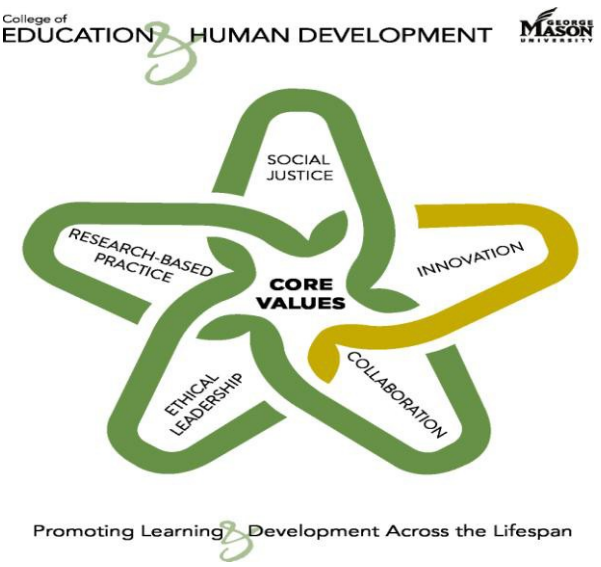
George Mason University
College of Education and Human Development
Secondary Education Program
EDCI 672 - 002: Advanced Methods of Teaching Mathematics in the Secondary School



~~~~~~

Instructor: Brad Rankin, Ph.D.
E-mail: BRankin3@gmu.edu
Office Hours: Wednesdays 6:45–7:20 pm, and by appointment
Class Meets: Wednesday 7:20 – 10:00 in Thompson Hall 1020

~~~~~~

Purpose of the Course
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!

Course Description as provided in the Course Catalog
This course emphasizes developing different styles of teaching and covers curricula, current issues, and research literature in secondary school mathematics. School-based field experience is required.

Pre-requisites:
EDCI 372/572

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

- demonstrate an ability to critique classroom discourse and the role of the teacher in facilitating that discourse through findings from research on student learning (NCTMSPAStandard3; NCTM SPA Indicators 7.3,7.4, 8.6; CEHD Core Values of Collaboration and Research-Based Practice)

- demonstrate an ability to plan a mathematics lesson that fosters deep understanding of mathematics content for *all* students(NCTM SPA Standards 4, 5; NCTM SPA Indicators 3a, 3b, 3c; CEHD Cores Values of Innovation, Research-Based Practice and Social Justice)
- 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 (NCTMSPAStandards1, 2; NCTM SPA Indicators 3d, 3e, 4e, 5bCEHD Core Values of Innovation, Research-Based Practice, and Social Justice)
- develop assessments that give a teacher insight into student thinking about mathematics content (NCTM SPAIndicators3f, 3g NCTM SPA Standard 4)
- conduct an analysis of ideas for teaching mathematics in diverse classrooms– Graduate Students only (NCTM SPA Indicators 3c; NCTM SPA Standard4;CEHD Core Value of Social Justice)
- 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 (NCTM SPA Indicator 7c; CEHD Core Value of Research-Based Practice)

Plan for the Course

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 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.

Textbooks and Materials
Daily access to the following materials is required:

Brahier, D.J. (2009 or 2012). *Teaching secondary and middle school mathematics* (3rd edition or 4th edition). Boston: Pearson Education Inc.

Brahier, D. J. (2001). *Assessment in middle and high school mathematics: A teacher's guide*. New York: Eye on Education.

Wiggins, G. & Jay McTighe (2005). *Understanding By Design* (2nd Expanded edition). Alexandria, VA: Assn. for Supervision & Curriculum Development.

Donovan, M. S., & Bransford, J. D. (2005). *How students learn: Mathematics in the classroom*. Washington, D.C.: The National Academies Press. We will look at excerpts from this text, which can be retrieved from the following website: http://www.nap.edu/catalog.php?record_id=11101

Kilpatrick, J., Swafford, J., & Findell, B. (2001). *Adding it up: Helping children learn mathematics*. Washington, D.C.: The National Academies Press. We will look at excerpts from this text, which can be retrieved from the following website: http://www.nap.edu/catalog.php?record_id=9822

Additional readings as assigned. All additional readings will be uploaded to Blackboard.

Course Expectations/Major Assignments
The following assignments will help you (and me) to gauge your development throughout the course:

Assessment	Due Date	Percentage of Grade
Participation and Preparation (including weekly and smaller assignments)		20%
Assessment Assignment		15%
Micro-Teaching		25%
Field Work Assignment		15%
Unit Plan Assignment (differentiated by undergrad/graduate level)		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 you work on a given assignment, and to participate in the activities of the day the entire class will suffer. You **must** commit to coming to every class on time, being prepared for the evening's activities, and 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 11:59 pm 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 Presentation

Throughout this semester, you will explore many issues related to the teaching and learning of mathematics. In this 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. **The requirement for this assignment differs for graduate and undergraduate students. You must pass this assignment to continue in the program.**

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. One assessment will be a quiz assessing the goals and objectives from one of the lessons in your unit plan. Another assessment will be an alternative form of assessment used to assess the goals and objectives of the unit.

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. You will choose one of your lessons from the unit plan for this assignment. The implementation of the 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.

Communication

You must regularly check your GMU email and Blackboard: https://courses.gmu.edu.

Evaluation

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%

Student Expectations (as described by the College of Education and Human Development)

- Students must adhere to the guidelines of the George Mason University Honor Code [See

http://academicintegrity.gmu.edu/honorcode/].

- Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
- Students must follow the university policy for Responsible Use of Computing [See http://universitypolicy.gmu.edu/1301gen.html].
- Students are responsible for the content of university communications sent to their George Mason University 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 must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
- Students are expected to exhibit professional behaviors and dispositions at all times.

TaskStream Requirements

Every student registered for any Secondary Education course with a required performance-based assessment is required to submit this assessment to TaskStream (regardless of whether a course is an elective, a onetime course or part of an undergraduate minor). Evaluation of the performance-based assessment by the course instructor will also be completed in TaskStream. Failure to submit the assessment to TaskStream will result in the course instructor reporting the course grade as Incomplete (IN). Unless the IN grade is changed upon completion of the required TaskStream submission, the IN will convert to an F nine weeks into the following semester.

GMU Policies and Resources for students

a) Students must adhere to the guidelines of the George Mason University Honor Code [See http://oai.gmu.edu/the-mason-honor-code/].
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 George Mason University 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) The George Mason University 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/].
e) Students with disabilities who seek accommodations in a course must be registered with the George Mason University Office of Disability Services (ODS) and inform their instructor, in writing, at the beginning of the semester [See http://ods.gmu.edu/].
f) Students must follow the university policy stating that all sound emitting devices shall be turned off during class unless otherwise authorized by the instructor.
g) The George Mason University Writing Center staff 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/].

Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times.

Commitment to the profession
Promoting exemplary practice
Excellence in teaching and learning
Advancing the profession
Engagement in partnerships

Commitment to honoring professional ethical standards
Fairness
Honesty
Integrity
Trustworthiness
Confidentiality
Respect for colleagues and students

Commitment to key elements of professional practice
Belief that all individuals have the potential for growth and learning
Persistence in helping individuals succeed
High standards
Safe and supportive learning environments
Systematic planning
Intrinsic motivation
Reciprocal, active learning
Continuous, integrated assessment
Critical thinking
Thoughtful, responsive listening
Active, supportive interactions
Technology-supported learning
Research-based practice
Respect for diverse talents, abilities, and perspectives
Authentic and relevant learning

Commitment to being a member of a learning community
Professional dialogue
Self-improvement
Collective improvement
Reflective practice
Responsibility
Flexibility
Collaboration
Continuous, lifelong learning

Commitment to democratic values and social justice
Understanding systemic issues that prevent full participation
Awareness of practices that sustain unequal treatment or unequal voice
Advocate for practices that promote equity and access
Respects the opinion and dignity of others
Sensitive to community and cultural norms
Appreciates and integrates multiple perspectives

Tentative Schedule

The dates 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. Sometimes students will read different articles or chapters and share their understandings with the class.

Date	Topic	Text	Assignment Due
Jan 21	**The Big Picture**: Course Goals and Unit Planning **Guess and Check Tables**	Brahier (2009): Chapter 1 *and* pp. 136-141 OPTIONAL: Sfard (1991) – See Blackboard	
Jan 28	**Assessment***:* - Role of Assessment - NCTM Assessment Standards **Staging a Unit**	Brahier(2009/2013): Chapter 9: pp. 259-270 (3rd ed); OR pp. Chapter 10: 277-288 (4th ed.) Brahier (2009/2013): Chapter 10: pp. 295-303 (3rd ed.) OR Chapter 11: pp. 311-321 (4th ed.) Wiggins and McTighe Chapters 1 & 2	Select unit topic Select appropriate NCTM, VA SOL, and CCSM standards that align to Unit Plan
Feb 4	**Creating Meaningful Assessments** **Effective Questioning** - Open Questions - Open-Middled Questions - Closed Questions - Student-Generated Questions **The Rule of Five**	Brahier (2001, assessment book) Chapter 1 Wiggins and McTighe Chapters 3 & 4	Unit idea and sketch of Concept map due (Upload to **Blackboard**)
Feb 11	**Assessment** - Creating Rubics for Alternate Assessments - Scoring Alternate Assessments **Integer Tiles**	Brahier (2009/2013): Chapter 10 pp. 303-315 (3rd ed.) OR Chapter 11 pp. 321-333 (4th ed.) Wiggins and McTighe Chapters 5 & 6	Select Micro-teaching Topic (in class)
Feb 18	**Assessment***:* - Alternative Assessments - The Role of Homework **Algebra Tiles (part 1)**	Brahier (2001, Assessment book): Brahier (2001): Chapters 2 and 3 Wiggins and McTighe Chapters 9 & 10	Drafts of open, open-middled, and closed questions for Unit Plan due (Upload to **Blackboard** and bring copy to class.)

Feb 25	**Assessment***:* - Determining Final Grades - Assessment Plans - Standardized Assessment **Algebra Tiles (part 2)**	Brahier (2001, Assessment Book): Chapters 4 and 5 Selected readings – see course site Wiggins and McTighe Chapters 11 & 12	First lesson plan for Unit Plan due (Upload to **Blackboard**)
Mar 4	**Differentiation, Equity, and Mathematics** - What is Differentiation? - NCTM's Equity Principle - Equity concerns in Math Education - Equitable Practice in Mathematics Classrooms **Generic Rectangles**	Brahier (2009, 3rd edition): Chapter 11 OR (2013, 4th edition): Chapter 12 Dodge Chapter 1	
Mar 11		**No Class – Spring Break**	
Mar 18	**Differentiation and Honoring Diversity and Equity in Teaching Mathematics** - Using manipulatives to differentiate - Special Education, IEPs, and the Mathematics Classroom **Geogebra (part 1)**	Selected readings – see course site	**Assessment Plan Due** (Upload to **Blackboard**)
Mar 25	**Differentiation and Honoring Diversity and Equity in Teaching Mathematics (cont.)** - Strategies for differentiation **Geogebra (part 2)**	Selected readings – see course site	
Apr 1	**Managing Mathematical Discourse** - Proof, Argumentation, and Geometric Reasoning - ELL students and Mathematics Instruction - Expectation messages in student-teacher discourse **Geogebra (part 3)**	Selected readings – see course site	Draft of Unit Plan due (Upload to **Blackboard**)

Apr 8	**Managing Mathematical Discourse and Effective Questioning** - Boaler & Broadie (2005) Question Types - Focusing vs. Funneling **The Number Line**	Selected readings – see course site	
Apr 15	**Role of Mathematics Teacher in the Community** - Working with Parents - Professionalism - Relationship Building and Classroom management **Smart Board and Notebook Software**	Brahier: Chapter 12 (3rd edition) Chapter 13 (4th edition)_	
Apr 22	**Micro Teaching Presentations**		**1.) Unit Plan Due** **2.) Micro-teaching Lesson Plans**
May 6	**Micro Teaching Presentations**		**1.) Field Work Assignment Due** **2.) Micro-teaching Lesson Plans**
May 13	**Micro Teaching Presentations**		**Micro-teaching Lesson Plans**

UNIT PLAN
Scoring Rubric

The unit plan will be evaluated using two different rubrics: *InTASC* and *NCTM*. Together, these two rubrics evaluate teacher candidates' ability to demonstrate a variety of NCTM SPA standards for the Planning assessment.

For each of the standards the following scoring criteria are used:
0 – unacceptable
1 – marginal
2 – meets expectations
3 – exceeds expectations

In order to pass this assignment, teacher candidates need to earn a mean score of at least 2.0 on <u>each</u> of the rubrics. Should a unit plan earn less than a mean score of 2.0 on <u>either</u> rubric, the teacher candidate will be asked to redo the unit plan until the minimum standard is met.

Rubric for *InTASC* Standards

Content: *InTASC* Standard 1 **SCORE _____**

The teacher candidate understands the central concepts, tools of inquiry, and structures of the discipline he or she teaches and can create learning experiences that make these aspects of subject matter meaningful to students.

Performance Indicators:

- Uses Essential Relevant Content
- Organizes Instruction Around Unifying Themes
- Builds a Conceptual Framework
- Displays Content Accuracy
- Fosters Understanding of Disciplinary Norms and Ways of Thinking

Interpretation for Mathematics: Instruction focuses on the "big ideas" of mathematics and shows connections between and among concepts. Students are engaged in discovery/inquiry-based activities whereby students make conjectures, explore relationships, and justify their thinking using multiple types of reasoning.

Scoring:

0	1	2	3
Content in the lessons is not important or unified, and does not focus on the "big ideas" within mathematics. Students are not actively engaged in learning mathematics through discovery/inquiry-based activities.	Instruction does focus on the "big ideas" of mathematics but does not show connections between and among concepts. Students may or may not be engaged in learning mathematics through discovery/inquiry-based activities.	Instruction focuses on the "big ideas" of mathematics and shows connections between and among concepts. Students are engaged in learning mathematics through discovery/inquiry-based activities.	Instruction focuses on the "big ideas" of mathematics and shows connections between and among concepts. Students are regularly and meaningfully engaged in learning mathematics through discovery/inquiry-based activities.

Student Learning *InTASC* Standard 2 **SCORE _____**

The teacher candidate understands how students learn and develop and can provide learning opportunities that support a student's intellectual, social, and personal development.

Performance Indicators:

- Fosters Active Student Involvement
- Uses Developmentally Appropriate Activities

Interpretation for Mathematics: Students are actively engaged in exploration of mathematical ideas and concepts. Progression of activities is appropriately organized to facilitate the development of deep, conceptual understandings of mathematics.

Scoring:

0	1	2	3
Students are not actively engaged in exploration of mathematical ideas and concepts. Progression of activities is not appropriately organized to facilitate the development of deep, conceptual understanding of mathematics.	Students are rarely actively engaged in exploration of mathematical ideas and concepts. Progression of activities is not appropriately organized to facilitate the development of deep, conceptual understanding of mathematics.	Students are rarely engaged in exploration of mathematical ideas and concepts. Progression of activities is appropriately organized to facilitate the development of deep, conceptual understanding of mathematics.	Students are regularly, actively engaged in exploration of mathematical ideas and concepts. Progression of activities is appropriately organized to facilitate the development of deep, conceptual understanding of mathematics.

Diverse Learners *InTASC* Standard 3 **SCORE _____**

The teacher candidate understands how students differ in their approaches to learning and creates instructional opportunities that are adapted to diverse learners.

Performance Indicators:

- Attends to Different Learning Styles
- Attends to Different Learning Needs (e.g., ELL, learning disabilities, gender, etc.)
- Attends to Different Skill Levels
- Uses Activities Relevant to Students

Interpretation for Mathematics: Students are actively engaged in meaningful learning of mathematics in ways that connect the mathematics to their worlds. Appropriate scaffolding is used to help students of various skill levels to develop strong understandings of mathematics. Note: This does not mean a lowering of the standards. Rather it means appropriate supports are put in place to help all students learn meaningful mathematics.

Scoring:

0	1	2	3
Lessons are not designed to attend to different learning styles, learning needs, or skill levels. Activities are not relevant to students nor do they enable students to engage in meaningful exploration of mathematics.	There is some evidence that lessons attend to different learning styles, learning needs, and skill levels – but it is rare. Activities are rarely relevant to students and rarely enable students to engage in meaningful exploration of mathematics.	Lessons frequently attend to different learning styles, learning needs, and skill levels. Activities are frequently relevant to students so that students are regularly engaging in meaningful exploration of mathematics.	Lessons regularly attend to different learning styles, learning needs, and skill levels. Activities are always relevant to students so that students are regularly engaging in meaningful exploration of mathematics.

Instruction *InTASC* Standard 4 **SCORE 1 ____, SCORE 2 ____, MEAN SCORE _____**

The teacher candidate understands and uses a variety of instructional strategies to encourage student development of critical thinking, problem solving, and performance skills.

Performance Indicators:

- Uses Variety of Strategies and Activities
- Uses Effective Questioning
- Fosters Higher-Order Thinking
- Encourages Student Thinking/Inquiry
- Fosters Student Creativity and Choices
- Demonstrates Teacher Creativity
- Incorporates Sufficient Detail to Teach
- Uses Coherent Connection among Activities

Interpretation for Mathematics: Students are engaged in the problem-solving process. They are presented with high-level questions and tasks and asked to explore mathematical concepts in a variety of contexts. These tasks are creatively developed or chosen by the teacher and demonstrate connection both within mathematics and of mathematics to the real-world. Students are encouraged to apply and adapt strategies to solve problems and to use a variety of representations.

Scoring (2 rubrics for this category):

0	1	2	3
Lessons do not encourage student thinking/inquiry nor do they engage students in higher-level thinking. Lessons do not foster student creativity/choice.	There is some evidence that lessons encourage student thinking/inquiry and engage students in higher-level thinking, but it is rare. Rarely do lessons foster student creativity/choice.	Lessons frequently encourage student thinking/inquiry and engage students in higher-level thinking. Lessons frequently foster student creativity/choice.	Lessons regularly encourage student thinking/inquiry and engage students in higher-level thinking. Lessons regularly foster student creativity/choice

0	1	2	3
Lessons do not exhibit teacher creativity. Activities are not connected coherently nor are they varied. There is not enough detail provided to	Rarely do lessons exhibit teacher creativity. Activities are somewhat coherently connected and varied. Most details are there to teach the	Lessons frequently exhibit teacher creativity. Most activities are coherently connected and varied. There is enough detail provided to	Lessons regularly exhibit teacher creativity. Activities are coherently connected and varied. There is enough detail provided to teach.

teach the lesson.	lesson.	teach.	

Learning Environment *InTASC* Standard 5 **SCORE _____**

The teacher candidate uses an understanding of individual and group motivation and behavior to create a learning environment that encourages positive social interaction, active engagement in learning, and self-motivation.

Performance Indicators:

- Establishes Routines
- Uses Individual Work
- Organizes Group Work
- Anticipates/Avoids Potential Discipline Problems

Interpretation for Mathematics: The learning environment is set-up (on a daily basis) to promote individual and group work and to support student learning through avoidance of potential discipline problems.

Scoring:

0	1	2	3
Lessons do not provide structure. There are not opportunities for <u>both</u> individual and group work.	Lessons provide structure. Rarely are there opportunities for <u>both</u> individual and group work.	Lessons provide structure. There are regular opportunities for <u>both</u> individual and group work.	Lessons provide structure. There are frequent opportunities for <u>both</u> individual and group work.

Communication *InTASC* Standard 6 **SCORE 1 ____, SCORE 2 ____, MEAN SCORE _____**

The teacher candidate uses knowledge of effective verbal, non-verbal and media communication techniques and appropriate technology to foster active inquiry, collaboration, and supportive interaction in the classroom.

Performance Indicators:

- Uses Effective Communication to Foster Inquiry
- Integrates Technology
- Fosters Collaboration
- Encourages Communication among Students
- Encourages Communication between Students and Teacher

Interpretation for Mathematics: Instruction incorporates technology facilitate learning of mathematics by enabling students to <u>explore</u> mathematics. The learning environment supports communication between and among teachers and students. Students are actively engaged with questions/tasks that encourage exploration. Students are asked to make conjectures, regularly analyze other students' thinking, and organize their own and others' thinking about mathematics.

Scoring (2 rubrics for this category):

0	1	2	3
Lessons do not provide opportunities for students to communicate their thinking with each other and the teacher. There are no opportunities for collaboration. .	Lessons rarely provide opportunities for students to communicate their thinking with each other and the teacher. There are rare opportunities for collaboration. .	Lessons regularly provide opportunities for students to communicate their thinking with each other and the teacher. There are regular opportunities for collaboration.	Lessons frequently provide opportunities for students to communicate their thinking with each other and the teacher. There are frequent opportunities for collaboration.

0	1	2	3
Technology is not infused in any lessons.	Technology is infused into some lessons but it is not used to facilitate meaningful mathematical exploration.	Technology is infused into some lessons and it is used to facilitate meaningful mathematical exploration.	Technology is infused into many lessons and is used to facilitate meaningful mathematical exploration.

Planning *InTASC* Standard 7 **SCORE_____**

The teacher candidate plans instruction based upon knowledge of subject matter, state and national standards, students, and the community.

Performance Indicators:

- Clearly Connects to Nat'l/State Standards
- Clearly connects to Course Objectives
- Relates Daily Question(s) or Objective(s) to Unit Question
- Relates Daily Activities to Question(s) or Objective(s)
- Relates Assessment to Questions/Objectives
- Develops Content Logically and Coherently

Interpretation for Mathematics: Instruction clearly connects to NCTM and VA SOL standards. All activities are appropriately designed to help students meet the specified objectives.

Scoring:

0	1	2	3
Lesson plans do not connect to standards. Activities and assessment do not align to expressed standards, nor do they develop in a logical way.	Rarely do lesson plans connect to standards. Activities and assessment do not align to expressed standards, nor do they develop in a logical way.	Lesson plans connect to standards. Activities and assessment are regularly aligned to expressed standards and regularly develop in a logical way.	Lesson plans connect to standards. Activities and assessment are frequently aligned to expressed standards and frequently develop in a logical way.

Assessment *InTASC* Standard 8 **SCORE_____**

The teacher candidate understands and uses formal and informal assessment strategies, consistent with instructional goals, to evaluate and ensure the continuous intellectual, social, and physical development of the learner.

Performance Indicators:

- Uses Variety of Formal/Informal Assessments
- Assesses Essential Understanding and Skills
- Assesses Higher Order Thinking Skills
- Incorporates Student Self-Assessment
- Uses Assessment to Inform Instruction

Interpretation for Mathematics: Assessment focused both on high- and low-level tasks/questions. Questions are designed to gain insight into students' procedural and conceptual understandings of important mathematics concepts and to assess their ability to problem solve. These assessments provide opportunities for students to assess their own understandings and reflect on their problem solving. The teacher uses these assessments to inform instruction.

Scoring (Score on this rubric is taken from the Assessment Assignment):

0	1	2	3
A variety of assessments are not used. Assessments do not assess higher order thinking, conceptual understanding, procedural skill, or problem solving. Assessment does not encourage self-assessment.	There is some variety in the choice of assessments. Rarely do assessments assess higher order thinking, conceptual understanding, procedural skill, or problem solving. Assessment may or may not encourage self-assessment.	There is some variety in the choice of assessments. Assessments assess higher order thinking, conceptual understanding, procedural skill, *and* problem solving to some degree. Assessment may or may not encourage self-assessment.	There is some variety in the choice of assessments. Assessments do a great job of assessing higher order thinking, conceptual understanding, procedural skill, *and* problem solving. Assessments encourage self-assessment.

Reflection *InTASC* Standard 9 **SCORE_____**

The teacher candidate is a reflective practitioner who continually evaluates the effects of his or her choices and actions on others (students, parents, and other professionals in the learning community) and who actively seeks out opportunities to grow professionally.

Performance Indicators:

- Presents Thoughtful/Coherent Research-based Rationale
- Shows Evidence of Reflection on this Rubric

Interpretation for Mathematics: The teacher engages in evidence-based reflection on the effectiveness of instruction to promote the development of problem solving skills and procedural/conceptual understanding of students.

Scoring:

0	1	2	3
Narrative and lessons do not provide evidence of reflection on research and suggestions of leaders in the field. Claims for instructional decisions are not well justified.	Narrative and lessons provide some evidence of reflection on research and suggestions of leaders in the field. Claims for instructional decisions are not well justified.	Narrative and lessons provide evidence of reflection on research and suggestions of leaders in the field. Claims for instructional decisions are well justified.	Narrative and lessons provide evidence of deep reflection on research and suggestions of leaders in the field. Claims for instructional decisions are very well justified.

Collaboration *InTASC* Standard 10 **SCORE_____**

The teacher candidate fosters relationships with school colleagues, parents, and agencies in the larger community to support students and their well being.

Performance Indicators:

- Fosters Professional or Community Relationships
- Uses Books, Internet, Research, and Other Resources)

Interpretation for Mathematics: The teacher is aware of professional resources for mathematics teachers (collaboration, journals, NCTM publications, technology) and consults these resources during planning.

Scoring:

0	1	2	3
No professional resources were used in construction of lessons.	There is some evidence of consultation to professional resources in the construction of the lessons.	There is evidence of consultation to professional resources in the construction of the lessons. Modifications to meet the needs of the lesson are mostly appropriate.	There is evidence of consultation to professional resources in the construction of the lessons. Modifications to meet the needs of the lesson are very appropriate.

Rubric for *NCTM* Standards

Each of the NCTM standards will be evaluated using the following rubric:

0	1	2	3
The candidate exhibits little, or irrelevant, evidence of meeting the standard for planning, teaching, and student learning.	The candidate exhibits insufficient evidence of performance in relation to essential knowledge, skills, dispositions required by the standard. Provides fundamental evidence of attainment but does not yet meet minimum expectations for planning, teaching, and student learning.	The candidate exhibits performance that meets the standard in essential knowledge, skills and dispositions. Provides evidence of sound work, usually with multiple examples of achievement which substantially meet basic expectations for planning, teaching, and student learning.	The candidate exhibits mastery of the knowledge, skills and dispositions required by the standard. Achieves an exceptional level of performance in relation to expectations of the program and generally provides multiple examples of excellence in performance for planning, teaching, and student learning.

***NCTM* Standard 1: Content Knowledge** **MEAN SCORE _____**

Candidates should demonstrate and apply knowledge of mathematical content.
Plans include opportunities for students to engage in the following:

Demonstrate knowledge of major mathematical concepts, algorithms, and procedures	0 1 2 3
Make connections between and among mathematical domains	0 1 2 3
Apply mathematics to varied contexts	0 1 2 3

***NCTM* Standard 2: Mathematical Practices** **MEAN SCORE _____**

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:

Use problem solving to develop conceptual understanding, make conjectures and generalizations, and apply and adapt a variety of strategies	0 1 2 3
Reason abstractly and quantitatively with attention to precision	0 1 2 3
Formulate, represent, analyze, and interpret mathematical models	0 1 2 3
Use the language of mathematics (e.g., vocabulary and symbols) to communicate mathematical ideas to others	0 1 2 3
Make connections between mathematical domains and the practices of problem solving, reasoning, communicating, connecting, and representing	0 1 2 3

***NCTM* Standard 3: Content Pedagogy** **MEAN SCORE _____**

Candidates apply knowledge of curriculum standards for mathematics and their relationship to student leraning.
Plans include:

Applying curriculum standards for secondary mathematics and relationship to student learning within the lessons	0 1 2 3
Use of research to create rich mathematical learning experiences	0 1 2 3
Use of instructional technologies to help students build conceptual understanding and procedural fluency	0 1 2 3
A variety of strategies and differentiated instruction for diverse populations	0 1 2 3
Opportunities for engagement and communication about mathematics (e.g, selecting high-quality tasks, guiding mathematical discussions, identifying key mathematical ideas,	0 1 2 3

addressing student misconceptions

Use of formative and summative assessment to inform instruction 0 1 2 3

***NCTM* Standard 4: Mathematical Learning Environment** **MEAN SCORE _____**

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:

Knowledge of adolescent learning, development, and behavior and foster positive disposition toward mathematics learning 0 1 2 3

Developmentally appropriate, sequential, and challenging learning opportunities 0 1 2 3

Knowledge of individual differences, including cultural and language diversity 0 1 2 3

Use of tools (e.g., manipulatives, physical models, drawings, and mathematics specific technologies) to enhance teaching and learning 0 1 2 3

Score Summary Sheet

***InTASC* Standard**	**Score**
Content	
Student Learning	
Diverse Learners	
Instruction	
Learning Environment	
Communication	
Planning	
Assessment	
Reflection	
Collaboration	
Mean Score	

***NCTM* Standard**	**Score**
Content Knowledge	
Mathematical Practices	
Content Pedagogy	
Mathematical Learning Environment	
Mean Score	

Did the teacher candidate earn an overall mean score of at least 2.0 on the *InTASC* rubric? _____

Did the teacher candidate earn an overall mean score of at least 2.0 on the *NCTM* rubric? _____

Overall mean score (sum of all scores divided by 14) _____

Grade as Percentage: $1.5\left[\frac{(overall\ mean - 2)}{.1}\right] + 85 =$ _____

Strengths:

Areas for Development: