate mathematics-specific technology in an attempt to build conceptual understanding and fluency.	Lessons include appropriate mathematics-specific technologies to effectively support all students' conceptual understanding and procedural fluency.
3e.1	Lessons do not incorporate selection of high quality tasks.	Lessons rarely incorporate high-quality tasks	Lessons often incorporate high-quality tasks	Lessons consistently incorporate high-quality tasks

3e.2	Candidate does not engage students through guided mathematical discussions.	Candidate rarely engages students in guided mathematical discussions.	Candidate often engage students in guided mathematical discussions.	Candidate consistently engage student in guided mathematical discussions and encourage students to facilitate their own discourse.
3e.3	Lessons do not support students in identifying key mathematical ideas.	Lessons have potential to support students in identifying key mathematical ideas, but candidate does not plan for opportunities for students to conjecture.	Lessons often support students in identifying key mathematical ideas.	Lessons consistently support students in identifying key mathematical ideas.
3e.4	Candidate does not identify and address student misconceptions within the lesson plans.	Candidate rarely identifies and addresses student misconceptions within the lesson plans.	Candidate identifies and address student misconceptions in lesson plans.	Candidates identify and address student misconceptions and encourage his/her students to do the same.
3e.5	Candidate does not employ any questioning strategies.	Candidate only uses closed questioning strategies.	Candidate uses a range of open and closed questioning strategies.	Candidate employs a wide range of questioning strategies, with emphasis on open questions that push students to create meaning.
3f.1	Candidate is not competent in planning, selecting, and implementing formative or summative	Candidate is competent in planning, selecting, and implementing summative or formative assessments, but not both, as	Candidate is competent in planning selecting and implementing summative assessments, as	Candidate is competent in planning, selecting, implementing formative and summative assessments to inform

	assessments, as evidenced by unit materials and narrative.	evidenced by unit materials and narrative.	evidenced by unit materials and narrative.	instruction, as evidenced in unit materials and narrative. Candidate uses results to inform instructional planning as evidenced in narrative.
3f.2	Candidate is not competent in interpreting and using formative assessments, as evidenced by unit materials and narrative.	Candidate is competent in interpreting and using formative assessments or summative assessments, but not both, as evidenced by unit materials and narrative.	Candidate is competent in interpreting and using results of formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students, as evidenced by unit materials and narrative.	Candidate is competent in interpreting in and using results of formative and summative assessments to inform instruction by reflecting on mathematical proficiencies essential for all students, as evidenced by unit materials and narrative. Candidate uses assessment results for subsequent instructional planning, as evidenced in narrative.
			Mean Score for Standard 3	
***NCTM* Standard 4: Mathematical Learning Environment** Candidates exhibit knowledge of adolescent learning, development, and behavior and use this knowledge to create learning opportunities that are grounded in mathematics education research in which students are actively learning and building on prior knowledge and skills. *Plans include the following:*				
4a.1	Candidate does not demonstrate evidence of	Candidate demonstrates minimal evidence of	Candidate demonstrates evidence of general	Candidate demonstrates strong evidence of in-

	in-depth knowledge of adolescent development. Lessons contain activities that do not align with adolescent behavior and development.	general knowledge of adolescent development. Lessons contain some activities that do not align with adolescent behavior and development.	knowledge of adolescent development. Lessons contain activities that align with adolescent behavior and development.	depth knowledge of adolescent development. Lessons contain activities that align with adolescent behavior and development.
4a.2	Candidate demonstrates evidence of fostering growth mind sets with students.	Candidate demonstrates evidence of fostering growth mind sets with students.	Candidate demonstrates evidence of fostering growth mind sets.	Candidate demonstrates strong evidence of fostering growth mind sets.
4b.1	Lesson plan activities were not developmentally appropriate and were not challenging enough or were too challenging.	Lesson plan activities were developmentally appropriate but were not challenging enough or were too challenging.	Lesson plan activities were developmentally appropriate and mostly integrated an adequate amount of challenge.	Lesson plan activities were sequenced to create challenge and learning opportunities that were developmentally appropriate.
4b.2	Instructional strategies are not grounded in mathematics education research.	Candidate references mathematics education research when selecting instructional strategies, but the enactment of strategies does not align with the research.	Instructional strategies are grounded in mathematics education research.	Instructional strategies are grounded in mathematics education research in which students are actively engaged.
4b.3	Lesson plans do not support students in building knowledge from	Lesson plans minimally support students in building new knowledge	Lesson plans support student in building new knowledge from prior	Lesson plans actively engage students in building new knowledge

	prior knowledge and experiences	from prior knowledge and experiences.	knowledge and experiences.	from prior knowledge and experiences.
4d	Candidate demonstrates equitable treatment and high expectations for all students.	Candidate demonstrates minimal consideration for the equitable treatment and high expectations for all students.	Candidate demonstrates consideration for the equitable treatment and high expectations for all students.	Candidate demonstrates equitable treatment and high expectations for all students and incorporates students' experiences into the curriculum
4e.1	Instructional tools (e.g., manipulatives, models, virtual manipulatives, etc.) are not used in the unit lessons.	Lessons include instructional tools (e.g., manipulatives, models, virtual manipulatives, etc.) that do not enhance teaching and learning.	Lessons incorporate instructional tools (e.g., manipulatives, models, virtual manipulatives, etc.) in ways that enhance teaching and learning.	Lessons incorporate instructional tools (e.g., manipulatives, models, virtual manipulatives, etc.) in ways that enhance teaching and learning. Candidate recognizes both insights to be gained and possible limitations of such tools.
4e.2	Mathematics-specific technologies were not used by the candidate.	Lessons include mathematics-specific technologies that do not enhance teaching and learning.	Lessons incorporate mathematics-specific technologies in ways that enhance teaching and learning.	Lessons incorporate mathematics-specific technologies in ways that enhance teaching and learning. Candidate recognizes both insights to be gained and possible limitations of such tools.
			Mean Score for Standard 4	

***NCTM* Standard 6: Professional Knowledge and Skills** Candidates provide evidence of participating in professional development experiences specific to mathematics and mathematics education, draw upon mathematics education research to inform practice, continuously reflect on their practice, and utilize resources from professional mathematics organizations. Candidates demonstrate the following:				
6c.	Candidate does not utilize resources from professional mathematics education organizations.	Candidate cites and/or uses resources from professional mathematics education organizations, but often refers to resources that do not align with professional mathematics education organizations.	Candidate often utilizes resources from professional mathematics organizations such as print, digital, and virtual resources/collections throughout the unit plan.	Candidate consistently utilizes resources from professional mathematics education organizations such as print, digital, and virtual resources/collections throughout the unit plan.
			Mean Score for Section 6	

EDCI 472/672 Unit Plan Project Rubric

STANDARDS	Mean Score across Standards
INTASC Standards	
InTASC Standard 1a	
InTASC Standard 6g	
InTASC Standard *7a*	
InTASC Standard 7d	
InTASC Standard 7b	
InTASC Standard 1e	
InTASC Standard 2f	
InTASC Standard 7k	
InTASC Standard 6b	
InTASC average score	
NCTM SPA Standards	
NCTM Standard 2: Mathematical Practices	
NCTM Standard 3: Content Pedagogy	
NCTM Standard 4: Mathematical Learning Environment	
NCTM Standard 5: Impact on Student Learning	
NCTM Standard 6: Professional Knowledge and Skills	
NCTM average score	

NOTE: Minimum mean rating of 3.0 (with at least a rating of <u>2.0</u> for each standard) is required for each rubric.