

**George Mason University  
College of Education and Human Development  
Elementary Education Program**

ELED 552-002 – Mathematics Methods for the Elementary Classroom

3 Credits, Fall 2023

Thompson Hall 1017, Fairfax Campus

Wednesday 4:30 PM - 7:10 PM

### **Faculty**

Name: Kathleen Matson, PhD

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Office Hours: By appointment

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### **Prerequisites/Corequisites**

Admission to the elementary education licensure program.

### **University Catalog Course Description**

Introduces methods for teaching all children topics in arithmetic, geometry, algebra, probability, and statistics in elementary grades. Focuses on using manipulatives and technologies to explore mathematics and solve problems.

### **Course Overview**

In this course, we will begin an inquiry into mathematics teaching and learning that will guide you in your first teaching job and give you the tools that will enable you to continue to inquire and learn as part of your work as a teacher. Class sessions will be interactive and will include a variety of hands-on experiences with concrete and virtual manipulatives appropriate for elementary school mathematics. We will explore:

- The teaching of mathematics, investigating both *what* to teach and *how* to teach it.
- What it means to do mathematics and what it means to understand mathematics through individual, small group, and large group mathematical problem solving.
- Ways to represent understandings of mathematical concepts, communicate reasoning about mathematical ideas, and construct mathematical arguments.
- The ways children might represent mathematical concepts, and look at ways to help children build connections and see relationships among mathematical ideas.
- Characteristics of a classroom environment conducive to mathematical learning by reading and discussing the importance of mathematical tasks, mathematical tools, the roles of teachers and students, and the assessment of mathematical understanding.

In this course, we will take a stance of learning *for*, *from*, and *in* practice as follows:

**Learning *FOR* Practice** (Doing Mathematics): We will build our own *knowledge* of mathematics by closely investigating ideas in number sense and fraction concepts. Additionally, we will engage in several math tasks, extending our knowledge of mathematics and students' thinking, which will provide the foundation for your professional decision-making.

**Learning *FROM* Practice** (Examining Records of Practice): Records of practice—such as videotapes of lessons taught by yourself or others, students' work, and teachers' professional writing—will allow us to investigate the work of teaching mathematics and improve our own practice.

**Learning *IN* Practice** (Trying Things Out): Because teaching involves more than just having knowledge, you will be engaged in *enacting* the practices we are investigating as much as possible, so that you are developing the skills and professional decision-making that will make you a successful teacher.

## Course Delivery Method

This class will be delivered in person on the Fairfax Campus. Individual session formats vary and may include lecture, small group/large group discussion, hands-on, interactive work, student presentations, and cooperative learning. Practical applications of theory will be explored in group activities.

## Technical Requirements

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

- High-speed Internet access with standard up-to-date browsers. To get a list of Blackboard's supported browsers see: [https://help.blackboard.com/Learn/Student/Getting\\_Started/Browser\\_Support#supported-browsers](https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#supported-browsers)

To get a list of supported operating systems on different devices see:

[https://help.blackboard.com/Learn/Student/Getting\\_Started/Browser\\_Support#tested-devices-and-operating-systems](https://help.blackboard.com/Learn/Student/Getting_Started/Browser_Support#tested-devices-and-operating-systems)

- Students must maintain consistent and reliable access to their GMU email and Blackboard, as these are the official methods of communication for this course.
- Students may be asked to create logins and passwords on supplemental websites and/or to download trial software to their computer or tablet as part of course requirements.
- The following software plug-ins for PCs and Macs, respectively, are available for free download:
  - Adobe Acrobat Reader: <https://get.adobe.com/reader/>
  - Windows Media Player: <https://support.microsoft.com/en-us/help/14209/get-windows-media-player>
  - Apple QuickTime Player: [www.apple.com/quicktime/download/](http://www.apple.com/quicktime/download/)

## Expectations

- Course Week:  
Our course week will begin on Monday of each week that we meet as indicated on the Class Schedule.

- Log-in Frequency:  
Students must actively check the course Blackboard site and their GMU email for communications from the instructor, class discussions, and/or access to course materials at least 4 times per week.
- Participation:  
Students are expected to actively engage in all course activities throughout the semester, which includes viewing all course materials, completing course activities and assignments, and participating in course discussions and group interactions.
- Technical Competence:  
Students are expected to demonstrate competence in the use of all course technology. Students who are struggling with technical components of the course are expected to seek assistance from the instructor and/or College or University technical services.
- Technical Issues:  
Students should anticipate some technical difficulties during the semester and should, therefore, budget their time accordingly. Late work will not be accepted based on individual technical issues.
- Workload:  
Please be aware that this course is **not** self-paced. Students are expected to meet *specific deadlines* and *due dates* listed in the **Class Schedule** section of this syllabus. It is the student's responsibility to keep track of the weekly course schedule of topics, readings, activities and assignments due.
- Instructor Support:  
Students may schedule a one-on-one meeting to discuss course requirements, content or other course-related issues. Students should email the instructor to schedule a one-on-one session, including their preferred meeting method and suggested dates/times.

### Learner Outcomes or Objectives

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

- A. Know what constitutes the essential topics in mathematics of the modern early and intermediate grades school program.
- B. Identify and use selected manipulatives and technology such as linking cubes, attribute blocks, geoboards, base-10 blocks, fraction circles, tangrams, calculators, and computers to teach appropriate mathematics content topics in the early and middle grades.
- C. Identify and use various instructional strategies and techniques (cooperative and peer group learning, activity centers, laboratories and workshops, teacher-directed presentations, etc.) to teach mathematical content topics appropriate for the early and intermediate grades to all children, including those from non-mainstreamed populations.
- D. Identify and use alternative methods for assessing students' work in mathematics in the early and intermediate grades.
- E. Solve problems in the mathematical content areas of logic, number theory, geometry, algebra, probability, and statistics appropriate for adaptation to the early and intermediate grades.
- F. Know and explain the learning progression in relation to the standards-based mathematics curriculum, the key elements of the National Council of Teachers of Mathematics Principles and

Standards for School Mathematics, and the key elements of the Virginia Standards of Learning for Mathematics.

- G. Understand the multiple representations of mathematical concepts and procedures.
- H. Understand and use the five processes—reasoning mathematically, solving problems, communicating mathematics effectively, making mathematical connections, and using mathematical representations—at different levels of complexity
- I. Explore the contributions of different cultures toward the development of mathematics, and the role of mathematics in culture and society.
- J. Understand the relationship of math to science, the design process, and technology.
- K. Understand, possess, and integrate the knowledge, skills, dispositions, and processes needed to support learners’ achievement in an interdisciplinary manner in Virginia's Foundation Blocks for Early Learning: Comprehensive Standards for Four-Year-Olds and the Virginia Standards of Learning in English, mathematics, history and social science, science, and computer technology.

Additionally, this course supports the CEHD Core Values of collaboration, ethical leadership, research-based practice, social justice, and innovation. Statements of these goals are at <http://cehd.gmu.edu/values/>.

### Professional Standards

(Interstate Teacher Assessment and Support Consortium (InTASC))

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

Course Student Outcomes (above)	INTASC Standard (2013)
A. Essential math	#4 Content Knowledge
B. Planning and Teaching using manipulatives	#7 Planning for Instruction
C. Instructional Strategies	#8 Instructional Strategies
D. Assessing	#6 Assessment
E. Problem Solving	#5 Application of Content
F. Learner Development and understanding of Learning Progression	#1 Learner Development, #2 Learner Differences

G. Multiple Representations	#4 Content Knowledge, #5 Application of Content
H. Five Processes	#4 Content Knowledge, #5 Application of Content

### Required Text

Van De Walle, J., Karp, K. S., & Bay-Williams, J. M. (2018). *Elementary and Middle School Mathematics: Teaching Developmentally*. (10th edition) New York: Pearson(2019:9780134802084)

### Course Performance Evaluation

All assignment details, templates, and rubrics will be available on Blackboard. Students are expected to submit all assignments on time in the manner outlined by the instructor (e.g., Blackboard).

### Assignments

- **Daily Participation, digital Interactive Notebook (dINB), and Professional Dispositions (28 points)**

*Addresses Learner Outcomes: A, B, C, D, E, F, G*

Reading and activity reflections will be done via daily Interactive Notebook entries. During class meetings, students are expected to analyze and reflect on solution strategies, provide differentiated approaches to center activities, and actively participate in class discussions by applying class readings. This work will be collected and kept in a digital interactive notebook shared with the instructor in Google Slides. Professional dispositions are to be displayed at all times while interacting with the instructor and other students.

Students are expected to contribute to both group and class discussions and activities online as well as genuinely listen to peers as they do the same. The instructor may also call on students in order to maximize classroom opportunities to hear from ALL of the students enrolled in the course. Remember, participation is more than just talking. Participation should raise the level of academic discourse, which may include asking questions and encouraging exploration, consideration, and learning. To be active participants in class, you must complete all pre-assigned readings and tasks before the class session for which they are assigned.

It is expected that you attend all scheduled classes outlined within the syllabus. Absence from class to observe a religious holiday, to serve jury duty, or to participate in required military service, and medical emergencies are exceptions to the above policy. If you need to be absent for any of these reasons, please make arrangements at least 48 hours in advance. In addition, you are expected to be on time to class each session unless 48 hours advance notice has been provided to the instructor.

This course operates with the assumption that knowledge is socially constructed and the most meaningful learning opportunities are those where you have the opportunity to offer and explore diverse perspectives with peers; therefore, you are expected to contribute to all class and online discussions and activities as well as genuinely listen to peers as they do the same. You are expected to be prepared for each class, which means having completed all assigned readings and tasks for that class prior to the start of class. Your participation includes completion of all synchronous and asynchronous application activities. This includes but is not limited to

- Contributions to whole group and small group discussions
- All digital Interactive Notebook (dINB) work

Cell phones are for emergency use only and it is expected that you will not use cell phones or computers or social media on personal watches in class for purposes beyond enhancing your own learning of course content.

**Evaluation** for dINB - You will complete in-class and between class activities in your online class notebook. Your notebook is located at the journal tab on Blackboard. **\*\*PLEASE NOTE:** If you are absent from class, you can earn half the daily points by completing all the between session classwork.

**Daily Participation and Interactive Math Memo RUBRIC**

	Unsatisfactory (0 pts per day)	Proficient (2 pts per day)
<p><b>Reading Reflection in digital notebook</b> - includes work due prior to class session</p> <p><b>Classwork (both individual and group)</b> - participation and collaboration during the session and group presentations</p> <p><b>Post-Class Reflection</b> - reflective and interactive work done after the class session. - Dialogue with the instructor</p>	<p>The student is absent from class and/or is not prepared for class (between class work is incomplete). Some or all work is missing.</p>	<p>The student is punctual and prepared for class (between class work is complete). The student actively participates and supports the members of the learning group and the members of the class. Work is completed in a distinguished way</p>

● **Math Autobiography - Vision and Reflection (12 points)**

At the beginning of the semester, students will write a brief autobiography (approximately 2 pages) that reflects on their past experiences as learners and doers of mathematics. Questions to prompt the reflection will be provided on Blackboard. (Initial autobiography worth 6 points.)

At the end of the semester, students will write a reflection on their math autobiography in light of their learning and growth throughout the semester. (Final autobiography reflection worth 6 points.)

● **Math Routine (15 points)**

*Addresses Learner Outcomes: A, B, C, D, E, F, G*

You are required to plan, teach, and complete a reflection for a Math Routine taught to your classmates during the course, and to your students in your field assignment. Each 10-15 minute Math Routine will include the six essential elements of Math Routine. A Math Routine lesson plan template will be provided, to which you will add your anticipated student responses and your expected series of questions.

See the rubric on Blackboard for more detail.

[Math Routine Menu](#) and [Number Sense Routines by Grade](#).

- **Problem-Based Lesson Rehearsal with Student Work Analysis (15 points)**

*Addresses Learner Outcomes: A, C, D, E, F, G, H, I*

This lesson will be taught by a small group and presented to your classmates as a simulated lesson. You are expected to: 1) select a [VDOE rich task](#) that includes student Anchor papers and create your own group's lesson plan using the GMU Elementary Education template; 2) solve the problem yourself using all three representations (concrete, pictorial, abstract); 3) Prepare and use a *Planning for Mathematical Discourse Chart* that includes anticipated student responses/strategies and questions to assess and advance student work; 4) Implement the rich task with your peers in our classroom; 5) Monitor, select and sequence student responses for sharing-out; make purposeful connections between student strategies in both simulated lesson and in the analysis of student anchor papers; 6) complete a Google Slide Deck per the template provided on Blackboard to summarize and reflect on your lesson.

See the rubric on Blackboard for more detail.

- **Learning Trajectory Assessment Project : (30 points)**

*Addresses Learner Outcomes: A, B, C, D, F*

To plan effective instruction, you will need to know how to assess children's knowledge of mathematical concepts. One way to assess children's thinking is a diagnostic assessment. This assignment has four parts:

- Part 1. Description of the Learning Trajectory/Progression with visual of LT concept map
- Part 2. Conducting a formative assessment with an individual or a small group with screenshots of student work; reporting on student strengths and edges of their understanding
- Part 3. Description of the data from part 2, setting learning goals and proposing a set of activities that will advance the learner along the developmental learning trajectory.
- Part 4. Reflection (1-2 pages) and share out with a brief set of slides

More details can be found in the assignment description and rubric on Blackboard.

*Note: Faculty reserve the right to add, alter, or omit any assignment as necessary during the course of the semester. You will always receive advance notice of any modifications. Bookmark this link to access the most current schedule of assignments, readings and due dates.*

## Attendance Policy

Attendance in the course is mandatory. You are held accountable for all information from each class session whether you are present or not. Reasons for any absence must be reported to the instructor in writing. Attendance is tied into your participation grade. If you are not in class, you are not participating.

## Tardiness

It is your responsibility to be on time for each class session. Reasons for any absence must be reported to the instructor in writing.

## Late Work

Work is due on the announced due date. All late work will incur a penalty of 10 percent for each day late. The only exception to this is for those students with excused absences (see Attendance Policy above).

Given these policies, I also acknowledge this is a fast-paced and condensed course. I care that you have opportunities to succeed. If something arises that threatens your ability to succeed in this course, communicate with me as soon as is reasonably possible.

## Grading

### Course Assignment Weighting

Assignment	Points
Daily participation and digital Interactive NoteBook (dINB)	28
Math Autobiography and Vision Statements (6 points each)	12
<a href="#"><u>Math Routine</u></a>	15
<a href="#"><u>Problem-Based Lesson Rehearsal with Student Work Analysis</u></a>	15
<a href="#"><u>Learning Trajectory Assessment Project</u></a>	30
<b>Total</b>	<b>100</b>

### Policies for Grading

The mathematics education courses in GMU's Elementary Education Program integrate pedagogy and mathematics content appropriate for the elementary school grades. For students to earn a grade of A in the



course, they must demonstrate excellence in *both* the pedagogical knowledge and the content knowledge of the mathematics appropriate at their level of teaching. Thus, the grading in the course is structured to help evaluate student excellence in both areas. Problem sets and assessment work focuses primarily on ascertaining student excellence in handling mathematics content appropriate for the elementary grades, and represents 50% of students' grades. Pedagogical knowledge is ascertained primarily from readings, assignments and participation in the course, and represents 50% of students' grades. Therefore, students who demonstrate excellence in both pedagogical knowledge and content knowledge receive grades of A.

At George Mason University course work is measured in terms of quantity and quality. A credit normally represents one hour per week of lecture or recitation or not fewer than two hours per week of laboratory work throughout a semester. The number of credits is a measure of quantity. The grade is a measure of quality. The university-wide system for grading graduate courses is as follows:

Grade	GRADING	Grade Points	Interpretation
A	94-100	4.00	Represents mastery of the subject through effort beyond basic requirements
A-	90-93	3.67	
B+	85-89	3.33	Reflects an understanding of and the ability to apply theories and principles at a basic level
B	80-84	3.00	
C*	70-79	2.00	Denotes an unacceptable level of understanding and application of the basic elements of the course
F*	<69	0.00	

\* Note: "C" is not satisfactory for a licensure course  
 "F" does not meet the requirements of the School of Education.

### Professional Dispositions

Students are expected to exhibit professional behaviors and dispositions at all times.  
 (See Elementary Education Program Handbook).

## Class Schedule

These topics and activities are subject to change to be responsive to the pace of the course. This is a projected sequence of due dates and planned readings. An **“Always Current”** schedule will be maintained on Google Drive and can be accessed through the Blackboard course site.

Session # Time	Active Learning and Discussion Emphasis	Readings Due	Assignments Due
Session 1 August 23	Welcome! Intro to Math Methods  Knowing and Doing Mathematics  How Do Children Learn Mathematics?	Ch 2: pp. 13–29 <b>Note:</b> Try tasks 1-4 before reading on  Watch Video: <a href="#">Surprising Facts About Learning</a>	Math Autobiography and Vision Statement  Daily Interactive Notebook (DiNB)
Session 2 August 30	Teaching Through Problem Solving  NCTM Mathematical Teaching Practices  Tasks That Promote Problem Solving  Introduction to the Standards	Ch 1: pp 1-12 Ch 3: pp 30-48  Read: <a href="#">Transforming Math Learning</a>	Daily Interactive Notebook (DiNB)
Session 3 September 6	Mathematical Discourse - 5 Practices  Developing Early Number Concepts and Number Sense  Learning Trajectories	Ch 3: 48-53  Ch 7: Selected Pages  <a href="#">Never Say Anything a Kid Can Say</a>	Daily Interactive Notebook (DiNB)
Session 4 September 13	Planning in the Problem-Based Classroom  Developing Meanings for the Operations	Ch 4  Ch 8	Daily Interactive Notebook (DiNB)  Choose a Math Routine
Session 5 September 20	Assessments for Learning  Developing Basic Fact Fluency/ Student Strategies	Ch 5  Ch 9  <a href="#">Kling and Bay-Williams (2014) Assessing Basic Fact Fluency</a>	Math Routine Lesson Rehearsals  Daily Interactive Notebook (DiNB)
Session 6 September 27	Teaching Math Equitably  Developing Whole-Number Place-Value Concepts	Ch 6  Ch 10: pp. 211-222; p. 236	Daily Interactive Notebook (DiNB)

			Math Routine Lesson Rehearsals LT Assessment Project Part 1
Session 7 October 4	Developing Strategies for Addition and Subtraction Computation  Developing Strategies for Multiplication and Division Computation	Chapter 11: Select pages  Chapter 12: Select Pages  <a href="#">Karp, Bush, Dougherty. (2019). Avoiding the Ineffective Keyword</a>	Daily Interactive Notebook (DiNB)  Math Routine Lesson Rehearsals
Session 8 October 11	Algebraic Thinking and Mathematical Modeling  Math Sense Routines	Chapter 13  Podcast: <a href="https://makemathmoments.com/episode156/">https://makemathmoments.com/episode156/</a> (Math Talks)	Daily Interactive Notebook (DiNB)  Math Routine Lesson Rehearsals
Session 9 October 18	Developing Fraction Concepts and Operations	Chapter 14 Chapter 15	Daily Interactive Notebook (DiNB)  Math Routine Lesson Rehearsals
Session 10 October 25	Developing Decimal and Percent Concepts and Decimal Operations	Chapter 16	Daily Interactive Notebook (DiNB)  Problem-Based Lesson Rehearsal  LT Assessment Project Part 2
Session 11 November 1	Ratios, Proportions, and Proportional Reasoning	Chapter 17	Daily Interactive Notebook (DiNB)  Problem-Based Lesson Rehearsal
Session 12 November 8	Developing Measurement Concepts and Geometric Thinking	Chapter 18: Select pages  Chapter 19: Select Pages	Daily Interactive Notebook (DiNB)  Problem-Based Lesson Rehearsal

Session 13 November 15	Developing Concepts of Data and Statistics	Chapter 20	Daily Interactive Notebook (DiNB)  LT Assessment Project Part 3
<b>THANKSGIVING BREAK</b>			
Session 14 November 29	Course Reflection Summing It Up	Blackboard reading choice	Daily Interactive Notebook (DiNB)  LT Project Share Symposium
Session 15 December 6	NO CLASS		Math Autobiography Reflection  Final LT Assessment Project

### Core Values Commitment

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

### GMU Policies and Resources For Students

#### Policies

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

## Campus Resources

University Libraries <https://library.gmu.edu>

Questions or concerns regarding use of Blackboard should be directed to <https://its.gmu.edu/knowledge-base/blackboard-instructional-technology-support-for-students/>.

Support for submission of assignments to VIA should be directed to [viahelp@gmu.edu](mailto:viahelp@gmu.edu) or <https://cehd.gmu.edu/aero/assessments>.

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

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

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

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

## Emergency Procedures

You are encouraged to sign up for emergency alerts by visiting the website <https://alert.gmu.edu>. There are emergency posters in each classroom explaining what to do in the event of crises. Crisis in Education App at: <https://itunes.apple.com/us/app/in-case-of-crisis-education/id476578079?mt=8>

## Course Materials and Student Privacy

- All course materials posted to Blackboard or other course sites are private; by federal law, any materials that identify specific students (via their name, voice, or image) must not be shared with anyone not enrolled in this class.
- Video recordings of class meetings that include audio or visual information from other students are private and must not be shared.
- Live video conference meetings (e.g. Collaborate or Zoom) that include audio or visual information from other students must be viewed privately and not shared with others in your household.

- Some/all of your CEHD synchronous class meetings may be recorded by your instructor to provide necessary information for students in this class. Recordings will be stored on Blackboard (or another secure site) and will only be accessible to students taking this course during this semester.

## Assessment Rubrics

### Math Routine (15 points)

<b>Part A Plan:</b> Design a slide of the number routine with brief launch and summary of the routine; identify the goal of the routine and the <b>Virginia SOL</b> addressed in the routine.	3 points
<b>Part A Q&amp;A:</b> Include <b>Questions</b> for making math visible, encouraging justification and reflection, and orienting students to other ideas or extending on other's ideas; pinpoint <b>Anticipated</b> student responses along the learning progression;	2 points
<b>Part B Teach:</b> Implement the routine in your field assignment, facilitate discourse, make connections between students' contributions	5 points
<b>Part C Reflect:</b> After enacting the routine, reflect on your experience implementing the math routine in our classroom. What kinds of questions did you use the most? How did students engage in this activity? If you did this again, what would you do the same and what would you do differently? How does this routine address supports mathematical learning and equitable teaching practices?.	5 points
<b>Total Points</b>	15

### Problem-Based Lesson Rehearsal with Student Work Analysis (15 points)


[VDOE task site](#) and Google Slide template

<b>Part A: Plan:</b> Unpack the VDOE rich task by creating your own lesson plan for the problem-solving task and completing the provided Google slide template; Prepare a <i>Planning for Mathematical Discourse Chart</i> for your task. <u>Anticipate</u> how you will select, sequence and connect student work.	5 points
<b>Part B: Teach:</b> Launch the task and provide individual think-time. Monitor (using a <i>Planning for Mathematical Discourse Chart</i> ), select, and sequence student work for share-out; make intentional CONNECTIONS between student strategies.	5 points
<b>Part C:</b> After enacting the problem-solving-task, reflect on how the lesson supports equitable teaching practices for student learning.	5 points
<b>Total Points</b>	15

## Learning Trajectory Assessment Project Rubric (30 points)

### SCORING GUIDELINES

- **3 (Exemplary Standard):** Candidates receive a score of 3 if they perform at an exemplary level.. There is evidence that candidates have done additional research, identified additional resources, and/or demonstrate exceptional understanding and application of the standard.
- **2 (Meets Standard):** This score reflects that candidates have met the standard at the level expected at this point in their program. Candidates who receive a 2 have successfully met the standard.
- **1 (Approaches Standard):** Candidates receive this score when their understanding and effort does not meet the target but shows basic understanding of the content being assessed.
- **0 (Does Not Meet Standard):** Candidates who do not submit work, and/or who submit work that is clearly below the expectations for a candidate at this point in their program.

Learning Trajectory based Student Assessment				
Performance	Does Not Meet Standard (0)	Approaches Standard (1)	Meets Standard (2)	Exemplary Standard (3)
<b>Part 1. Description of the Learning Progression</b>				
<p><b>1a. Research on Description of the learning progression.</b> Summarize the research around the learning progression around the topic chosen.</p> <p>InTASC 1 &amp; 2; VDOE 1;</p> 	The candidate does not describe the learning progression using multiple resources (text, Learning progression documents and other research).	The candidate describes briefly the learning progression without any references.	The candidate describes the learning progression only using one resource (text, Learning progression documents and other research).	The candidate describes in depth the learning progression using multiple resources (text, Learning progression documents and other research).
<p><b>1b. Research on Description of common teaching and learning strategies.</b> What are some of the common teaching strategies and the ways in which students develop the skills and understandings?</p> <p>InTASC 2; VDOE 4</p>	The candidate does not describe the common teaching and learning strategies for the specific concept varying the strategies based on learning trajectory..	The candidate describes briefly the common teaching and learning strategies for the specific concept varying the strategies based on learning trajectory.	The candidate describes the common teaching and learning strategies for the specific concept varying the strategies based on learning trajectory but only uses one resource.	The candidate describes in depth common teaching and learning strategies for the specific concept varying the strategies based on learning trajectory using multiple resources (text, Learning progression documents and other research). Provides specific examples.






<p><b>1c. Research on Description of Student conceptions and misconceptions.</b> Specific references are made common conceptions and misconceptions one might attend to based on the research on the learner development using the text and progression document</p> <p>InTASC Standard #6 Assessment.</p>	<p>The candidate does not describe the common student conceptions and misconceptions for the specific concept based on learning trajectory.</p>	<p>The candidate briefly describes the common student conceptions and misconceptions for the specific concept .</p>	<p>The candidate describes the common student conceptions and misconceptions for the specific concept based on learning trajectory using only one resource.</p>	<p>The candidate describes in depth common student conceptions and misconceptions for the specific concept based on learning trajectory using multiple resources (text, Learning progression documents and other research). Provides specific examples.</p>
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**Part 2. Assessment Data from Tasks and Questions with Learning Progression Considered**

<p><b>2a. Assessment tasks with multiple representations.</b> Uses multiple and appropriate types of <u>assessment tasks that uses multiple representations</u> including pictorial, numeric, verbal and hands on manipulatives to assess student thinking and identify each learner’s needs (InTASC Standard #6 Assessment)</p>	<p>The candidate does not address learner educational needs or inappropriately uses assessment data to create a statement of educational need.</p>	<p>The candidate locates assessments that are not well aligned to the math concept.</p>	<p>The candidate reports on assessment data through designed tasks aligned to the math concept but does not consider multiple representations.</p>	<p>The candidate effectively integrates results from the assessment tasks from multiple sources to create a thorough and appropriate report aligned to the learning progression. The assessment tasks uses multiple representations including pictorial, numeric, verbal and hands on manipulatives to assess student thinking and identify the learner’s needs</p>
<p><b>2b. Purposeful questions.</b> Designs assessment with tasks aligned with <u>prepared questions</u> that gathers information about student’s interest, background and cultural information as well as specific questions linked to the tasks that probes thinking, and makes math visible.</p>	<p>The candidate does not describe an assessment plan that evaluates all learning objectives or describes a plan with any questions.</p>	<p>The candidate describes an assessment plan that evaluates all learning objectives but does not include questions that delve into the child or concept.</p>	<p>The candidate describes an assessment plan that evaluates all learning objectives and includes questions linked to the tasks that probes thinking, and makes math visible but does not gather info about the whole child.</p>	<p>The candidate describes an assessment plan that evaluates all learning objectives and prepares a variety of questions to gather information about student’s interest, background and cultural information as well as specific questions linked to the tasks that probes thinking, and makes math visible.</p>
<p><b>2c. Geared up and geared down with rationale on conceptual development.</b> Considers learner differences and has <u>at least three (3) differentiated tasks geared up and down with one technology</u> app-and to develop differentiated learning experiences. (INTASC Standard #2: Learning Differences)</p>	<p>The candidate does not identify either adaptations or accommodations to support learner achievement of learning objectives.</p>	<p>The candidate identifies either adaptations or accommodations that do not fully align with identified needs.</p>	<p>The candidate identifies and describes appropriate adaptations or accommodations that support learner achievement of learning objectives/goals, including technology.</p>	<p>The candidate thoroughly describes multiple, appropriate adaptations or accommodations that clearly support learner achievement of learning objectives/goals, including technology.</p>

**Part 3 Learning goals and Instructional Activities**

<p><b>3a. Set Learning Goal</b> (aka: target, benchmark, expectation) based on Developmental path along which children develop to reach that goal</p> <p>The candidate individually and collaboratively selects and creates learning objectives that are appropriate for curriculum goals and content standards, and are relevant to learners. The candidate identifies objectives for instruction based on formative and summative assessment data, prior learner knowledge, and learner interest.</p> <p><b>InTASC 7; VDOE 2</b>  </p>	<p>The candidate identifies learning objectives that are either incomplete because related outcomes are not identified or the objectives are not directly related to learner educational need.</p>	<p>The candidate identifies learning objectives without relevance to learner educational need.</p>	<p>The candidate identifies learning objectives with related outcomes that are relevant to individual learner needs.</p>	<p>The candidate identifies distinct learning objectives with related outcomes that are relevant to individual learner needs. These learning outcomes allow for different and individualized learning pathways that can be accessed fluidly during instruction.</p> <p>Includes rationales for the selection of those objectives and how they support the achievement in advancing student along the learning progression</p>
<p><b>3b. INSTRUCTIONAL STRATEGIES AND ADAPTATIONS</b>-Set of activities matched to each of the levels of thinking in that path that help children develop the next higher level of thinking. The candidate plans how to achieve each learner's learning goals, choosing appropriate strategies and accommodations, resources, and materials to differentiate instruction for individuals and groups of learners.</p> <p><b>InTASC 4</b>    Standard #4: Content Knowledge.</p>	<p>The candidate does not identify instructional strategies or identifies instructional strategies that are not related to the learning objectives or learning needs.</p>	<p>The candidate identifies instructional strategies that are inappropriate for meeting the learning objectives or learning needs.</p>	<p>The candidate identifies evidence-based instructional strategies that are aligned to the learning objectives and learning needs.</p>	<p>The candidate identifies evidence-based instructional strategies that are aligned to specific learning objectives and learning needs. The candidate provides evidence of the effectiveness of these selected learning strategies through data analysis of the assessment.</p>
<p><b>3c. Developmental path along which children develop to reach that goal</b> The candidate connects concepts and uses different perspectives and digital resources to engage learners in critical thinking, creativity, and collaborative problem solving.</p> <p><b>InTASC 5; VDOE 2;</b>  </p>	<p>Candidate does not connect concepts, address different perspectives or use digital resources to engage learners in higher-level learning.</p>	<p>Candidate connect concepts, addresses different perspectives or uses digital resources to engage learners but at a basic level of learning and recall.</p>	<p>Candidate connects concepts, addresses different perspectives and uses digital resources to engage learners in higher-level learning in using at least one of these higher-order skills: critical thinking, creativity, and collaborative problem solving.</p>	<p>Candidate creates multi-disciplinary opportunities and a range of multiple perspectives to engage learners in critical thinking, creativity, and collaborative problem solving.</p>
<p><b>Part 4. REFLECTION and Presentation</b></p>				
<p>The candidate uses ongoing analysis and reflection to improve planning and practice</p>	<p>There was no evidence that the candidate used ongoing analysis and/or reflection to improve planning and practice.</p>	<p>The candidate uses marginal analysis and reflection strategies to improve planning and practice.</p>	<p>The candidate uses ongoing analysis and reflection to improve planning and practice</p>	<p>The candidate effectively uses ongoing analysis and deep reflection to improve planning and practice. Candidates reflect and share on learning about the student's learning trajectory.</p>

## Great Resources at Your Fingertips:

As you work on your assignments, the intent is that you also deepen your math knowledge for teaching and learn about important resources for teaching and learning such as:

- Van de Walle et al. text as a resource
- [VDOE Curriculum Framework document](#) (standards unpacked with essential knowledge and skills)
- [VDOE Math Instructional Plans](#) (suggested instructional plans for each standard)
- VDOE Bridging Standards Site <https://www.mathstrength.org/>
- [VDOE Vertical Articulation Tool](#)
- Clements and Samara Learning Trajectories website: <https://www.learningtrajectories.org/>

## Helpful Websites:

- University of Washington Number Talks and other Instructional Activities with videos and lesson plans: [tedd.org](http://tedd.org)
- National Council of Teachers of Mathematics – Illuminations: [illuminations.nctm.org](http://illuminations.nctm.org)
- Jo Boaler’s blog and resources: [joboaler.com](http://joboaler.com)
- Another Jo Boaler/Stanford University website w/K-12 math resources: <https://www.youcubed.org/>
- Estimation 180 (Andrew Stadel’s site – elementary and MS focused): [estimation180.com](http://estimation180.com)
- Fawn Nguyen’s website (MS Math focused): <https://www.fawnnguyen.com/>
- Dan Meyer’s website (more HS focused): [blog.mrmeyer.com](http://blog.mrmeyer.com) and his “3-Act” math lessons (MS and HS focused, linked to CCSS): [www.livebinders.com/play/play\\_or\\_edit?id=330579](http://www.livebinders.com/play/play_or_edit?id=330579)
- [Math Tasks/Resources/Manipulatives](#)
- University of Washington Number Talks website: <https://tedd.org/>
- National Council of Teachers of Mathematics – Illuminations: <https://illuminations.nctm.org/>
- Estimation 180 (Andrew Stadel’s site – elementary and MS focused): <https://estimation180.com/>
- Graham Fletcher “3-Act” math lessons (ES focused): <https://gfletchy.com/>
- Michael Pershan’s blog, elementary school teacher: [Math Mistakes blog](#)

## CCSS Helpful Websites:

- CCSS Progressions Documents: <http://ime.math.arizona.edu/progressions/>
- Lots of lesson plans and videos organized by Standard: [insidemathematics.org](http://insidemathematics.org)
- CCSS aligned tasks: [illustrativemathematics.org](http://illustrativemathematics.org)
- CCSS aligned tasks and assessments: [map.mathshell.org/](http://map.mathshell.org/)
- Learning and Teaching with Learning Trajectories <https://learningtrajectories.org/>
- Progressions Videos <https://gfletchy.com/progression-videos/>